5-1 Log #160 NEC-P05 **Final Action: Reject**
(Entire Document)

NOTE: The following proposal consists of Comment 5-1 on Proposal 5-1 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 5-1 was:
Change the term "equipment grounding conductor" to "equipment bonding conductor" throughout the NEC.
Submitter: Glenn W. Zieseniss, Crown Point, IN
Recommendation: The recommendation to change the term "equipment grounding conductor" to "equipment bonding conductor" throughout the NEC should have been accepted.
Substantiation: A descriptive designation of EGC and EBC is a necessity to using the NEC effectively. I agree with the comments of Messers. Dobrowsky, Johnston, Mello, Skuggevig, and White. In just the last 3 months, had reviewed plans for 3 cell towers and equipment. Two of the plans specifically stated the installation to be installed per the NEC and local codes, then went on to specifically have an Isolated ground rod for the Service Equipment and another Isolated ground rod for the Telco (telephone) service to the building. The third installation showed very well detail ground ring with all of the connections to it and the Grounding Bar detail, then did not connect the Service Equipment to the grounding ring which is only inches away. These plans were stamped by Electrical Engineer(s).

Comments by some of the "Explanation of Negative", such as "the terms ground, grounding and equipment ground conductor have been used in the NEC for years and are widely understood". But it is not widely understood by all electrical people!
Panel Meeting Action: Reject
Panel Statement: The panel does not accept the proposal and comment to globally change the term "equipment grounding conductor" to "equipment bonding conductor" throughout the 2008 NEC. The NEC Technical Correlating Committee formed a Task Group on Grounding and Bonding with the assignment to explore the issues identified in Proposal/Comment 5-1 (from the 2005 Code cycle) regarding "grounding" and "bonding", and to consider development of proposals for the 2008 NEC to establish consistent use of the terms as outlined in Proposal/Comment 5-1.

The Technical Correlating Committee Task Group on Grounding and Bonding developed the following proposals: 5-2, 5-6, 5-8, 5-9, 5-12, 5-14, 5-38, 5-48, 5-61, 5-76, 5-77, and 5-337. These proposals to CMP-5 revise definitions in Article 100 and sections of Article 250 to improve and clarify requirements related to grounding and bonding. Additional proposals were submitted to other articles.

All of these proposals were balloted through the TCC. After the ballot, the Task Group considered each of the negative comments received. The task group responded to and addressed each negative comment and clarified its intentions. See panel actions and statements on Proposals 5-2, 5-6, 5-8, 5-9, 5-12, 5-14, 5-38, 5-48, 5-61, 5-76, 5-77, and 5-337.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

DOBROWSKY, P.: The work of the task group on bonding and grounding made many changes that help clarify where items are connected to instead of simply saying they need to be grounded. Changing the term "equipment grounding conductor" to "equipment bonding conductor" is still necessary because presently the terms are not clear.

18-1 Log #161 NEC-P18 **Final Action: Reject**
(Entire Document)

NOTE: The following proposal consists of Comment 18-1 on Proposal 18-1 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 18-1was:

Change the term "equipment grounding conductor" to "equipment bonding conductor" throughout the NEC.
Submitter: John Stricklin, International Assoc. of Electrical Inspectors
Recommendation: Equipment grounding conductor to be changed to equipment bonding conductor.
Substantiation: Eustace Soares stated in his book "Grounding Electrical Distribution Systems for Safety", if I were asked to describe what it is that is responsible for the mystery in "Grounding" my answer could be given in ONE word. That word would be TRADITION. Tradition has been the nemesis of the progress of civilization for centuries. The only way we can fight the enemy of tradition is to view the facts with an open mind and not let tradition close our eyes to the truth.

TRADITION says we did something fifty years or more ago so we became hide-bound (having an inflexible character) and continue to do it despite the changes over the years, which dictate otherwise.

Eustace Soares states in the preface of his book on grounding, "The effectiveness and safety of any system finally rests on the methods of installations. The book covers pitfalls that must be avoided in order to comply with the rules as set down in the Code."

One of these pitfalls is to separate the differences between "Ground, grounded and grounding" and "Bond, bonded, and bonding."

Ground, grounded and grounding relate to "Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operation." Is it not the power supplier that needs, "line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during their noraml operations?"

Bond, bonded, and bonding relate to "Non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the electrical supply source in a manner that establishes an effective fault current path."

Until the users of the National Electrial Code, change grounding and bonding to what they really are and mean, nearly everyone that trys to use the present NEC is always confused. Ground, grounded and grounding relate to lightning protection. Bond, bonded, bonding relates to fault current protection. When grounding and bonding are separated, that could be the first step in making grounding workable.
Panel Meeting Action: Reject
Panel Statement: The term Equipment Bonding Conductor as proposed is not consistent with the TCC Task Group Proposal 18-8, which is accepted by the panel. The work of the TCC Task Group shown in Proposal 18-8 establishes common definitions and guidance for these terms throughout the Code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-2 Log #162 NEC-P18 **Final Action: Reject**
(Entire Document)

NOTE: The following proposal consists of Comment 18-2 on Proposal 18-1 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 18-1 was:

Change the term "equipment grounding conductor" to "equipment bonding conductor" throughout the NEC.
Submitter: John Stricklin, International Assoc. of Electrical Inspectors
Recommendation: Change equipment grounding conductor to equipment bonding conductor.
Substantiation: The NEC is supposed to be "THE BOOK" for electricians and the users of electricity. The biggest part of the NEC is easy to understand but "GROUNDING" is another subject. How many people have been injured or killed, or had personal property destroyed by the misunderstanding of grounding? This little three word (equipment bonding conductor) change could be the most important change ever made in the NEC.
Panel Meeting Action: Reject
Panel Statement: The term Equipment Bonding Conductor as proposed is not consistent with the TCC Task Group Proposal 18-8, which is accepted by the panel. The work of the TCC Task Group shown in Proposal 18-8 establishes common definitions and guidance for these terms throughout the Code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-3 Log #163 NEC-P18 **Final Action: Reject**
(Entire Document)

NOTE: The following proposal consists of Comment 18-2a on Proposal 18-1 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 18-1 was:

Change the term "equipment grounding conductor" to "equipment bonding conductor" throughout the NEC.
Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Accept the proposal.
Substantiation: I still believe changing the term equipment grounding conductor (EGC) to equipment bonding conductor (EBC) remains the best thing to do, and understand there is still much to do. Although the necessary 2/3 vote by CMP5 was not achieved, a majority vote was, indicating that there is support for the change. Using the present term, one must "ignore" the actual language. It is amazing how many individuals shared verbal comments that using the proposed term is much clearer. These comments came from those that are very experienced. Some indicate that the existing terms are acceptable and have been used for many years. That doesn't make them correct, and to understand the function and concept, one must actually ignore the definitions. What about the new user of the NEC? We need to think of the future and whether this change is helpful.

Some have argued that a great expense will be incurred, but what about the hidden expense of misunderstanding. If a FPN is included with the new definition (EBC) indicating that the term equipment grounding conductor was for this purpose in past editions of the NEC, product standards and manufacturers instructions can be changed as part of the normal revision process. In the 2002 NEC, the term "lighting fixture" was changed to "luminaire" with no indication of a tremendous expense to the industry. Retailers continue to advertise they are selling lighting fixtures. In many applications, the device terminal described as that intended for the connection of the equipment grounding conductor actually is "grounded" using equipment bonding jumper. That jumper doesn't get connected to ground; it completes the fault current path by bonding. In many instances, the fault can be cleared with no current passing through "ground." Electricians will continue to connect the green colored or bare conductor to the green device terminal regardless of whether the manufacturer's literature describes it as an equipment grounding terminal.

Some have argued that there will be a fortune to be made in seminars. I believe that this will be fairly easy to explain and will actually decrease the amount of education necessary in the future because the terms will be more self evident of what they are being used for. In 250.80 and 250.84 we provide exceptions that "do not require elbows buried in the earth to be grounded." They are in the earth! Isn't that grounded by the definition?

The discussions related to the proposed concept have been very interesting and enlightening and has already increased the awareness of the differences between grounding and bonding. The true quality of many individuals was very evident, and exemplifies the NEC process. Even those individuals that disagree with this change continue to remain good friends.

Panel Meeting Action: Reject

Panel Statement: The term Equipment Bonding Conductor as proposed is not consistent with the TCC Task Group Proposal 18-8, which is accepted by the panel. The work of the TCC Task Group shown in Proposal 18-8 establishes common definitions and guidance for these terms throughout the Code.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-4 Log #1121 NEC-P18 **Final Action: Reject**

(Entire Document)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Change "luminaire(s)" to "lighting fixtures".

Substantiation: There is no definition for a lighting fixture which does not conform to the definition of luminaire. A chandelier with unenclosed (not protected) lamps does not conform to the definition nor does a fluorescent fixture without a lens. The proposed definition does not include equipments which are basically lampholders, such as sign receptacles, pendant supported brass screw shell lampholders, or porcelain and plastic lampholders designed for mounting on an outlet box, or weatherproof type lampholders.

Panel Meeting Action: Reject

Panel Statement: The proposal would change the term "Luminaire" to "Light Fixture". Making this change would not address the concerns expressed in the substantiation.

There are luminaire designs that do not include a diffuser. In these instances the light is "distributed" by the lamp alone.

"Luminaire" is the term specified by the IESNA, in the ANSI/UL safety standards and the ANSI/NEMA performance standards for lighting products that were previously referred to as "light fixtures" in the U.S. "Luminaire" is also the term used in IEC standards and accepted globally. It is the panel's intent to use the internationally accepted term in this Code.

The panel also agrees that lampholders and sign receptacles are not luminaires. See panel action and statement on Proposal 18-44, which deletes the term "(fixture)" throughout the Code. See also Panel Proposal 18-4b (log CP1800) which revises the definition of luminaire as follows: Luminaire – A complete lighting unit consisting of a light source such as a lamp or lamps, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source, ballast, or distribute the light. A lampholder itself is not a luminaire.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

ARTICLE 90 — INTRODUCTION

1-1 Log #808 NEC-P01 **Final Action: Reject**

(90 and and 110)

Submitter: John MacLennan, Prescott, WI

Recommendation: Since the NFPA Standards do exist and are written to further define the NEC 70 why then aren't they mentioned as a requirement in their associated articles of the NEC 70? I am now retired but I still keep myself active in the codes. As the proud holder of a MN Master Electrician's/Contractors License I speak out whenever the need arises on a given subject as to the further requirements of the NFPA Bulletins on various subjects!

Substantiation: I discussed inspection discrepancies I have come across through my 50 years in the trades, with the the promoters of the seminar I attended in Jan 2005 in MN. I was told by the heirarchy from the MN Electrical State Board that although the NFPA does go a step further, MN laws only allow us to enforce the NEC70! So my question is why muddy the waters with un enforced recommendations?

Panel Meeting Action: Reject

Panel Statement: The submitter does not provide specific locations for the recommended changes or proposed text, as required by 4-3.3(b) and 4-3.3(c) of the Regulations Governing Committee Projects.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-2 Log #3561 NEC-P01 **Final Action: Reject**

(90.2(D) & (E) (New))

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc.

Recommendation: Add new 90.2(D) and 90.2(E) as follows:

<u>(D) Existing Installations. Existing electrical installations that do not comply with the provisions of this code shall be permitted to be continued in use unless the authority having jurisdiction for enforcing this code determines that the lack of conformity with this code presents an imminent danger to occupants. Where changes are required for correction of hazards, a reasonable amount of time shall be given for compliance, depending on the degree of the hazard.</u>

<u>(E) Additions, Alterations, or Repairs. Additions, alterations, or repairs to any building, structure, or premises shall conform to that required of a new building without requiring the existing building to comply with all the requirements of this code. Additions, alterations, installations, or repairs shall not cause an existing building to become unsafe or to adversely affect the performance of the building as determined by the authority having jurisdiction. Electrical wiring added to an existing service, feeder, or branch circuit shall not result in an installation that violates the provisions of the code in force at the time the additions are made.</u>

Substantiation: The proposed text is intended to clarify in the scope of the code that the NEC is not retroactive. The proposed wording is based on 80.9(B) and (C) of Annex G. Presently, Annex G is informative unless specifically adopted by the local jurisdiction. However, there is confusion and uncertainty about application of the code, and the proposed text should be a normative part of the NEC. The application of the NEC described in the proposed wording is the established practice in the majority of jurisdictions. The assumption that the NEC is not retroactive is sometimes the basis for acceptance or rejection of NEC change proposals.

Other standards that are adopted into law by reference contain sections on application. An example is rule 013 of the National Electrical Safety Code (NESC).

Panel Meeting Action: Reject

Panel Statement: Retroactive application is within the purview of the adopting jurisdictions, such as Annex G, which may be specifically adopted by the local authority having jurisdiction adopting the NEC. The Code itself cannot usurp the authority of these jurisdictions. The submitter's concerns are addressed by 90.1(A) and (B) and in other NFPA standards such as NFPA 73.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

MCCARVER, R.: While retroactive application may be in the purview of adopting jurisdictions, it is seldom their practice to make retroactive applications. It is difficult to see how moving this statement from Annex G into the Code could be seen as usurping the authority of an adopting jurisdiction. All a jurisdiction has to do is adopt the Code without this clause if it desires. There is no authority being usurped. The NFPA Manual of Style, paragraph 1.6.1.5, provides that "retroactivity statements shall be used as applicable." Annex A of that document even provides suggested language for retroactivity statements.

Questions continually arise from Code users as to whether the NEC is retroactive. Frequently the NEC is interpreted incorrectly on this issue leading to unnecessary added installation and maintenance procedures and costs. The proposed revision clarifies the scope of the NEC relevant to retroactivity and re-institutes retroactivity considerations as normative text.

1-3 Log #3346 NEC-P01 **Final Action: Reject**

(90.2(1)(3))

TCC Action: The Technical Correlating Committee advises that Article Scope statements and are the responsibility of the Technical Correlating Committee, however, 90.2 covers the scope of the NEC and is not an Article Scope statement.

Submitter: Paula Walach, P&G/Gillette

Recommendation: Revise text to read:

Exception to railway rolling stock. This would be limited to railway rolling stock that runs confined in railway territory with overhead electric catenary,and or third rail or street running conduit slot. Only where the rolling stock cars are occupied in the same manor as a place of public assembly,and are equipped with bathrooms and restaurant facilities or sleeping quarters, that as rolling stock defined only that carries passenger for hire. It also may address station facilities and waiting rooms, that are connected with electric railway systems. It does not cover substations, locomotive, or general power distribution. Power for such electric railway can have power derived from a local utility grid.

Substantiation: With the advent of such electric railway rolling stock having being equipped for lap top computers, lavatories having Ground fault circuit interrupter, food service cars having all sorts of electrical appliances that is normally supplied by on board electric power, there has to be regulation of installation and repair of such on board conviences. Then qualified people (licensed electricians in jurisdictions that such rolling stock is maintained or built) that work in building premise wiring would carry out a same safe standard.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The requirements of the Code have been developed, recognizing that railway rolling stock is not covered, as 90.2(B)(3) is specific to only railways operating rolling stock associated with generation, transformation, transmission, or distribution of power. The proposed language is general and makes an exception to the scope of the Code. As such it is not specific as to which Code requirements would be applicable to rolling stock and which would not be applicable. The concerns of the submitter would best be directed to those industry standards governing railway rolling stock. In addition, the substantiation addresses station facilities and waiting rooms that are presently covered by the Code under 90.2(A).

The Manual of Style for NFPA Technical Documents, Section 2.3.5.4, states that "exceptions shall not be permitted to be used where the exception covers the predominate use or application and would more appropriately be addressed as a requirement." CMP-1 notes that the NEC Style Manual, Section 2.2.1, requires that "the approval of the article scope statements is the responsibility of the Technical Correlating Committee."

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-4 Log #3203 NEC-P01 **Final Action: Reject**

(90.2(A)(2), FPN 2)

Submitter: Donald Cook, Shelby County Development Services

Recommendation: Delete this FPN completely.

Substantiation: A review of 90.2 (A) and (B), the Article 100 definition of service point, the complete NEC text and specifically the text in Articles 225, and 230 leads one to believe that electrical wiring and equipment located on the load side of the service point is under the scope of the NEC. This FPN, which based on the text in 90.5(C) is not enforceable, provides no value to the NEC user.

If industry believes information in the NESC is necessary for installations on the load side of the service point, that information should included as requirements of the NEC, not as a FPN. As an FPN, it only adds to the confusion of designers, installers, and AHJ's working on installations working on premises wiring.

Panel Meeting Action: Reject

Panel Statement: The FPN provides the user of the Code an applicable resource that can be adopted by governmental bodies to cover industrial substations or multibuilding complexes. Although the submitter recognizes these rules are not covered fully in the Code, ANSI C2 provides the specific information for those installations.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-4. Our explanation is as follows:

While we agree that a FPN reference to the NESC may be helpful, we agree with the submitter that "as an FPN, it only adds to the confusion of designers, installers, and AHJ's working on installations working on premises wiring." We further agree with the submitter that "if industry believes information in the NESC is necessary for installations on the load side of the service point, that information should included as requirements of the NEC, not as a FPN."

1-5 Log #2018 NEC-P01 **Final Action: Reject**

(90.2(B)(5)(b))

Submitter: Wayne Robinson, Lothian, MD

Recommendation: Delete the following text:

Are located in legally established easements, rights-of-way, <u>or by other agreements either</u> designated by or recognized by the public service commissions, utility commissions, or other regulatory agencies having jurisdiction for such installations.

Substantiation: 90.2(B)(5)(b) Allows public utilities to work in established easements and rights of ways. Public Utilities are interpreting that the present language allows the utility to install lighting installations in private parking areas, without proper permitting or oversight by the AHJ. The removal of "or by other agreements either" will limit the public service commission and utility commissions authority to establish easements or rights-of-way for the distribution of electricity, not for electrical installations on private property covered by 90.2(A). Utilities in Maryland have been granted the ability to supersede the NEC by the public service commission and install private area lighting without service disconnects, branch circuit protection or proper grounding means under Article 250 NEC. I believe this is unsafe and wrong.

Panel Meeting Action: Reject

Panel Statement: The text "or by other agreements" allows for the installation of utility facilities directed by their regulatory commissions on other than easements or right of ways through applications executed for service to the premise. These facilities include private area lighting, the safety of which is covered through utility conformance with the requirements of the authorities having jurisdiction over the utility.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-5. Our explanation is as follows:

Accepting this Proposal will, in our opinion, go a long way towards achieving a primary goal of a still-convened electrical industry coalition. The electrical industry continues to struggle to find ways to stem the tide of the erosion of installations installed and inspected in accordance with the requirements of the NEC. It is important to note that this is not a debate on who should or who will be making electrical installations, rather what installation codes are to be followed and enforced. The presentation given by Mr. Mark Ode during the CMP-1 ROP meeting on the proliferation of industrial machinery installations built and installed outside the scope of the NEC and its enforcement is very relevant example of that erosion of NEC installations and enforcement.

The use of difficult to enforce, potentially vague, and open-ended language such as "or by other agreements" could be compared to writing a blank check. Using words such as these and hoping they mean what CMP1 thought they meant in the future does not seem prudent. As utilities continue to deregulate and the electrical industry as a whole continues to seek its own level, it is hard to imagine what the scope and implications of the words "or by other agreements" could one day mean. An excellent picture of what could happen was eloquently painted in the hypothetical example offered by the Chairman of CMP-1, Mr. John Minnick, in the code making panel deliberations on this issue. My notes indicate that he asked us to envision the Hilton Head Crowne Plaza complex where we were meeting being installed per the NESC under other agreements that are designated or recognized by regulatory agencies. Imagine an entire complex of that size and complexity installed without the requirements and enforcement of the NEC. The words "or by other agreements could permit an "agreement" with a utility to completely disregard the safety driven provisions of the NEC. Enforcement may no longer be necessary and the electrical inspector may no longer be needed.

We continue to agree with Mr. Ivory's vote to reject TC Comment 1-26a in the 2002 NEC cycle and his Explanation of Negative where he disagrees with the TC-generated substantiation's general assertion that the "…amended wording adds more clarity…." Furthermore, it is extremely important to note that the term "or by other agreements" did not have public review when it went into the NEC. The term "or by other agreements" first appeared in the 2002 NEC. The term did not appear in the 1999 NEC or prior editions of the NEC. Researching this fact clearly points out that this text was not incorporated into NFPA-70 through an ANSI consensus process. The term "or by other agreements" does not appear in a public Proposal or Comment in the 2002 NEC cycle. That term was introduced in a Technical Committee Comment (Comment 1-26a). Therefore, it is our position that introduction of this term was in violation of Section 4-4.3.2 (now 4.4.3.2) of the NFPA Rules Governing Committee Projects. It states that "Technical Committee-generated Comments shall not introduce a concept that has not had public review."

It is virtually impossible to argue or contemplate that in the context of proposals and comments submitted in the 2002 cycle of the NEC that the term "or by other agreements" was intended. A review of all proposals and comments clearly reveals that no submitter suggested language that would allow any entity to make an "agreement" with the utility to completely disregard the NEC and eliminate electrical inspections. It is the position of the IBEW that a very serious error has occurred in the NFPA consensus process. We are of the opinion that the term "or by other agreements" did not have public review and was therefore not appropriately introduced by the Technical Committee (TC) in a TC-generated Comment. We ask that the TCC, Standards Council and NFPA legal counsel review this issue.

HITTINGER, D.: Electrical work that is done on the load side of the utility is subject to the NEC rules regardless of who does the work. The submitter indicates in the substantiation that work is being done by utilities without permits or inspections that enforce the NEC requirements resulting in unsafe installations. The panel statement addresses "or by other agreements" to allow for the installation of utility facilities through applications executed for service to the premises but does not address the concerns raised by the submitter for parking lot lighting installations on private property by a utility company. If that is the intent of the statement, a utility could wire an entire building "by other agreements." The panel should accept the deletion of the statement to limit the utilities' work to legally established easements or rights of way.

Comment on Affirmative:

LABRAKE, JR., N.: Deleting the text "or by other agreements" could cause a conflict with existing governing laws; i.e., local, state, federal. Out sourcing of work by utilities is controlled by the utilities methods and procedures within their tariffs and rules.

1-6 Log #839 NEC-P01 **Final Action: Accept in Principle**

(90.3)

Submitter: Stephen W. Drayton, Eastern Idaho Electrical JATC

Recommendation: Revise as follows:

Chapter 9 consists of tables and shall be applicable only as referenced elsewhere in the NEC.

Substantiation: The rest of 90.3 and Figure 91.3 states how each of the chapters are arranged and how they apply except for the Chapter 9 statement.
Panel Meeting Action: Accept in Principle
Revise this proposal as follows:
"Chapter 9 consists of tables applicable as referenced."
Panel Statement: The mandatory text of "shall" is not required for this statement and the text is revised according to the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-7 Log #3037 NEC-P01 **Final Action: Reject**
(90.3)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Revise text to read as follows:

90.3 Code Arrangement.

This Code is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally; Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions. These latter chapters supplement or modify the general rules. Chapters 1 through 4 apply except as amended by Chapters 5, 6, and 7 for the particular conditions. Chapter 8 covers communications systems and is ~~not~~ subject to the requirements of Chapters 1 through 7 ~~except where~~ unless the requirements are specifically excluded ~~referenced~~ in Chapter 8.

Chapter 9 consists of tables.

Annexes are not part of the requirements of this Code but are included for informational purposes only.

The same changes are needed in Figure 90.3, as shown below.

Substantiation: It is important to make this change because the fire safety implications of the wiring in Chapter 8 should be discussed at a level that exceeds that of CMP 16, which has total responsibility now (subject, of course, to the oversight of the Technical Correlating Committee).

A key issue is the issue of grounding of wires, cables and conductors, which is addressed, of course, in Article 250, which Chapter does not need to follow. The wiring covered by Chapter 8 is often not low voltage wiring and it is inappropriate that Chapter 2, for example, should not apply. Chapter 8 should become a special condition type of chapter, just like Chapters 5 through 7. This may have implications in other areas, which will have to be looked into in detail, probably. However, the safety considerations are critical here.

With regard to wiring in ducts, for example, Chapter 3, in article 300, states that there shall be no wiring in ducts, as follows:

300.22 (A) Ducts for Dust, Loose Stock, or Vapor Removal. "No wiring systems of any type shall be installed in ducts used to transport dust, loose stock, or flammable vapors. No wiring system of any type shall be installed in any duct, or shaft containing only such ducts, used for vapor removal or for ventilation of commercial-type cooking equipment."

At present this is consistent with the statements in each one of the articles in Chapter 8, as follows, for articles 800, 820 and 830:

800.133 Installation of Communications Wires, Cables, and Equipment.
(D) Wiring in Ducts for Dust, Loose Stock, or Vapor Removal. Section 300.22(A) shall apply.
800.154 Applications of Listed Communications Wires and Cables and Communications Raceways.
Communications wires and cables shall comply with the requirements of 800.154(A) through 800.154(F) or where cable substitutions are made in accordance with 800.154(G)
(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned cables shall not be permitted to remain. Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.
FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
820.3 Other Articles.
Circuits and equipment shall comply with 820.3(A) through 820.3(G).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned coaxial cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts, plenums, or other spaces used for environmental air, shall apply.
Exception: As permitted in 820.154(A).
820.154 Applications of Listed CATV Cables and CATV Raceways.
CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154.
(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.
FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
830.3 Other Articles.
Circuits and equipment shall comply with 830.3(A) through 830.3(E).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned network-powered broadband communications cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22 shall apply where installed in ducts, plenums, or other spaces used for environmental air.
Exception: As permitted in 830.154(B).
830.151 Medium Power Network-Powered Broadband Communications System Wiring Methods.
Medium power network-powered broadband communications systems shall be installed within buildings using listed Type BM or Type BMR, network-powered broadband communications medium power cables.
(A) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22 shall apply.

However, CMP 16 added into articles 800 and 820 the definition of a new term, which is actually not used in the articles, namely "air duct", as follows:

Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum.

Since air ducts are neither defined in Chapter 100 of the NEC nor in Chapter 3, clearly, the intent of the addition of this definition is to add requirements for wiring in air ducts. In fact, CMP 16, responsible for Chapter 8, approved proposals for the last edition of the NEC that would have allowed wiring methods into air ducts, before Standards Council imposed a moratorium.

Figure 90.3 Code Arrangement

Chapter 1 - General Chapter 2 - Wiring and Protection Chapter 3 - Wiring Methods and Materials Chapter 4 - Equipment for General Use	Applies Generally to All Electrical Installations
Supplements or Modifies Chapters 1 through 4	Chapter 5 - Special Occupancies Chapter 6 - Special Equipment Chapter 7 - Special Conditions
Chapter 8 - Communications Systems	Chapter 8 is ~~not~~ subject to the requirements of Chapters 1 through 7 ~~except where~~ unless the requirements are specifically ~~referenced~~ excluded in Chapter 8.
Chapter 9 - Tables	Applicable as Referenced
Annex A through Annex G	Informational only; not mandatory

Another example of potential problems is that the communications wiring methods defined in 300.22 would, at first sight, appear to exclude the use of the type of cables that is normally used in plenums (or in "other spaces used for environmental air"), namely CL2P, CL3P, FPLP, NPLFP, OFNP, OFCP, CMP, CATVP and BLP. In fact, however, the CATVP and BLP wiring systems are covered confusingly in articles 820 and 830 by the exclusion of Chapter 8 from requiring compliance with article 300.22, with added exceptions, as follows:

820.3 Other Articles.
Circuits and equipment shall comply with 820.3(A) through 820.3(G).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned coaxial cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts, plenums, or other spaces used for environmental air, shall apply.
Exception: As permitted in 820.154(A).
820.154 Applications of Listed CATV Cables and CATV Raceways.
CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154.
(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.
FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
830.3 Other Articles.
Circuits and equipment shall comply with 830.3(A) through 830.3(E).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned network-powered broadband communications cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22 shall apply where installed in ducts, plenums, or other spaces used for environmental air.
Exception: As permitted in 830.154(B).
830.154 Low-Power Network-Powered Broadband Communications System Wiring Methods.
Low-power network-powered broadband communications systems shall comply with any of the requirements of 830.154(A) through 830.154(D).
(A) In Buildings. Low-power network-powered broadband communications systems shall be installed within buildings using listed Type BLX, Type BL, Type BLR, or Type BLP network-powered broadband communications low-power cables.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type BLP. Type BLX cable installed in compliance with 300.22 shall be permitted.

However, CMP cables are also covered confusingly in Article 800, which states as follows:

800.3 Other Articles.
(A) Hybrid Power and Communications Cables. The provisions of 780.6 shall apply for listed hybrid power and communications cables in closed-loop and programmed power distribution.
FPN: See 800.179(J) for hybrid power and communications cable in other applications.
(B) Hazardous (Classified) Locations. Communications circuits and equipment installed in a location that is classified in accordance with Article 500 shall comply with the applicable requirements of Chapter 5.
(C) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned communications cables shall not be permitted to remain.
(D) Equipment in Other Space Used for Environmental Air. Section 300.22(C) shall apply.
800.154 Applications of Listed Communications Wires and Cables and Communications Raceways.
Communications wires and cables shall comply with the requirements of 800.154(A) through 800.154(F) or where cable substitutions are made in accordance with 800.154(G)
(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned cables shall not be permitted to remain. Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.

Going to articles 725, 760 and 770, thecables are covered by exceptions as follows:

725.3 Other Articles.
Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through 725.3(G). Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits.
(A) Number and Size of Conductors in Raceway. Section 300.17.
(B) Spread of Fire or Products of Combustion. Section 300.21. The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.
(C) Ducts, Plenums, and Other Air-Handling Spaces. Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22. Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air.
760.3 Other Articles.
Circuits and equipment shall comply with 760.3(A) through 760.3(F). Only those sections of Article 300 referenced in this article shall apply to fire alarm systems.
(A) Spread of Fire or Products of Combustion. Section 300.21. The accessible portion of abandoned fire alarm cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts or plenums or other spaces used for environmental air.
Exception: As permitted in 760.30(B)(1) and (B)(2) and 760.61(A).
760.30 Multiconductor NPLFA Cables.
Multiconductor non–power-limited fire alarm cables that meet the requirements of 760.81 shall be permitted to be used on fire alarm circuits operating at 150 volts or less and shall be installed in accordance with 760.30(A) and 760.30(B).
(B) Applications of Listed NPLFA Cables. The use of non–power-limited fire alarm circuit cables shall comply with 760.30(B)(1) through (B)(4).
(1) Ducts and Plenums. Multiconductor non–power-limited fire alarm circuit cables, Types NPLFP, NPLFR, and NPLF, shall not be installed exposed in ducts or plenums.
FPN: See 300.22(B).
(2) Other Spaces Used for Environmental Air. Cables installed in other spaces used for environmental air shall be Type NPLFP.
Exception No. 1: Types NPLFR and NPLF cables installed in compliance with 300.22(C).
Exception No. 2: Other wiring methods in accordance with 300.22(C) and conductors in compliance with 760.27(C).
Exception No. 3: Type NPLFP-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.
760.61 Applications of Listed PLFA Cables.
PLFA cables shall comply with the requirements described in either 760.61(A), (B), or (C) or where cable substitutions are made as shown in 760.61(D).
(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type FPLP. Types FPLP, FPLR, and FPL cables installed in compliance with 300.22 shall be permitted. Type FPLP-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.
770.3 Other Articles.
Circuits and equipment shall comply with 770.3(A) and 770.3(B). Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.
(A) Spread of Fire or Products of Combustion. The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. The accessible portion of abandoned optical fiber cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. The requirements of 300.22 for electric wiring shall also apply to installations of optical fiber cables and raceways where they are installed in ducts or plenums or other space used for environmental air.
Exception: As permitted in 770.154(A).
770.154 Applications of Listed Optical Fiber Cables and Raceways.
Nonconductive and conductive optical fiber cables shall comply with any of the requirements given in 770.154(A) through 770.154(E) or where cable substitutions are made as shown in 770.154(F).
(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.
FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.

In consequence, it is important to ensure that proper guidance for wiring systems is given throughout the NEC and that CMP 16 not be able to set its own rules in a vacuum.

In many ways, the responsibility of overall requirements for Chapter 8 wiring (which is, indeed, low voltage wiring, in most cases, albeit not in all cases) is not that different from the responsibility of overall requirements for Chapters 5, 6, and 7 wiring and communications systems should be treated the same way as the "special occupancies", "special equipment" and "special conditions" systems. In fact, communications systems could easily be considered special equipment just like the equipment in Chapter 6.

When chapter 8 was initially being treated differently, it was thought that it would include only low voltage wiring. However, there are now "medium power wiring" systems in articles 800, 820 and 830, as well as in articles 725, 760 and 770. Thus, there is actually less difference between the wiring systems of articles 725, 760 and 770 and those of articles 800, 820 and 830 than is apparent initially. In fact, network-powered broadband communications systems can have up to 150 V and should be required to meet all grounding requirements of article 250, rather than having a selection of rules made in article 820: this is a worker safety issue.

The changes proposed to article 90 need to be correlated with a proposed change to section 300.22 that specifically includes the permitted wiring systems, such as the following, which is a proposal I am making to CMP 3. With these changes, further clarity is added to the NEC.

300.22 Wiring in Ducts, Plenums, and Other Air-Handling Spaces. The provisions of this section apply to the installation and uses of electric wiring and equipment in ducts, plenums, and other air-handling spaces.

FPN: See Article 424, Part VI, for duct heaters.

(C) Other Space Used for Environmental Air. This section applies to space used for environmental air-handling purposes other than ducts and plenums as specified in 300.22(A) and (B). It does not include habitable rooms or areas of buildings, the prime purpose of which is not air handling.

FPN: The space over a hung ceiling used for environmental air-handling purposes is an example of the type of other space to which this section applies.

Exception: This section shall not apply to the joist or stud spaces of dwelling units where the wiring passes through such spaces perpendicular to the long dimension of such spaces.

(1) Wiring Methods. The wiring methods for such other space shall be limited to the following:

(a) Totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections

(b) Type MI cable

(c) Type MC cable without an overall nonmetallic covering

(d) Type AC cable

(e) Factory-assembled multiconductor control or power cable that is specifically listed for the use

(f) Listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath

(g) Cables and conductors installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers

(h) Cables listed as low smoke-producing cable and fire-resistant cable, because the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

~~***totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections, Type MI cable, Type MC cable without an overall nonmetallic covering, Type AC cable, or other factory-assembled multiconductor control or power cable that is specifically listed for the use, or listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath. Other types of cables and conductors shall be installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers***~~ .

(2) Equipment. Electrical equipment with a metal enclosure, or with a nonmetallic enclosure listed for the use and having adequate fire-resistant and low-smoke-producing characteristics, and associated wiring material suitable for the ambient temperature shall be permitted to be installed in such other space unless prohibited elsewhere in this Code.

Exception: Integral fan systems shall be permitted where specifically identified for such use.

(D) Information Technology Equipment. Electric wiring in air-handling areas beneath raised floors for information technology equipment shall be permitted in accordance with Article 645.

I understand that the responsibility for scopes belongs to the NEC Technical Correlating Committee, but this is being brought to the NEC TCC attention for CMP 1 and TCC action

Panel Meeting Action: Reject

Panel Statement: CMP-1 rejects this proposal because it is incomplete and would create conflicts with other panels for which there are no proposals to resolve in this code cycle. However, the Panel concludes that the intent of the submitter would be met as editorially modified by CMP-1 as follows:

90.3 Code Arrangement.

This Code is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally; Chapters 5, 6, ~~and~~ 7 , and 8 apply to special occupancies, special equipment, ~~or other~~ special conditions , or communications systems . These latter chapters supplement or modify the general rules. Chapters 1 through 4 apply except as amended by Chapters 5, 6, ~~and~~ 7 , and 8 for the particular conditions.

~~Chapter 8 covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8.~~

The remainder of 90.3 would be unchanged by this proposal except for Figure 90.3.

Chapter 8 articles include references to other parts of the Code as deemed applicable by CMP-16 to communications systems. If additional references or other requirements in Chapter 8 are deemed necessary, specific proposals should be made to CMP-16 for its consideration.

This proposal is being referred to the Technical Correlating Committee for their consideration of: (1) the submitter's contention that "…the fire safety implications of the wiring in Chapter 8 should be discussed at a level that exceeds that of CMP-16…"; and (2) whether Chapter 8 should remain a stand-alone chapter. If the TCC disagrees with having Chapter 8 as a stand-alone chapter, it is recommended that the TCC form a task group to generate the necessary correlating proposals for the next code cycle.

The panel does not agree with all of the submitter's substantiation.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

HICKMAN, P.: While we agree that this proposal has merit, we agree with the Panel Action to Reject and the Panel Statement recognizing that the proposal, as submitted, could create conflicts with requirements beyond the purview of CMP1.

MCCARVER, R.: The Panel's action to reject this proposal is the correct one. Its statement, however, includes a suggestion to change the code arrangement to treat Chapter 8 like Chapters 5 through 7. There is insufficient substantiation for this suggestion. It is curious that panel members provide this suggestion in a reject action, rather than addressing the merits of the original proposal. Chapter 8 deals with communications systems, which are uniquely different from power systems. It does not make sense to require the whole of the Code to apply to communications systems when they differ so significantly from power systems. Communications systems conductors and cables operate at current and power levels greatly reduced from those of power circuits, and are power-limited thereby greatly reducing the likelihood of electrical fire. The grounding requirements of Chapter 8 have been in place for many years, yielding an exemplary safety record. Some grounding considerations are unique to Chapter 8 and it is appropriate that communications systems have their own grounding requirements. However, where the requirements of Article 250 are applicable, they are referenced (see for example 800.100(B)(1), 800.100(B)(2), 800.100(C), 800.106(A) and similar sections in 820 and 830). Article 770 references Article 250 for grounding as well. Hence, there are no "fire safety implications" to the present requirements of Chapter 8 (and 770) as the submitter alleged. Chapter 8 goes beyond other sections of the Code in that it contains requirements for lightning protection. The present requirements have a long-established exemplary safety record. The submitter failed to provide any evidence refuting this, and the Panel failed in not recognizing that.

CMP16 contains balanced representation from the electrical industry including electrical inspection, manufacturing, installation, power distribution and communications. As such, CMP16 does not "set its own rules in a vacuum," but is specifically constituted to address both electrical and communications safety issues. The submitter has indicated in his substantiation that there are medium power wiring systems in Articles 800, 820, 830 and 770. This is incorrect. Only Article 830 contains medium power systems; electrical safety concerns have been properly addressed. Furthermore, Article 770 has no power whatsoever. The submitter's statements about wiring in air ducts are confusing. Articles 725 and 800 have permitted plenum cables to be installed in air ducts since the 1975 NEC. Currently, Articles 725, 760, 770, 800, 820 and 830 permit wiring in air ducts. The requirements are the same in these articles notwithstanding the fact that three of them are in Chapter 7 and three are in Chapter 8.

Finally, revisions suggested by either the original submitter or in the Panel statement would result in pure chaos unless each and every requirement in Chapters 1 through 6 were considered and addressed by CMP 16. There are no proposals to do so.

1-8 Log #1397 NEC-P01 **Final Action: Reject**
(90.4)

Submitter: George Stolz, II, Pierce, CO

Recommendation: Add the following statement to 90.4:

The authority having jurisdiction of enforcement of the Code shall accept listed and labeled equipment or materials where used or installed in accordance with instructions included with the listing or labeling. The authority shall have the responsibility for deciding upon the approval of unlisted or unlabeled equipment and materials, and for granting the special permission contemplated in a number of the rules.

Substantiation: As it is currently written, per 90.4 and 110.2, the authority having jurisdiction has the final say and the authority to reject listed materials and equipment. If listed products are used in accordance with their listing, then these items should automatically be acceptable to the AHJ according to the NEC. This would greatly clarify the roles of the parties involved. It would ease the burden on inspectors who currently have to determine if they agree with the

listing, and would greatly ease the burden on the installers in the field. Listing should stand as a guarantee to the installer that they are compliant with the NEC. A similar rule has been adopted in Massachusetts to the benefit of all parties involved.
Panel Meeting Action: Reject
Panel Statement: The Title of Section 90.4 is Enforcement. Enforcement of the NEC and determining the approval of equipment and materials is the responsibility of the authority having jurisdiction. Adding wording to require automatic approval of equipment or materials is in direct conflict with this section and the definition of “Authority Having Jurisdiction.” The submitter’s concern relative to unlisted equipment is already addressed in the last sentence of the first paragraph of 90.4.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-9 Log #3545 NEC-P01 **Final Action: Reject**
(90.5(D))

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Revise as follows:
90.5 Mandatory Rules, Permissive Rules, ~~and~~ Explanatory and Changed Material.
(A) Mandatory Rules...
(B) Permissive Rules...
(C) Explanatory Martial ...
(D) Changed Material. Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (●) between the paragraphs that remain.
Substantiation: To help make the code more “user friendly”, protocols, on how to use the code, should be located together in the introduction to the code. The present location for instructions on the protocol for changes is located in a section of the code unrelated to usage.
Panel Meeting Action: Reject
Panel Statement: The panel agrees with the submitter’s position on users identifying modifications to new editions of the NEC. This information already appears in the title page of the NEC, and the panel concludes it does not need to be included in Article 90.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HITTINGER, D.: I believe the proposed text to add item (D) “Changed Material” to 90.5 would provide helpful information. Providing the protocols in the code rather than the title page would alert users to these important modifications when they occur in the code.

1-10 Log #3153 NEC-P01 **Final Action: Reject**
(90.8(A))

Submitter: Ernest Hohengasser, Electrical Inspector
Recommendation: Revise the first sentence of (A) as follows:
(A) Future Expansion and Convenience. Plans and specifications that provide ample spaces in raceways, and additional spaces in electric rooms to allow for future increases in electric power and communication circuits.
Substantiation: Where space is at a premium, it has become quite common that electric rooms are designed just large enough for the initial construction needs with hardly any room for future expansion or for additional equipment. This proposal is intended as a “heads up” and for designers to have somewhere to “hang their hat” when requiring additional space in electric rooms for future expansion
Panel Meeting Action: Reject
Panel Statement: Adding the words, “in electric rooms” to 90.8(A) provides no additional clarification of the section and, in essence, limits the intent of the section to electric rooms only.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-11 Log #431 NEC-P01 **Final Action: Reject**
(90.8(B))

Submitter: Daniel Hipsher, Logansport, IN
Recommendation: Revise text to read as follows:
It is elsewhere provided in this code that the number of wires and circuits confined in a single enclosure be varyingly restricted. ~~Limiting the number of circuits in a single enclosure minimizes the effects from a short circuit or ground fault in one circuit.~~ Following the manufacturer’s limit of available circuit space in an enclosure minimizes the effect from a short circuit or a ground fault in one circuit.
Substantiation: The current text of 90.8(B) is unclear in suggesting that fewer circuits are safer. Is it recommending to not use all available circuit space in a given enclosure? Is it suggesting that enclosures have a given available space in them for circuits and this is not to be increased by any method or means?
Panel Meeting Action: Reject
Panel Statement: The current language in the subject section first appeared in the 1975 NEC edition and was developed by a Special Subcommittee on Clarification of Mandatory Applications. The intent of this subcommittee was to remove recommendations from the NEC whether the recommendation language was deleted or converted into mandatory text. The current 2005 NEC wording does not address any type of circuit limitation in an enclosure but is rather intended to provide recommendations that electrical designers take into account the effects from breakdowns such as short circuits or grounds that could involve the entire service to a premise or where such breakdowns cause damage or interruption of essential circuits and independent services such as fire pump or emergency systems. Insufficient substantiation has been provided in accordance with 4.3.3(d) of the NFPA Regulations Governing Committee Projects.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-12 Log #1658 NEC-P01 **Final Action: Reject**
(90.9)

Submitter: Earl Dean, Griswold, CT
Recommendation: Change SI designated measurements to U.S. Customary units first with the SI in parenthesis in the version intended for use in the U.S.
Substantiation: This document is primarily used in the USA where the prevalent measurement system is English. For the non-English printings of the NEC, the metrics should be used first.
The only thing printing SI first has done is to make the NEC cumbersome to use for American Electricians. Years from now, when we truly have an international stage, is the time to have the NEC be SI first.
Panel Meeting Action: Reject
Panel Statement: The submitter does not provide specific locations for the recommended changes or proposed text, as required by 4-3.3(b) and 4-3.3(c) of the Regulations Governing Committee Projects.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 100 — DEFINITIONS

16-1 Log #3027 NEC-P16 **Final Action: Reject**
(100.Abandoned (as applied to cable))

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Add text to read as follows:
100 Definitions (I General)
Abandoned (as applied to cable). Installed cable that is not terminated at equipment and not identified for future use with a tag.
Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:
640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.
725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.
The additional wording in the definitions in articles 760, 770, 800, 820 and 830 cause confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100 (the present one). The advantage inherent in having a definition in article 100 (which could then lead to delete all the others) is that a new definition is not needed every time a new cable comes into use.
Panel Meeting Action: Reject
Panel Statement: A single definition of “abandoned cable” is inappropriate to cover optical fiber, communications, CATV and network-powered broadband. Each of these has its own installation practices that must be accommodated in the definition of “abandoned cable” to avoid inappropriate and unnecessary removal. For example, buildings are often “pre-wired” for telecommunications. The wiring may be terminated in a connector or “terminal block”, but not necessarily “equipment”. Nothing may be plugged into the connector. While the current tenant may not require all the communications pre-wiring, future tenants may have additional needs and require the additional wiring. It is inappropriate to remove “pre-wiring”, which the proposed single definition of “abandoned cable” may lead to. A similar argument may be made for OF, CATV, and network-powered broadband cabling.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

3-1 Log #2673 NEC-P03 **Final Action: Reject**
(100.Abandoned Cable)

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:
Abandoned Cable. An installed cable that is not terminated at equipment other than a connector and not identified for future use with a tag.
Substantiation: Despite the efforts of the TCC Task Group during the last code cycle to provide individual definitions for “abandoned cable” based on the cable type, the term “abandoned cable” is still used in eight different locations

in the 2005 NEC. These include 645.5(D)(6), 770.154(A), 770.154(B), 800.154(A), 800.154(B), 820.154(A), 820.154(B)(1), 820.154(D). Also, the seven new definitions based on cable types are basically the same in all cases. Adding the definition in Article 100 would eliminate the need to have it defined in every cable Article. The similarity in each definition to the proposed is evident below.

640.2 Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.

725.2 Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.

760.2 Abandoned Fire Alarm Cable. Installed fire alarm cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

770.2 Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

800.2 Abandoned Communications Cable. Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag.

820.2 Abandoned Coaxial Cable. Installed coaxial cable that is not terminated at equipment other than a coaxial connector and not identified for future use with a tag.

830.2 Abandoned Network-Powered Broadband Communications Cable. Installed network-powered broadband communications cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

Panel Meeting Action: Reject

Panel Statement: There are enough subtle differences between each one of the abandoned cable definitions in each article that these definitions should stay within their own articles. For example, an abandoned cable for a Class 2 or a Class 3 cable does not require a connector to be installed, since most of these cables are stripped and terminated directly at equipment, whereas optical fiber cable is most often terminated at a connector. Both cables must be labeled or tagged to indicate future use for this cable to remain.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

PACE, D.: The panel should have accepted this proposal.

As stated in the submitter’s substantiation, the term “abandoned cable” appears in “definitions” sections of eight different articles of the NEC. Although there are some slight differences in wording, the defiitions are essentially the same.

The panel statement says there are enough subtle differences that having the term defined in eight diffeent places is substantiated. The “subtle differences” provided by the panel statement are not differences relating to whether or not the cable is abandoned, they are differences due to the type of the cable and how it is usually installed. Also, the differences are not mandatory. For example, the fact that the definition for optical fiber cable includes provisions for a connector (i.e., “not terminted at equipment other than a connector”) does not require the cable to have a connector to be defined as “abandoned cable”. In fact, the definition would still apply if the cable did <u>not</u> have a connector and, therefore, would be identical to other definitions in other articles. The panel should accept this propsoal.

1-13 Log #1632 NEC-P01 **Final Action: Reject**
(100.Accessible, Immediately (Immediately Accessible))

Submitter: Jim Davis, Electrical Education Services, LLC

Recommendation: Add new definition as follows:

<u>Accessible, Immediately (Immediately Accessible). Capable of being reached instantly for emergency operation without requiring those to whom immediate access is requisite to climb over or remove obstacles, remove locks, or to resort to portable ladders, and so forth.</u>

Substantiation: The 2003 edition of the NEC Style Manual, in Table 3.2.1, describes the word “readily” as “possibly unenforceable and vague.” Therefore, the existing term “Readily Accessible” is in conflict with the style manual. The NFPA Handbook for the 2005 NEC describes the term “Readily Accessible” in such a way as to NOT connote a sense of urgency (use of locks) in those who might choose to operate such equipment (usually a disconnect). In addition, the explanatory text in the NFPA Handbook for the 2005 NEC, in the justification of the revised text in 680.41 Emergency Switch for Spas and Hot Tubs for the term “readily accessible,” describes a situation which clearly indicates the need for the proposed new definition of “Immediately Accessible” rather than just “readily accessible.”

Panel Meeting Action: Reject

Panel Statement: The proposed term “Immediately Accessible” is not used in the Code and does not require a definition.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-14 Log #51 NEC-P01 **Final Action: Reject**
(100. Air Duct)

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Add a definition to read as follows:

Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum. [NFPA 97:1.26]

Substantiation: The definition of an air duct is in the definitions section of Articles 800 and 820. The style manual requires that a definition be placed in Article 100 rather than multiple articles. Furthermore, the term “air duct” is used in sections 454.58 and 551.56(F).

Panel Meeting Action: Reject

Panel Statement: The Panel refers to NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

“[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A.”

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

6-1 Log #557 NEC-P06 **Final Action: Reject**
(100.Ampacity)

Submitter: John E. Conley, Stratford, CT

Recommendation: Revise ampacity definition to read:

Ampacity. <u>Conductor current limit expressed in amperes. Where the limit is determined only by conductor thermal capability and is calculated mathematically,</u> the current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating.

Substantiation: The originators of the term ampacity did not think of its derivation in terms of current, they thought of it in terms of heat. Current generates heat that warms the conductor. This heat is continually dissipated into the environment by convection, conduction and radiation. With continuous current, the generated heat drives the conductor temperature to some stable level where the rate of heat dissipation equals the rate of heat input. When the current is such that the stabilized temperature is equal to the rated conductor temperature (the highest temperature at which the insulation remains functional), that ampere level is called the current carrying capacity, or ampacity, of the conductor in that environment. Such an ampacity has two important aspects: (1) it is established by nature, involving no human judgment, and (2) it can be mathematically calculated when all critical environmental factors are known. It is an important limit to know from both a safety standpoint and an economic standpoint. Exceeding the limit (overheating the conductor insulation) can have dire consequences.

Considerable human effort has been expended trying to calculate ampacities for a variety of conductors in differing environments. In some ampacity publications no specific definition is offered, but the definition is intrinsic in the calculations.

Several ampacity definitions have appeared over the years, all trying to define the term as explained above. For clarity, precision and conciseness, the NEC definition is the best. Ironically, it is not suitable for the NEC because regulatory needs differ from the definition’s strict technological focus. The NEC must consider all factors related to safety. The NEC recognizes this, and, in its own words, essentially explains the shortcomings of the definition. See FPN in 310.15(B). Some examples are illustrative:

-The ampacities for flexible cords, Table 400.5(A), are set to protect end connectors from overheating, not conductors. See (1) in the FPN. The definition deals only with conductors. Code ampacities come about through experience and judgment beyond the scope of the definition. Note that many cord types are available in several temperature ratings that would normally justify different ampacities if not for the connector problem. Also note that the NEC does not specify a temperature rating for flexible cords, making it impossible to calculate any ampacity as defined. (Cord temperature ratings are used to match cords with environments, not to adjust ampacities).

-The effective ampacities of 14-10 AWG conductors are well below what the definitions would suggest, set there by experience and judgment, not calculation. The primary reason for the adjustment is to reduce the amount of heat released into panelboards. Excess heat is known to adversely affect overcurrent devices. See FPN (2).

-UL conductor listings, for example, do not permit 90C rated conductors to carry more current than 75C rated conductors. See FPN (3).

-Advancements in the science of ampacity calculation has made many of the values in bellwether tables like 310.16 through 310.20 obsolete, but the tables have been retained because of their traditional worth. See FPN (4). Also these tables do not provide enough specificity in regard to environmental conditions to satisfy the precision demanded by ampacity calculations.

-NEC Table 310.21 has ampacities for bare conductors. The definition applies only to insulated conductors. Table 610.14(A) has ampacities for short time, fluctuating or intermittent currents. The definition applies only for continuous current.

Code ampacities that comply with the definition are those in Tables 310.67 through 310.86 and appendix Tables B310.1 through B310.10. (Some of the tabulated values have been rounded from those calculated, so are not as precise as a purist might prefer). Other Code ampacities get their name authority from pre-1981 usage when the definition was substantially identical to that in the initial sentence of this proposal. It was the 1981 change in definition that put things out of kilter.

By any analysis, the rate of noncompliance with the definition is very high. While my numerous past proposals to correct the problem were all rejected (for largely technical reasons), no one has ever challenged my basic assertion. I have not and do not claim any demonstrable hazard. Almost a quarter century of usage has not created any. I am embarrassed, as an NFPA member, with the seemingly blithe acceptance of the situation by NFPA. It surprises me because I know the rigorous requirements that NFPA normally insists on. Rightly so. One questionable definition casts doubt on all definitions. While the present definition is admirable, it simply does not mesh with NFPA's usage or needs. Strict compliance would make it impossible for NFPA to fulfill its regulatory function. Somehow a way must be found to expand the definition to fit the circumstances of use, while retaining the valuable present definition. Yes, I would like to make the proposal a bit less awkward, but the situation itself is awkward. This proposal offers a distinct improvement over what we have.

Panel Meeting Action: Reject

Panel Statement: The existing definition is technically correct, and the additional wording will not add to clarity. The panel directs the submitter to 3.2.5.1 of the NEC Style Manual.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

1-15 Log #2322 NEC-P01 **Final Action: Reject**

(100.Arc Resistant Switchgear (New))

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.

Recommendation: Add a new definition to read:

Arc Resistant Switchgear. Switchgear in an enclosure that is capable of withstanding the effects of an internal arcing fault.

FPN: See IEEE Standard C37.20.7 for performance and testing requirements.

Substantiation: Arc resistant switchgear is being utilized in the industry. This term is not recognized or defined in the NEC. Inclusion of this definition will provide users a consistent definition.

Panel Meeting Action: Reject

Panel Statement: The proposed term "Arc Resistant" is not used in the Code and does not require a definition.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

FLOYD, II, H.: The applicatin of Arc Resistant Switchgear in US markets has grown over the past decade, to the point that all major manufacturers now offer this design. Experience in installations in the US and longer-term experience in other global regions demonstrates that arc resistant designs can reduce the frequency of personnel exposure to hazardous arcing faults. While I support the concept of recognizing this type of equpment in the NEC, I agree with the panel action for rejection. If above and below 600V arc fault resistant enclosures had a NEMA enclosure designation, such as NEMA 21, then the NEC could incorporate this concept in Table 110.20 Enclosure Types. The proposal submitter should consider working with the appropriate manufacturers to designate a NEMA enclosure type for arc fault resistant enclosures.

9-1 Log #3379 NEC-P09 **Final Action: Reject**

(100.Auto Transformer (New))

Submitter: Jason Guza, Bad Axe, MI

Recommendation: Add a new definition to read:

Auto Transformer. An electrical transformer in which the primary and secondary coils have some or all windings in common. It converts 120 volts to 240 volts, or 240 volts to 120 volts.

Substantiation: Auto transformer is referred to many times in the code, but there is no definition for auto transformer.

Panel Meeting Action: Reject

Panel Statement: The term is commonly understood. CMP-9 notes that the term "transformer" is not defined either. There is no evidence of confusion in the field that would require a definition.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

1-16 Log #1663 NEC-P01 **Final Action: Reject**

(100.Bedroom)

Submitter: Todd Wilson, Employee of 1st Priority Electric-Barrington NH

Recommendation: Please define "bedroom".

Substantiation: With more and more references to the safeguarding of bedrooms (i.e., smoke detects/arc faults). I wish we could have a concrete definition included in the NEC 2008. I realize it is not a very clear-cut definition to come-up with, but I feel it high time we come-up with one.

Panel Meeting Action: Reject

Panel Statement: No proposed text was submitted, as required by 4-3.3(c) of the Regulations Governing Committee Projects.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-17 Log #3411 NEC-P01 **Final Action: Reject**

(100.Bedroom)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for comment.

Submitter: Fred Tyler, Minneapolis, MN

Recommendation: Add a new definition to read:

Bedroom. An area separated by walls or partitions from other similar parts of the structure or building which are, or could be, used primarily for sleeping.

Substantiation: Contractors will not be able to get out of following the Code when wiring bedrooms by calling the room a study, office, library, or other, when it really is a bedroom. (for AFCIs)

Panel Meeting Action: Reject

Panel Statement: Currently, the building codes only define "habitable space", which includes a space for sleeping but does not specifically define a bedroom. In addition, the area described in the proposed definition where such areas are separated by walls or partitions would disqualify a number of bedroom areas currently utilized in both dwellings and in hotel and motel rooms. In response to the submitter's substantiation, Section 90.4 states that the authority having jurisdiction for enforcement of the Code has the responsibility for making interpretations of the rules and the NEC does not provide any such authority to contractors.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

ANTHONY, M.: This would have been a proposal that could have been accepted in principle and in part had the substantiation been stronger. A bedroom, by any other name, still contains individuals who are vulnerable injury or death due to fire, smoke inhalation and the like. The term "bedroom" is used as a criterion for the application of 210.12(B). (The 120VAC smoke detector plugged into an AFCI-protected circuit is a particular application problem of interest.) In fact the term bedroom meets the necessary criterion for inclusion in the NEC because the word "bedroom" shows up twice in Chapter 2 (210-52(A)) and as well as three more times in 517.2, 517.33(A)(8), and 550.25(B). .

I believe that we serve the AHJ better by adding a definition of bedroom in a code cycle in the near future. Adaptations of the NEC, which frequently appear as local residential building codes, will be improved with a definition of "bedroom" or a similar practical, or culturally sensitive term such as "sleeping unit" which appears in the 2003 IBC. The NFPA's own building code, NFPA-5000 uses the term "sleeping area" in contexts that have implications for electrical installations.

HICKMAN, P.: While we do not necessarily agree with all of the substantiation of the submitter, we feel that this proposal raises an issue that needs to be addressed. Since the TCC has channeled definitions to panels having primary jurisdiction over definitions, perhaps this proposal should have been sent to CMP2.

5-2 Log #1512 NEC-P05 **Final Action: Accept**

(100.Bonding (Bonded))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Revise the definition of bonding (bonded) as follows:

~~**Bonding (Bonded)**~~ **Bonded (Bonding)** . ~~The permanent joining of metallic parts to form an electrically conductive path that ensures electrical continuity and the capacity to conduct safely any current likely to be imposed.~~ Connected to establish electrical continuity and conductivity.

Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to others throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

It is proposed that the present definition for bonding be rewritten to apply generally throughout the NEC and simply describe its purpose and function. The purpose of **bonding** is to connect two or more conductive objects together to:

(1) ensure the electrical continuity of the fault current path, and
(2) provide the capacity and ability to conduct safely any fault current likely to be imposed, and
(3) minimize potential differences (voltage) between conductive components.

The intent of the term **bonding** is to convey that normally non-current carrying conductive materials likely to become energized must be electrically connected together and to the supply source in a manner that establishes an effective fault current path. "Normally non-current carrying conductive materials likely to become energized" include:
(1) conductive materials enclosing electrical conductors or equipment, or
(2) forming part of such equipment, or
(3) other electrically conductive materials and equipment that may present a shock hazard.

There are conditions in the Code where specific bonding is required solely to minimize the difference of potential (voltage) between conductive components.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

HAMMEL, D.: The panel should consider adding the term (connecting) to create parallel syntax. This would be consistent with the definition of Grounded (Grounding). Bonded (Bonding): Connected (connecting) to establish electrical continuity and conductivity .

5-3 Log #2932 NEC-P05 **Final Action: Accept**
(100.Bonding Jumper, System)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Move existing definition of "System Bonding Jumper" from Article 100 to 250.2.
Substantiation: The term is used in only Article 250 and should be located in 250.2 in accordance with the NEC Style Manual.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

10-1a Log #1259 NEC-P10 **Final Action: Accept in Principle**
(100.Branch Circuit Overcurrent Device)

Submitter: Frank G. Ladonne, Underwriters Laboratories Inc.
Recommendation: Add new text to read:

Branch-circuit Cvercurrent Device. A device capable of providing protection for branch circuit conductors and equipment over the full range of overcurrents between its rated current and its interrupting rating. Branch circuit overcurrent protective devices are provided with interrupting ratings appropriate for the intended use but no less than 5,000 amperes.

Substantiation: The current edition of the National Electric Code (NEC) has a definition for Supplementary Overcurrent Protective Device but no complementary definition for Branch-circuit Overcurrent Device exists in the Code though the term Branch Circuit Overcurrent Device is used in several NEC Articles. The ambiguity caused by the lack of a determinative definition for this term leads to undesirable subjectivity by users of the Code in ascertaining and asserting the acceptability of an overcurrent device for use in a branch-circuit application with potentially hazardous consequences.

At present, certification organizations categorize their fuse certifications by physical attributes, i.e., cartridge fuses, plug fuses, miscellaneous, miniature and microfuses, special purpose fuses, etc. They do not, however categorize fuses by use, i.e., branch circuit fuses vs. supplementary fuses. Until very recently, all fuses acknowledged to be suitable for branch circuit protection belonged to well defined classes, i.e., Class J, Class K, Class H, etc., where the physical and electrical sizes, geometries and performance characteristics were well defined. Recently, there have been submittals (and in a few cases actual certifications) for fuses that have all of the electrical performance characteristics of branch circuit fuses but have a size and/or shape that is very different from the fuse class emulated by the electrical performance. Conversely, there are also fuses that are the same size and shape as a class fuse but have electrical performance characteristics different from those specified for the class. This puts certification organizations in the position of needing to internally track sizes, geometries and performance characteristics to ensure that they don't inadvertently certify fuses that constitute a violation of the noninterchangeability provision of the NEC (240.60(B). As you can well appreciate, there is significant potential for some unfortunate results when fuses are casually interchanged.

Providing a definition within the Code addresses the needs of the following constituencies:

–From an end-product application standpoint, the ambiguity over the appropriate fuse type is removed both for end-product manufacturers as well as for product certification engineering staff.

–From an AHJ standpoint, again, the ambiguity and uncertainty surrounding the suitability of a given fuse for branch circuit application is removed.

–From the standpoint of safety, this strategy provides a greater level of comfort that fuses would not be misapplied.

Panel Meeting Action: Accept in Principle

Revise the wording in the proposal as follows:

"Branch-Circuit Overcurrent Device. A device capable of providing protection for service, feeder, and branch circuits ~~circuit conductors~~ and equipment over the full range of overcurrents between its rated current and its interrupting rating."

The second sentence of the proposal is to remain unchanged.

Panel Statement: The phrase "service, feeder, and" was added so as not to confuse the user into thinking that a branch-circuit overcurrent device could only be utilized to protect branch circuits, and that these devices could not protect service and feeder circuits.

The phrase "circuit conductors" was replaced with "circuits" so as not to confuse the user into thinking that only conductors and equipment could be protected. This change makes it clear that such devices can protect the entire branch circuit, not just conductors.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

KIMBLIN, C.: This definition is unnecessary. In particular, Branch Circuit and Overcurrent are already defined in Article 100. Further, the proposed definition is confusing because it defines a Branch-Circuit Overcurrent Device but then deals with service, feeder and branch circuit protection. Here it is noted, for example, that the protection of service equipment over the full range of overcurents frequently involves the additional feature of ground fault protection (240.13).

(Note: Sequence 2-1 was not used)

2-2 Log #1113 NEC-P02 **Final Action: Reject**
(100.Branch Circuit, Individual)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:

A branch circuit that supplies only one utilization equipment or a single receptacle .

Substantiation: A branch circuit with multiple unused receptacles but supplying only one equipment literally meets the present definition. An individual branch circuit may supply any load for which it is rated. A branch circuit supplying two or more receptacles (could be a duplex) is limited to loads specified in 210.23(A)(1) and (A)(2). By special permission, a circuit with multiple receptacles (could be other than parallel blade type) to supply utilization equipment that is normally or regularly moved (such as a welder or floor polisher) may still be considered as an individual circuit. An approved utilization equipment with two supply cords/caps is still one utilization equipment and could utilize a multiple receptacle, per the proposal.

Panel Meeting Action: Reject
Panel Statement: The definition proposed by the submitter is too restrictive. A receptacle other than a single receptacle could be used and other means such as configuration or arrangement of the equipment could limit the application to a single utilization equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-18 Log #1204 NEC-P01 **Final Action: Reject**
(100.Building)

Submitter: James Tente, City of Naperville
Recommendation: Revise as follows:

A structure that stands alone or that is cut off from adjoining structures by firewalls with all openings therein protected by approved means . ~~fire doors~~ .

Substantiation: The phrase "fire doors" is too specific, whereas a firewall may contain several different types of openings all of which would be required to be protected. Some fire walls may have no openings to protect whatsoever and still create multiple buildings.

Panel Meeting Action: Reject
Panel Statement: The term "fire doors" is referring to openings in the fire wall, so the use of the term is correct. The term "fire wall" is defined in the NFPA Glossary of Terms; the term "approved means" is not. The NEC Style Manual Section 3.3.4, requires that words and terms used in the NEC shall be specific and clear in meaning. CMP-1 notes that the definition of "building" is the responsibility of the NFPA 101 Life Safety Code committee.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-19 Log #497 NEC-P01 **Final Action: Accept**
(100. Bundled)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting and also be referred to Code-Making Panels 6, 7, 12, and 15 for comment. This action will be considered by the Panel as a Public Comment.
Submitter: Bryan P. Holland, Holland Electric
Recommendation: Move the definition of "Bundled" in Section 520.2 to Article 100 Definitions.
Substantiation: Per Section 2.2.2.1 Article 100 of the NEC Style Manual, "In

general, Article 100 shall contain definitions of terms that appear in two or more other articles of the NEC." There are at least three uses of the term "bundled" in the NEC - sections 310.15(B)(2); 334.80 and 520.53(H)(2). This will add clarity to the NEC at large.

Panel Meeting Action: Accept

Panel Statement: The panel recommends that the TCC refer this proposal to CMPs 6 and 7 for comment.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

LABRAKE, JR., N.: This proposal should be rejected. The definition of "bundled" in 520.2 is appropriate to the use of the term in Article 520, but is not necessarily suitable for its application in the other sections referenced.

MINICK: This proposal should be rejected. The definition of bundled is specific in its application to Article 520. The definition does not necessarily reflect all of the possible bundling configurations that may require derating in accordance with 310.15, particularly when the bundling does not include a "physical" means of bundling.

1-20 Log #358 NEC-P01 **Final Action: Accept in Principle**
(100. Clothes Closet (New))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Add a new definition to read as follows:

<u>Clothes Closet. A small room, chamber, or area used primarily for storage of clothes.</u>

Substantiation: This proposed definition is intended to provide clarification in the Code as to the installations that the rules in 240.24(D), 410.8, and 550.11(A) apply to. If the area in question meets the criteria provided in the proposed definition, then the rules apply. If the area in question does not meet the criteria of the proposed definition, then all other rules applicable to rooms or living spaces, such as those provided in 210.52 and 210.70, 210.12, etc., would be applicable. It seems to be a problem for those encountering larger rooms that are intended to function as closets for clothes and storage. Folks typically want relief from the clothes closet rules in the NEC, but do not want to adhere to the other rules that would apply if the area in question is determined not to be a clothes closet. The majority of the wording in the definition was derived from the International Building Code. The words "or area" have been added to cover common applications encountered in the field where the situation is an area and not a room.

Panel Meeting Action: Accept in Principle

The panel has revised the submitter's definition as follows:

"A non-habitable room or space intended primarily for storage of garments and apparel."

Panel Statement: CMP-1 concurs that a need exists to define the term "clothes closet." CMP-1 notes that In accordance with the NEC Style Manual, Section 2.2.2, definitions shall not contain the term that is being defined. The panel believes this action meets the intent of the submitter.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-21 Log #2143 NEC-P01 **Final Action: Reject**
(100. Commerical Site (New), Industrial Site)

Submitter: Wesley Gerrans, Northwest Kansas Technical College

Recommendation: Add a new definition to read:

<u>Commercial Site. A facility that sells or services products, or is otherwise involved with public or private services.</u>

Delete the following definition:

~~Industrial Site. A facility that processes or manufactures a product or products.~~

Substantiation: There seems to be quite a lot of uncertainty in the field as to what comprises an Industrial or Commercial Site. It is the intent of this proposal to codify appropriate, concise definitions for these areas.

Panel Meeting Action: Reject

Panel Statement: The proposed term "Commercial Site" is not used in the Code and does not require a definition. The term and definition for "Industrial Site" is not currently included in Article 100.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-22 Log #2142 NEC-P01 **Final Action: Reject**
(100. Commerical Site, Industrial Site (New))

Submitter: Wesley Gerrans, Northwest Kansas Technical College

Recommendation: Delete the following definition:

~~Commercial Site. A facility that sells or services products, or is otherwise involved with public or private services.~~

Add a new definition to read:

<u>Industrial Site. A facility that processes or manufactures a product or products.</u>

Substantiation: There seems to be quite a lot of uncertainty in the field as to what comprises an Industrial or Commercial Site. It is the intent of this proposal to codify appropriate, concise definitions for these areas.

Panel Meeting Action: Reject

Panel Statement: The proposed term "Industrial Site" is not used in the Code and does not require a definition. The term and definition for "Commercial Site" is not currently included in Article 100.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-23 Log #2376 NEC-P01 **Final Action: Reject**
(100.Concealed Space)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Add new text to read as follows:

<u>**Concealed Space.** That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and in whose size might normally range from 44.45 mm (1 3/4 in.) stud spaces to 2.44 m (8 ft) interstitial truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting. [NFPA 96:3.3.42.1]</u>

Substantiation: This definition is an extract from NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. It is the only definition of concealed space in the NFPA Glossary.

While the NEC has a definition for "concealed," it is important to also define "concealed space." The term "concealed space" is used in 320.30(D)(1), 330.30(D)(1), 332.30(B), 334.30(B), 376.10, 604.4, 760.30(A)(1), 760.52(B)(1), 770.154(A), 800.154(A) and 820.154(A).

It is important to understand what constitutes a concealed space. For example, NFPA 13, ***Installation of Sprinkler Systems*** has a requirement to install an automatic sprinkler system in concealed spaces where combustible loading is present. With the significant quantities of combustible cable being installed in concealed spaces (hollow spaces or HVAC system ducts and plenums), system designers and installers need this guidance.

Panel Meeting Action: Reject

Panel Statement: The panel refers to NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

4-1a Log #164a NEC-P04 **Final Action: Reject**
(100. Conductor, open, Cable, open multiconductor)

NOTE: The following proposal consists of Comment 1-53 on Proposal 1-74 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-74 was:

In 100.1 General, add a definition for "conductor open: insulated or bare conductor installed exposed, i.e. not installed in a raceway or cabletray" and add a definition for "cable, open multiconductor: insulated cable installed exposed i.e. not installed in a raceway or cable tray".

Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)

Recommendation: Please have proposal number 1-74 (Log #3476) redirected to CMP #4 for inclusion in Article 225.

Substantiation: In submitting the original proposal, the submitter was unaware that the NEC style manual prohibited the inclusion of new definitions in Article 100 unless they are used in two or more NEC articles. Since the terms proposed to be added only appear in Article 225, this is where they should be defined.

Panel Meeting Action: Reject

Panel Statement: The recommendations for the definitions are not complete and the concepts are incorrect. Open conductors can be insulated, covered, or bare. These conductors could be installed in cable trays and raceways where there is a transition between the use of open conductors and a Chapter 3 wiring method. These conductors are permitted in a cable tray according to Section 230.44.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-1b Log #165a NEC-P04 **Final Action: Reject**
(100. Conductor, open, Cable, open multiconductor)

NOTE: The following proposal consists of Comment 1-54 on Proposal 1-74 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-74 was:

In 100.1 General, add a definition for "conductor open: insulated or bare conductor installed exposed, i.e. not installed in a raceway or cabletray"

and add a definition for "cable, open multiconductor: insulated cable installed exposed i.e. not installed in a raceway or cable tray".
Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)
Recommendation: Please have proposal number 1-74 (Log #3476) redirected to CMP-4 for inclusion in Article 225.
Substantiation: In submitting the original proposal, the submitter was unaware that the NEC style manual prohibited the inclusion of new definitions in Article 100 unless they are used in two or more NEC articles. Since the terms proposed to be added only appear in Article 225, this is where they should be defined.
Panel Meeting Action: Reject
Panel Statement: The recommendations for the definitions are not complete and the concepts are incorrect. Open conductors can be insulated, covered, or bare. These conductors could be installed in cable trays and raceways where there is a transition between the use of open conductors and a Chapter 3 wiring method. These conductors are permitted in a cable tray according to Section 230.44.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

6-2 Log #164 NEC-P06 **Final Action: Reject**
(100. Conductor, open, Cable, open multiconductor)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be referred to Code-Making Panel 4 for action in Article 225. This action will be considered by Code-Making Panel 4 as a Public Comment.
NOTE: The following proposal consists of Comment 1-53 on Proposal 1-74 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-74 was:
In 100.1 General, add a definition for "conductor open: insulated or bare conductor installed exposed, i.e. not installed in a raceway or cabletray" and add a definition for "cable, open multiconductor: insulated cable installed exposed i.e. not installed in a raceway or cable tray".
Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)
Recommendation: Please have proposal number 1-74 (Log #3476) redirected to CMP #4 for inclusion in Article 225.
Substantiation: In submitting the original proposal, the submitter was unaware that the NEC style manual prohibited the inclusion of new definitions in Article 100 unless they are used in two or more NEC articles. Since the terms proposed to be added only appear in Article 225, this is where they should be defined.
Panel Meeting Action: Reject
Panel Statement: During the 2005 Code cycle, CMP6 accepted the change that "open" would only refer to "open wiring on insulators" (Article 398) and exposed would apply to single conductors and multiconductor cables not installed within a raceway. "Exposed (as applied to wiring methods)" is already defined in Article 100 as "On or attached to the surface or behind panels designed to allow access."
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-3 Log #165 NEC-P06 **Final Action: Reject**
(100. Conductor, open, Cable, open multiconductor)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be referred to Code-Making Panel 4 for action in Article 225. This action will be considered by Code-Making Panel 4 as a Public Comment.
NOTE: The following proposal consists of Comment 1-54 on Proposal 1-74 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-74 was:
In 100.1 General, add a definition for "conductor open: insulated or bare conductor installed exposed, i.e. not installed in a raceway or cabletray" and add a definition for "cable, open multiconductor: insulated cable installed exposed i.e. not installed in a raceway or cable tray".
Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)
Recommendation: Please have proposal number 1-74 (Log #3476) redirected to CMP-4 for inclusion in Article 225.
Substantiation: In submitting the original proposal, the submitter was unaware that the NEC style manual prohibited the inclusion of new definitions in Article 100 unless they are used in two or more NEC articles. Since the terms proposed to be added only appear in Article 225, this is where they should be defined.
Panel Meeting Action: Reject
Panel Statement: During the 2005 Code cycle, CMP6 accepted the change that "open" would only refer to "open wiring on insulators" (Article 398) and exposed would apply to single conductors and multiconductor cables not installed within a raceway. "Exposed (as applied to wiring methods)" is already defined in Article 100 as "On or attached to the surface or behind panels designed to allow access."
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

9-2 Log #1134 NEC-P09 **Final Action: Reject**
(100.Conduit Body)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
A separate fitting ~~portion~~ of a ~~conduit or tubing~~ wiring system that permits access...(remainder unchanged).
Substantiation: Edit. Conduit bodies are apparently restricted to use with conduit or tubing systems by this definition; however, they are not prohibited by any section for use with cables or flexible cords.
Panel Meeting Action: Reject
Panel Statement: Although a cord might enter a conduit body, the conduit body (if properly used) will be attached to a raceway at another end. Therefore the use described in the substantiation agrees with the definition, and no change is warranted.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

5-4 Log #1726 NEC-P05 **Final Action: Reject**
(100.Connect, Connected, & Connecting)

Submitter: John Stricklin, Meridian, ID
Recommendation: Change Bond, Bonded and Bonding to Connect, Connected, and Connecting throughout the National Electrical Code.
Substantiation: "Connect" is a lot easier to understand as everyone has used this word in their vocabulary.
An instance for comparison "equipment bonding conductor" would become "equipment connecting conductor."
Grounding and bonded has been so entangled in the NEC that it has become hard for the average journeyman electrician to understand.
Panel Meeting Action: Reject
Panel Statement: The Technical Correlating Committee Task Group on Grounding & Bonding implemented this change in certain situations. Globally changing all terms as proposed creates language that loses the meaning intended by these specifically defined terms. See the panel action on Proposal 5-2.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

2-3 Log #1101 NEC-P02 **Final Action: Reject**
(100.Connected Load (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
CONNECTED LOA d. Utilization equipment that is connected to supply circuit conductors.
Substantiation: Some loads are calculated on the basis of square foot area, purpose, (laundry circuit, small appliance circuit, clothes dryers, ranges, number of receptacles, etc.) which do not specifically relate to actual utilization equipment load but to usage or number of outlets. "Connected load" is used in 210.11(B), 220.32(C) and 220.84(C).
Panel Meeting Action: Reject
Panel Statement: Connected load is well understood in the context in which it is used. There is no need to add a definition when no specific need is substantiated.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-24 Log #1392 NEC-P01 **Final Action: Reject**
(100.Connection, Permanent (Direct), Connection, Cord-and-Plug (New))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Add the following definitions:
Connection, Permanent (Direct). Connected in a permanent method, such as by means of approved connectors or terminals.
Connection, Cord-and-Plug. A non-permanent connection by means of an attachment plug and matching receptacle.
Substantiation: Without definition, a cord-and-plug-connection could be viewed as a direct connection. There has been debate among instructors as to whether a cord-and-plug connection is a direct connection, as opposed to induced connections. This will eliminate any ambiguity on the subject in the NEC.
Panel Meeting Action: Reject
Panel Statement: Generally, the term "Cord-and-Plug Connection" is understood, as it requires the use of a flexible cord. The definition as proposed would be overly restrictive, as some permanent equipment is cord-and-plug connected. The word non-permanent would conflict with the use of flexible cords for the connection of specific fixed equipment, such as kitchen waste disposers, built-in dishwashers, trash compactors, and range hoods. The proposed definition would necessitate that all electric vehicles be tethered to the premises wiring system. See 625.29(A). In addition, CMP-1 notes that the

NEC Style Manual, Section 2.2.2, states that definitions shall not contain the term that is being defined – the definitions contain "connection, permanent and plug."
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

(Note: The sequence 14-1 was not used)

15-1 Log #CP1 NEC-P15 **Final Action: Accept**
(100. Definitions (GOT))

TCC Action: The Technical Correlating Committee directs the panel to correlate the text with the definition of "Hospital" in the 2006 edition of NFPA 101.
Submitter: Code-Making Panel 15,
Recommendation: Adopt the preferred definitions from the NFPA Glossary of Terms for the following terms:
Hospital. (preferred) NFPA 101, 2003 ed.
A building or portion thereof used on a 24-hour basis for the medical, psychiatric, obstetrical, or surgical care of four or more inpatients.
Nursing Home. (preferred) NFPA 99, 2004, ed.
A building or portion of a building used on a 24-hour basis for the housing and nursing care of four or more persons who, because of mental or physical incapacity, might be unable to provide for their own needs and safety without the assistance of another person.
Patient Bed Location. (preferred) NFPA 99, 2005 ed.
The location of a patient sleeping bed, or the bed or procedure table of a critical care area.
Patient Equipment Grounding Point. (preferred) NFPA 99, 2005 ed.
A jack or terminal that serves as the collection point for redundant grounding of electric appliances serving a patient care vicinity or for grounding other items in order to eliminate electromagnetic interference problems.
Substantiation: Adoption of preferred definitions will assist the user by providing consistent meaning of defined terms throughout the National Fire Codes.
The following procedure must be followed when acting on defined terms (extract from the Glossary of Terms Definitions Procedure):
2.1 Revising Definitions.
2.1.1 Prior to revising Preferred definitions, the Glossary of Terms should be consulted to avoid the creation of additional Secondary definitions.
2.1.2 All Secondary definitions should be reviewed and eliminated where possible by the following method (in order of preference):
a) adopt the preferred definition if suitable.
b) modify the secondary term and/or definition to limit its use to a specific application within the scope of the document.
c) request that the Standards Council determine responsibility for the term.
d) request that the Standards Council authorize a secondary definition.
(extract from the NFPA Manual of Style):
2.3.2.6 Existing general definitions contained in the NFPA Glossary of Terms shall be used where technically accurate and correct.
Panel Meeting Action: Accept
Panel Statement: The panel also reviewed the primary and secondary definitions for the terms "Anesthetizing Location," "Critical Care Areas," "General Care Areas," and "Health Care Facilities" and chose to keep the secondary definitions used in NFPA 70 since their differences are significant to their usage in NFPA 70.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11
Ballot Not Returned: 1 Conry, C.

19-1 Log #CP5 NEC-P19 **Final Action: Accept**
(100. Definitions (GOT))

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the proposal and make clear the intended status of the existing second paragraph. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 19,
Recommendation: Adopt the preferred definitions from the NFPA Glossary of Terms for the following term:
Manufactured Home . (preferred) NFPA 501, 2003 ed.
A structure, transportable in one or more sections, that, in the traveling mode, is 8 body-ft (2.4 m) or more in width or 40 body-ft (12.2 m) or more in length or, when erected on site, is 320 ft^2 (29.7 m^2) or more and that is built on a permanent chassis and designed to be used as a dwelling, with or without a permanent foundation, when connected therein. The term manufactured home includes any structure that meets all the provisions of this paragraph except the size requirements and with respect to which the manufacturer voluntarily files a certification required by the regulatory agency, and except that such term shall not include any self-propelled recreational vehicle. Calculations used to determine the number of square feet (square meters) in a structure are based on the structure's exterior dimensions, measured at the largest horizontal projections when erected on site. These dimensions include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows.
Substantiation: Adoption of preferred definitions will assist the user by providing consistent meaning of defined terms throughout the National Fire Codes.
The following procedure must be followed when acting on defined terms (extract from the Glossary of Terms Definitions Procedure):
2.1 Revising Definitions.
2.1.1 Prior to revising Preferred definitions, the Glossary of Terms should be consulted to avoid the creation of additional Secondary definitions.
2.1.2 All Secondary definitions should be reviewed and eliminated where possible by the following method (in order of preference):
a) adopt the preferred definition if suitable.
b) modify the secondary term and/or definition to limit its use to a specific application within the scope of the document.
c) request that the Standards Council determine responsibility for the term.
d) request that the Standards Council authorize a secondary definition.
(extract from the NFPA Manual of Style):
2.3.2.6 Existing general definitions contained in the NFPA Glossary of Terms shall be used where technically accurate and correct.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

9-7 Log #86 NEC-P09 **Final Action: Accept in Principle in Part**
(100.Device, FPN (New))

Submitter: Warren Austin, Western Area Power Admin
Recommendation: Revise as follows:
Device. A unit of an electrical system that is intended to carry or control but not utilize electric energy.
FPN: To include devices with internal lumination and/or control in programmable devices with minimal power consumption.
Substantiation: Luminated switches, swamp cooler controllers, etc...
Panel Meeting Action: Accept in Principle in Part
Change the definition of "Device" to read as follows:
Device. A unit of an electrical system that carries or controls electric energy as its principal function.
Panel Statement: CMP-9 accepts the concept of making an accommodation in the definition for incidental consumption of electrical energy, but rejects the fine print note.
The proposed fine print note modifies the definition and therefore would have mandatory impact, which is not appropriate' see 90.5(C). CMP-9 has revised the definition to allow for incidental functions that consume electric energy.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H

(Note: The sequence 1-25 was not used)

1-26 Log #1488 NEC-P01 **Final Action: Reject**
(100.Disconnecting Means)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
"...without provisions for automatic reconnection."
Substantiation: Many devices meet the present definition, such as time switches, pressure switches, temperature switches, proximity switches, light sensitive switches, limit switches, flow switches, etc. which should be specifically not permitted as a means to isolate a circuit or equipment from its supply.
Panel Meeting Action: Reject
Panel Statement: Section 2.2.2 of the NEC Style Manual states: "Definitions shall not contain requirements or recommendations."
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-27 Log #512 NEC-P01 **Final Action: Accept**
(100. Dwelling Unit)

TCC Action: The Technical Correlating Committee directs that this Proposal be referred to the NFPA 1 Committee, the NFPA 101 Committee and the NFPA 5000 Committee for information.
Submitter: John D. Minick, National Electrical Manufacturers Association
Recommendation: Revise text to read:
Dwelling Unit. One or more rooms arranged for ~~the use of one or more individuals living together, providing~~ complete, independent housekeeping purposes, with space for ~~living facilities, including permanent provisions for living;~~ eating, living, and sleeping, ~~eating,~~ : facilities for cooking, and provisions for sanitation.
Substantiation: The NEC TCC requested that Panels 1 and 2 and SAF/BLD-RES form a task group to revise and correlate the definition of Dwelling Unit. The task group met twice via teleconference calls along with numerous e-mails to resolve the issue. It is the task group's opinion that this one definition will meet the needs of the NEC, NFPA 1, NFPA 101, and NFPA 5000 with regard to dwelling units. The task group believes that this definition does not change the intent of any of the codes, while at the same time simplifies and clarifies what a dwelling unit is and correlates the four documents. Members of the task group included David Hittinger and Lanny McMahill from NEC CMP-1,

Donald King and Susan Porter from NEC CMP-2, and James Lathrop and Harry Bradley from the SAF/BLD-RES committee.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

5-5 Log #559 NEC-P05 **Final Action: Reject**
(100.Electrical Bond (New))

Submitter: Ben Jacks, Seattle, WA
Recommendation: Add:
Electrical Bond. The faying surface connection between metal or semi-conductive parts to allow a safe current-carrying capacity through a circuit or ground.
Substantiation: Solves problem of confusing "bond" as "ground" and establishes the clarity of a joined connection as a surface condition and not a "jumper".
(Faying surface is still common terminology in all aspects of electronics, welding, construction bonding matrix's, etc.)
Panel Meeting Action: Reject
Panel Statement: The term is used only once in the current edition of the NEC according to a search of the Code. The work of the Task Group on Grounding and Bonding resulted in removal of the term and revision that clarifies that provision where it was used. Article 100 of the NEC indicates that it contains only those definitions essential to the proper application of this Code. It is not intended to include commonly defined general terms or commonly defined technical terms from related codes and standards. In general, only those terms that are used in two or more articles are defined in Article 100. Other definitions are included in the article in which they are used but may be referenced in Article 100. See also Section 2.2.2.1 of the NEC Style Manual.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

1-28 Log #2577 NEC-P01 **Final Action: Accept**
(100.Electrical Power Production and Distribution Network)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 13 for action. This action will be considered by Code-Making Panel 13 as a public comment.
Submitter: Timothy M. Croushore, Allegheny Power
Recommendation: Please add new definition to Article 100 for Electrical Power Production and Distribution Network. The definition is as follows:
Electrical Power Production and Distribution Network. Power production, distribution, and utilization equipment and facilities, such as a electric utility system that deliver electric power to the connected loads, that is external to and not controlled by an Interactive System.
Substantiation: The purpose of this change is to add a new definition of Electrical Power Production and Distribution Network that will be used in Article 690, 692, and Article 705. Code Making Panel 13 should be given authority for this definition to appear in Article 100. The definition is the same as the definition in section 2.41 of Underwriter Laboratory Standard 1741 – Inverters, Converters and Controllers for Use in Independent Power Systems.
This new definition will replace the three different definitions of "Electrical Power Production and Distribution Network" used in Article 690, 692 and Article 705. This change is being proposed as part of a re-write of Article 690, 692 and Article 705 with respect to the interconnection of systems and equipment for use with distributed energy resources.
UL 1741 is currently under revision with a title change from "Inverters, Converts, and Controllers for Use in Independent Power Systems" to "Inverters, Converters, Controllers and Interconnection Systems Equipment for Use with Distributed Energy Resources." However, the definition of Electrical power prodction and distribution network remains unchanged.
Panel Meeting Action: Accept
Panel Statement: The panel recommends that the TCC assign responsibility for this definition to CMP-13.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BARRIOS, JR., L.: The following editorial changes should be made. Modify ", such as a electric utility system…" to ",such as electric utility systems…" and modify ",that is external to…" to ", that are external to…".

1-29 Log #261 NEC-P01 **Final Action: Reject**
(100. Enclosure)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Enclosure. The case of housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts, or to protect the equipment from ~~physical~~ damage.
Substantiation: The word is superfluous. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is a common term used in industry. Generally, it is damage caused to property from external events, such as accidents, vandalism, destruction, and other potential hazards. CMP-1 notes to the submitter that an enclosure does not protect equipment from internal events, such as caused by short-circuit and ground-fault conditions or computer and data errors. In addition, this proposal is in violation of 3.2.5.5 of the NEC Style Manual, as the term "physical damage" is a special term identified in that section.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-30 Log #1979 NEC-P01 **Final Action: Accept**
(100.Enclosure, FPN)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Correct cross reference within FPN, as a result of new Table location, as follows:
FPN: See Table ~~430.91~~ 110.20 for examples of enclosure types.
Substantiation: This is a companion proposal to the proposal to move text form 430.91 and Table 430.91 into a new 110.20. It should be done ONLY IF that proposal is accepted.
Panel Meeting Action: Accept
Panel Statement: The panel recommends that the TCC forward this proposal to CMP-11 for comment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-31 Log #2869 NEC-P01 **Final Action: Accept in Principle**
(100.Equipment)

Submitter: Robert D. Osborne, Underwriters Laboratories Inc.
Recommendation: Revise definition of "Equipment" as follows:
Equipment. A general term including material, fittings, devices, appliances, utilization equipment, luminaries (fixtures), apparatus, and the like used as a part of, or in connection with, an electrical installation.
Substantiation: Article 100 contains definitions essential to the proper application of the Code. The Code is intended to be suitable for mandatory application by government bodies that exercise legal jurisdiction over electrical installations (Sec. 90.4). Addition of the term "utilization equipment" to the definition of equipment is needed to ensure proper application of the Code and provide clear direction to governmental bodies enforcing the text. In response to an appeal brought before the North Carolina Building Code Council, a review by that Council raised questions as to whether industrial machinery was covered by the NEC. To illustrate the source of this dilemma, I have constructed a summary of the applicable requirements:
I) Section 90.2(A)(3) notes that the Code covers "Installations of conductors and equipment that connect to the supply of electricity". It is acknowledged that an industrial machine is not a conductor, but is "equipment".
II) "Equipment" as defined in Article 100 is "A general term including material, fittings, devices, appliances, luminaires (fixtures), apparatus, and the like used as a part of, or in connection with, an electrical installation". This definition does not include "industrial machinery".
III) In review of the definitions provided for: fittings, devices, appliances, and luminaire; it is noted that an industrial machine is none of these. Definitions are not provided for "material" or "apparatus".
IV) An industrial machine, being not specifically mentioned in the definition for "equipment", or covered by one of the terms identified as "equipment", is not covered by the Code.
It is acknowledged by the submitter that the definition of "equipment" notes that the term is general and that the list is not intended to be an all inclusive summary of all things identified as "equipment"; however, the list provided does exclude one of the general terms used to define equipment that utilizes electric energy. "Utilization Equipment' is defined in Article 100, and is a general term that covers equipment not included in other definitions such as devices or appliances. It is this general term that would apply to industrial machinery.
It is the intent of the requirements to include industrial machinery as "equipment" which is covered by the Code. This would seem evident by, among other things, incorporation of Article 670 for Industrial Machinery. Rather than propose a change that would begin a list of specific "equipment",

this proposal includes reference to a generic type of equipment that is already defined in Article 100 and satisfactorily addresses this concern.
Panel Meeting Action: Accept in Principle
Revise definition of "Equipment" as follows:
Equipment. A general term including material, fittings, devices, appliances, luminaires (fixtures), apparatus, machinery, and the like used as a part of, or in connection with, an electrical installation.
Panel Statement: CMP-1 agrees that expanding the definition of "equipment" to include machinery is needed; however, they disagree that "utilization equipment" is the appropriate term to add. The panel concludes that machinery and all other types of utilization equipment are included within the scope of the definition of "Equipment."
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

5-6 Log #1513 NEC-P05 **Final Action: Accept**
(100.Equipment Grounding Conductor)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise the definition of equipment grounding conductor as follows:
Equipment Grounding Conductor <u>(EGC)</u> . The <u>conductive path installed to connect normally</u> non–current-carrying metal parts of equipment, ~~raceways, and other enclosures~~ <u>together</u> and to the system grounded conductor or to the grounding electrode conductor ~~, or both, at the service equipment or at the source of a separately derived system~~ .
<u>FPN No.1: It is recognized that the equipment grounding conductor also performs bonding.</u>
<u>FPN No.2: See 250.118 for a list of acceptable equipment grounding conductors.</u>
Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to others throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
It is proposed that the present definition for Equipment Grounding Conductor be rewritten to more accurately describe its purpose and function. The Equipment Grounding Conductor performs grounding and bonding functions as follows:
(1) to facilitate the operation of an overcurrent device by providing a low impedance fault current path between the normally non–current-carrying metal parts of equipment, raceways, and other enclosures to the system grounded conductor, the grounding electrode conductor, or both, at the service equipment, or at a separately derived system, or at a building or structure disconnecting means where supplied by a feeder(s) or branch circuit(s),
(2) to connect all normally non–current-carrying metal parts of equipment and conductive material enclosing electrical conductors together so that potential differences (voltage) between equipment enclosures is minimized.
(3) to connect all normally non–current-carrying metal parts of equipment and conductive material enclosing electrical conductors to ground so that potential differences (voltage) to ground are minimized.
The following are specific examples of Equipment Grounding Conductor function.
(1) During a line to ground fault condition, the Equipment Grounding Conductor serves as an adequate and effective fault current path to facilitate the operation of the overcurrent device.
(2) Where installed with the circuit conductors between enclosures, the Equipment Grounding Conductor provides a means of bonding (connecting) enclosures together.
(3) Where installed between enclosures and the grounding electrode conductor, the Equipment Grounding Conductor provides a path to ground.
The words "raceways, and other enclosures" within the definition are being removed because types of Equipment Grounding Conductors are listed in 250.118 and does not need to be repeated. The words "or both, at the service equipment or at the source of a separately derived system" within the definition are being removed because the installation rules are found elsewhere in the ***Code*** .
The FPN No. 1 was added to inform the user that the equipment grounding conductor also performs bonding. The FPN No. 2 was added to inform the user where to find the acceptable list of equipment grounding conductors.
It is concluded that the equipment grounding conductor serves in a dual role in bonding equipment together as well as extending the earth connection. The definition is proposed to be revised to include this concept and to include a FPN explaining the role of the equipment grounding conductor.
The use of the acronym EGC has been introduced into the definition for usability and in accordance with the NEC style manual.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: This term should be deleted and a new term "equipment bonding conductor" should be inserted.

5-7 Log #3254 NEC-P05 **Final Action: Reject**
(100.Equipotential Plane)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because Code-Making Panel 19 did not agree with the placement of a general definition of "equipotential plane" in Article 100.
Submitter: Donald Dekker, N. Muskegon, MI
Recommendation: Add text to read as follows:
Equipotential Plane. An area where wire mesh or other conductive elements are embedded in or placed under the walk surface, within 75 mm (3 in.) and bonded to all metal structures and fixed nonelectrical equipment that may become energized, and connected to the electrical grounding system to prevent a difference in voltage from developing within the plane.
Substantiation: The term Equipotential Plane is defined in 2 separate sections of the Code and its methods are utilized in 3 distinct articles. I recommend deleting the 2 separate definitions and adding the definition of Equipotential Plane to 100-1. See companion proposals.
Panel Meeting Action: Accept in Principle
Revise the proposal text to read as follows: An area where wire mesh or other conductive elements are embedded in or placed under concrete or other conductive surface, are bonded together and to all metal structures and fixed nonelectrical equipment that may become energized, and are connected to the electrical grounding system.
Panel Statement: Code Making Panel 5 recognizes that the term "equipotential plane" is defined in Articles 547 and 682. This definition is intended to incorporate the concepts contained in those definitions but does not include the purpose served by the equipotential plane, as the purpose is inappropriate for the definition. Code Making Panel 5 refers this proposal to Code Making Panels 17 and 19 for information.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

13-1 Log #CP3 NEC-P13 **Final Action: Accept in Principle**
(100.Fault Tolerant External Control Circuit (GOT))

TCC Action: The Technical Correlating Committee understands that the Panel Action was to accept the proposed secondary definition which is the same text that appears in the 2005 Code.
The Technical Correlating Committee directs that the definition remain in 695.2, since it is only used in Article 695.
This action will be considered by the Panel as a Public Comment.
Submitter: Code-Making Panel 13,
Recommendation: Adopt the preferred definitions from the NFPA Glossary of Terms for the following terms:
Fault Tolerant External Control Circuit. (preferred) NFPA 20, 2003 ed.
Those control circuits entering and/or leaving the fire pump controller enclosure, which if broken, disconnected, or shorted will not prevent the controller from starting the fire pump and may cause the controller to start the pump under these conditions.
Fault Tolerant External Control Circuit . (secondary) NFPA 70, 2005 ed.
Those control circuits either entering or leaving the fire pump controller enclosure, which if broken, disconnected, or shorted will not prevent the controller from starting the fire pump from all other internal or external means and may cause the controller to start the pump under these conditions.
Substantiation: Adoption of preferred definitions will assist the user by providing consistent meaning of defined terms throughout the National Fire Codes.
The following procedure must be followed when acting on defined terms (extract from the Glossary of Terms Definitions Procedure):
2.1 Revising Definitions.
2.1.1 Prior to revising Preferred definitions, the Glossary of Terms should be consulted to avoid the creation of additional Secondary definitions.
2.1.2 All Secondary definitions should be reviewed and eliminated where possible by the following method (in order of preference):
a) adopt the preferred definition if suitable.
b) modify the secondary term and/or definition to limit its use to a specific application within the scope of the document.
c) request that the Standards Council determine responsibility for the term.
d) request that the Standards Council authorize a secondary definition.
(extract from the NFPA Manual of Style):
2.3.2.6 Existing general definitions contained in the NFPA Glossary of Terms shall be used where technically accurate and correct.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel requests that NFPA 20 editorially revise its definition to agree with the working definition in the NEC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This proposal should be rejected because it is used in only one article and the definition already exists in Article 695. In addition, the Panel did not indicate which of the two recommendations was accepted.

2-4 Log #2055 NEC-P02 **Final Action: Reject**
(100.Feeder)

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
Add a new informational FPN to the definition of "Feeder" in Article 100 as follows:
Feeder. All circuit conductors between the service equipment, the source of a separately derived system, or other power supply source and the final branch-circuit overcurrent device.
FPN: For installation requirements of transformer secondary conductors, see 240.4(F) and 240.21(C).
Substantiation: The proposed FPN is suggested to improve clarity, usability and proper enforcement of the existing definition of "Feeder."
The existing definition of "Feeder" can cause quite a bit of confusion for installers and designing engineers. The existing definition leads the user of this code to believe, that "Feeders" are, as written in the definition: "All circuit conductors between the ….. source of a separately derived system ….. and the final branch-circuit overcurrent device.
The text of the definition in the previous sentence is modified to look at this definition the way that the code user reads this when applying this definition to "transformer secondary conductors." This definition leads the user of this code to believe that ALL conductors between the primary overcurrent protective device (OCPD) protecting the transformer to the final OCPD are feeders.
One thing is for sure, transformer secondary conductors are always transformer secondary conductors. However in most cases transformer secondary conductors are not considered to be protected by the transformer primary OCPD and therefore the transformer secondary conductors are not feeders. These conductors meet the definition of "Tap Conductors" in 240.2, because they are not protected at their rated ampacity at the point of supply.
The intent of this proposal is only to clear up the existing confusion. I do not believe a modification to the definition of "Feeder" is necessary. An informational FPN should solve this problem. Other "separately derived system" conductors are not subject to the confusion addressed by this proposal.
In accordance with 240.4(F) and 240.21(C)(1) transformer secondary conductors may be considered, under specific conditions, as protected by the primary overcurrent protective device. These conditions are limited to "two-wire primaries to two-wire secondary" and "delta three-wire primaries to delta three-wire secondary." This means that all, three-wire single phase secondary conductors and all four wire delta and wye connected secondary conductors are not considered protected by the primary OCPD. The fact that the definition of "Feeder" names transformer secondary conductors via "separately derived systems," as "feeders," leads the user of this code to believe that they are protected. Transformer secondary conductors must meet the provisions of 240.21(C).
For example, it is typical for an inspector to find an installation of a 3-phase wye connected transformer secondary with the transformer secondary conductors taken into a wireway and multiple disconnects or panelboards "tapped" from the transformer secondary conductors in the wireway. This is a violation of the last sentence of the mother text in 240.21 which prohibits "tapping a tap."
The enforcement community in the Philadelphia area has recently run into staunch opposition to the provisions of 240.21(C) in some cases, from designing engineers who claim that as per the definition of "Feeder," ALL transformer secondary conductors are feeders. This leads to major problems in enforcement.
This FPN is necessary to aid both the user of this code and the enforcement community.
Panel Meeting Action: Reject
Panel Statement: There are numerous requirements for feeders through out the NEC. Adding a specific FPN reference to the definition implies that the additional requirements are limited to Article 240. Transformer secondary conductors are, by definition, feeder conductors. The requirements in Article 240 deal with acceptable means to locate and provide overcurrent protection for transformer secondary conductors.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: This proposal should have been accepted. The submitter has substantiated a problem that exists in the interpretation of this definition where the tap rules of Section 240.21 are applied. The fine print note is not intended to list a particular requirement for feeders as is indicated in the panel statement, but rather provides information for the code user to distinguish between feeders and transformer secondary tap conductors.

3-2 Log #2377 NEC-P03 **Final Action: Reject**
(100.Fire Stop)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add new text to read as follows:
Fire Stop: A fire-resistant material, barrier, or construction installed in concealed spaces or
between structural elements of a building to prevent the extension of fire through walls,
ceilings, and so forth. [NFPA 914: 3.2.34]
Substantiation: This definition is an extract from NFPA 914-2001, ***Code for Fire Protection of Historic Structures.*** The term firestop is used in numerous places in the NEC including 530.18(C)(2), 725.61(B), 760.30(B)(3), 760.61(B), 770.154(B)(3), 800.154(B)(3), 820.154(B)(3). It should be defined.
Panel Meeting Action: Reject
Panel Statement: "Fire Stop" is a common phrase used in the building industry, similar to "fire rating" and "fire resistance" used in various sections in the NEC, that does not require a definition be inserted into Article 100 for the user of the NEC. Where these terms are used, the user of the Code can access other documents, such as NFPA 914 and the various building codes, to determine the meaning of these terms, if he or she doesn't already know the definition. Inserting all the building code definitions would make Article 100 totally unwieldy and difficult to use.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

1-32 Log #3224 NEC-P01 **Final Action: Reject**
(100.Flexible)

Submitter: Steve Walser, Chesaning, MI
Recommendation: (Flexible) Add to definitions, section 100 NEC. (Capable of being flexed or bent, bowed or twisted without breaking. Pliable, yielding to pressure, not stiff or brittle.)
Substantiation: There is no definition in the NEC about flexible. Flexible is used several times in the code.
Panel Meeting Action: Reject
Panel Statement: The Scope of Article 100 states that it "is not intended to include commonly defined general terms."
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

5-8 Log #1515 NEC-P05 **Final Action: Accept**
(100.Ground)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise the term ground as follows:
Ground. ~~A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth or to some conducting body that serves in place of t~~ T he earth.
Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to others throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
It is proposed that the present definition for ground be rewritten to simply describe its function. The purpose of **ground** is to serve as a common electrical potential reference for an electrical system or equipment. The intent of ground is to describe the earth for premises wiring systems.
The phrase "some conducting body that serves in place of the earth" in the present definition of "ground" is concluded to leave Code users wondering what that conducting body serving as a substitute for the earth really is. Vehicles such as airplanes and automobiles have a metal frame that is often used as a reference for the onboard electrical wiring. It is often referred to as "ground." These types of installations are not covered by the rules of the NEC as indicated in Section 90.2(B). Where the NEC refers to "ground" it implies a connection to the earth and not something that serves as an earth substitute.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRETT, JR., M.: I believe this proposal should have been rejected. There was no substantiation to revise the current definition for the purpose of enforcing the NEC. In many applications, we make this connection to something that provides a low impedance path to earth but is not earth. In other applications, we make the connection to something that serves in place of earth such as a chassis ground. This definition is well understood and has served our industry for many years. The committee, over the years, has received very few public comments on the current definition and it should not be changed for without substantiation.
Comment on Affirmative:
DOBROWSKY, P.: This definition is a good improvement because it provides a simple description. Something is either connected to ground (earth) or it is not. Other conducting bodies may be used as a reference point but if they are not connected to the earth they are not grounded.

2-5 Log #1746 NEC-P02 **Final Action: Accept**
(100.Ground-Fault Circuit Interrupter, FPN)

Submitter: John W. Young, Siemens Energy & Automation
Recommendation: Revise text to read as follows:
FPN: Class A ground-fault circuit interrupters trip when the current to ground is 6 mA or higher and do not trip when the current to ground is less than 4 mA . ~~has a value in the range of 4 mA to 6 mA.~~ For further information, see UL

943, Standard for Ground-Fault Circuit Interrupters.
Substantiation: The present wording is apparently misunderstood in some instances. Some readers have interpreted the wording to mean that tripping only occurs when the value is between 4 and 6 mA and that the device will not trip when the current is above 6 mA. The proposed change in wording clearly states the current levels at which the GFCI will not trip and at which it will trip. The GFCI may or may not trip when the current is between 4 and 6 mA.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-6 Log #1727 NEC-P02 **Final Action: Reject**
(100.Ground-Fault Circuit Interrupter System, Three-Phase (GFCIS-3Ph) (New))

Submitter: Paul S. Hamer, Chevron Texaco Energy Research and Technology Company
Recommendation: Add a new definition:
Ground-Fault Circuit-Interrupter System, Three-Phase (GFCIS-3Ph). A system intended to provide protection of personnel from line-to-ground fault currents on three-phase systems. The system operates to cause a disconnecting means to open all ungrounded conductors of the faulted feeder or branch circuit within an established period of time when a sensed fault current to ground exceeds a current of 6 mA. For secure operation during ground faults, the system: (1) simultaneously processes and discriminates the sensed currents (to ground) of all of the feeder or branch circuits of the service, or of the protected separately-derived system; (2) only initiates disconnection of the circuit that has the highest magnitude of sensed current to ground; and (3) inhibits disconnection of the "non-faulted" circuits at the same time the "faulted" circuit disconnecting means is opened.
FPN No. 1: On three-phase systems that operate above 150 volts to ground, the capacitive-charging current of a non-faulted individual feeder or branch circuit (a current that is also sensed during a system ground fault) can exceed the 6 mA current threshold for a circuit of normal length. The GFCIS-3Ph discriminates between the normal capacitive charging current of the "healthy" three-phase feeder or branch circuits during a ground fault, and the genuine ground-fault current on the faulted feeder or branch circuit.
FPN No. 2: The GFCIS-3Ph may also be used to selectively detect and isolate incipient insulation failure of electrical equipment connected to three-phase feeder or branch circuits.
Substantiation: A new definition is required to accompany companion proposals also submitted for the GFCIS-3Ph in 210.8(D), 215.9, 430.59, and 430.64. See the proposals for details of the system. There is no present NRTL standard for GFCI devices applied above 125 volts to ground; hence the pickup level of 6 mA is defined in the proposed definition. It is expected that a new NRTL (e.g., Underwriters Laboratories) standard will be developed for the GFCIS-3Ph that will establish the required opening time of the disconnecting means of the system, expected to be a inverse-time characteristic between 6 mA and approximately 30 mA, and a definite time (between 0.025 and 0.10 second, depending on the application) for sensed ground-fault currents that exceed 30 mA.
FPN No. 1 is proposed to provide information on how the system functions. FPN No. 2 is proposed to describe an alternate use of the system beyond the primary use for personnel protection.
The basis of this proposal and the associated proposals is "A ground-fault circuit-interrupter method and system for three-phase electrical power systems," for which patent applications have been submitted. Refer to my proposal for 210.8(D) for details of how the system operates and the problem it resolves. Chevron Corporation will be the owner of the patents, if granted. If this proposal is accepted for inclusion in the NEC, Chevron will comply with the NFPA and ANSI Patent Policy, namely:
a) A license will be made available without compensation to the applicants desiring to utilize the license for the purpose of implementing the standard; or
b) A license will be made available to applicants under reasonable terms and conditions that are demonstrably free of any unfair discrimination.
Panel Meeting Action: Reject
Panel Statement: The companion proposal (2-88) submitted was rejected by the panel therefore there is no applicability of this definition in the NEC.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
KING, D.: This proposal should have been accepted. The addition of this new technology to the NEC would save many lives. See my explanation of negative for Proposal 2-88.
WEBER, R.: The panel has rejected companion proposal (2-88) and, therefore, the panel vote to reject the definition is justifiable due to the fact that without a code requirement, permissive use statement or language in the code a definition is not warranted. However, further consideration should be given to the proposal and my negative vote. See my comments and explanation for the Negative vote on Proposal 2-8.
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-6; 2-88; and 2-285.

5-9 Log #1517 NEC-P05 **Final Action: Accept in Principle**
(100.Grounded)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise the term grounded as follows:
Grounded (Grounding) : Connected to ~~earth~~ ground or to ~~some conducting~~ a conductive body ~~that serves in place of the earth~~ that extends the ground connection .
Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to others throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
It is proposed that the present definition for grounded be rewritten to more accurately describe its purpose and function. The phrase "… that extends the ground connection" was added to emphasize that the conductive body actually extends the ground connection such as the items in 250.118 for the purpose of "grounding" in premises wiring.
The phrase "some conducting body that serves in place of the earth" in the present definition of "grounded" may leave Code users wondering what a conducting body serving as a substitute for the earth really is. Vehicles such as airplanes and automobiles have a metal frame that is often used as a reference for the onboard electrical wiring. It is often referred to as "ground." These types of installations are not covered by the rules of the NEC as indicated in Section 90.2(B). Where the NEC refers to "ground" it implies a connection to the earth and not something that serves as an earth substitute. Where an item is "grounded" it is connected to the earth either directly through a grounding electrode and grounding electrode conductor, or it is connected to the earth through the equipment grounding conductor. The equipment grounding conductor extends the ground (earth) connection. Where the NEC uses the word "grounded" in the rules, it implies a connection to the ground (earth) or a conductive body that extends the earth connection and not to a ground (earth) substitute such as a vehicle or airplane frame as the present definition of "grounded" implies literally.
It is proposed that a new term for "grounding" be added with the term "grounded" to describe the action of grounding. The term **grounding** describes the action of connecting a system or a conductive part to ground. The reason for **grounding** a system is to:
(A) Limit the magnitude of voltages imposed by:
(1) Lightning, or
(2) line surges, or
(3) unintentional contact with higher voltage lines.
(B) Stabilize the voltage to ground during normal operations.
The reason for **grounding** equipment is to limit the magnitude of voltage to ground imposed by:
(1) Lightning, or
(2) line surges, or
(3) unintentional contact with energized parts, or
(4) capacitive coupling.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the term grounded as follows:
Grounded (Grounding) : Connected (connecting) to ~~earth~~ ground or to ~~some conducting~~ a conductive body ~~that serves in place of the earth~~ that extends the ground connection .
Panel Statement: Adding the term (connecting) creates parallel syntax.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: The proposal should be accepted in principle in part. The definition should read: Grounded (Grounding) Connected (connecting to ground.
The portion about "a conductive body that extends the ground connection should be deleted. Definitions need to be kept simple with out multiple conditions where possible. The concept of a conducting body that extends the earth is vague.
Comment on Affirmative:
HARDING, G.: I agree with the panel action of Accept in Principle except that I think that the word "body" should be replaced with "object" to be consistent with the revised definition for Grounding Electrode on Proposal 5-14.

5-10 Log #3555 NEC-P05 **Final Action: Accept in Principle**
(100.Grounded)

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Revise the definitation as follows:
Grounded. Connected to earth ~~or to some conducting body that serves in place of the earth~~ .

Substantiation: The concept of using some other body in place of the earth should be deleted because it causes confusion. Systems or equipment is either connected to earth or they are considered ungrounded. If a conducting path is provided to make this connection it serves as the connection, not in place of the earth. Equipment such as generator frames that are not grounded do not serve in place of the earth, they are actually ungrounded but are bonded to the conductor that provides for an effective fault current path.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 5-9 which satisifes the submitter's intent.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
BRETT, JR., M.: See my explanation of negative vote on Proposal 5-8.
DOBROWSKY, P.: See my comment on 5-9.

5-12 Log #1516 NEC-P05 **Final Action: Accept**
(100.Grounded, Effectively)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "grounded, effectively" and its definition entirely from Article 100.
Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to others throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-13 Log #357 NEC-P05 **Final Action: Accept in Principle**
(100. Grounding (New))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Add a new definition to read as follows:
<u>Grounding. The process of connecting equipment or the grounded circuit conductor of a wiring system to the earth through a grounding electrode or electrode(s).</u>
Substantiation: No definition of the word "grounding" currently exists in the NEC, yet it is used several times throughout the Code. This proposed definition should help users by providing clear description (in a definition) of the action or process of grounding. Grounding (connecting to the earth) should not be considered as an effective ground-fault current path. That path is produced through the ongoing action or process of "bonding" as defined in Article 100 and described in 250.90.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 5-9 which satisifes the submitter's intent.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-11 Log #3556 NEC-P05 **Final Action: Reject**
(100.Grounding Conductor)

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Delete the term "Grounding Conductor" and its definition.
Substantiation: This proposal is intended to be combined with the proposal to revise the existing definition of "Grounding Electrode Conductor". The term Grounding Conductor is sometimes used in place of the term grounding electrode conductor and at other times is used to describe all types of grounding conductors.
Panel Meeting Action: Reject
Panel Statement: The term "grounding conductor" is necessary to describe the full set of grounding conductors. Not all "grounding conductors" are necessarily "grounding electrode conductors."
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: This proposal should be accepted or accepted in principle. The present definitions of "grounding conductor" and "grounding electrode conductor" are too similar. Possibly the term grounding conductor can be modified to describe the conductor used with the Intersystem Bonding Termination.
Comment on Affirmative:
MELLO, C.: The actions of the panel were correct to reject the deletion of this definition. After the full deliberations it appears the definition of "grounding conductor" should be considered for revision to ensure the concept of being all-inclusive as follows:
Grounding Conductor. ~~A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes~~ A general term used to include all conductors that connect equipment or systems to ground and that connect normally non-current carrying metal parts of equipment together.
FPN: Grounding electrode conductors, bonding conductors, and equipment grounding conductors all are types of grounding conductors.

5-14 Log #1514 NEC-P05 **Final Action: Accept in Principle**
(100.Grounding Electrode)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise the definition of grounding electrode as follows:
Grounding Electrode. ~~A device that establishes an electrical connection to the earth.~~ <u>A conducting element, material, or device through which a direct connection to earth is established.</u>
Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to others throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

It is proposed that the present definition for grounding electrode be rewritten to better describe its function. The **Grounding Electrode** establishes and maintains a direct connection to earth. For examples of grounding electrodes, see Section 250.52(A).

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the definition of grounding electrode to read as follows:
Grounding Electrode. ~~A device that establishes an electrical connection to the earth.~~ <u>A conducting object through which a direct connection to earth is established.</u>
Panel Statement: The term "object" was substituted for "element, material or device" because "object" includes all the items listed in the recommendation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-15 Log #1705 NEC-P05 **Final Action: Reject**
(100.Grounding Electrode (New))

Submitter: Charles M. Trout, Maron Electric Company
Recommendation: Add new definition as follows:
Supplementary Grounding Electrode. A grounding electrode permitted to be installed, but not required to be installed.
FPN: Refer to NFPA 70, 250.54 for additional information.
Substantiation: There is considerable confusion in the field relating to the meaning of supplementary in Article 250. Webster's dictionary defines supplementary as forming a supplement. It defines supplement as something added to complete a thing or forming an addition to. Article 250 uses the term supplemental in 250.53(D)(2) requiring that a metal underground water pipe be supplemented by an additional electrode. Webster's dictionary defines additional as being supplementary.
Panel Meeting Action: Reject
Panel Statement: The term "supplementary grounding electrode" only appears twice in Code rules. It appears one time in Section 250.54 and once in Section 692.47. The requirements are different between these two sections. In 692.47 the supplementary grounding electrode becomes a required electrode by the manufacturer. Section 692.47, Grounding Electrode System, indicates that any supplementary grounding electrode required by the manufacturer shall be connected to the equipment grounding conductor specified in 250.118. By the requirements of Section 110.3(B) and the specific requirements of this section, the supplementary grounding electrode becomes a required grounding electrode that must be installed.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
HAMMEL, D.: It is worth noting the panel action on 5-170. The panel has deleted the term supplementary in favor of the term "Auxiliary" in 250.54.

5-16 Log #2933 NEC-P05 **Final Action: Accept in Principle**
(100.Grounding Electrode)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise the definition of Grounding Electrode as follows:
Grounding Electrode: A conductive object ~~device~~ that establishes an electrical connection to the earth.
Substantiation: The term "device" does not work in this definition as 250.52(A) describes several conductive objects that do not meet the present definition of "device" in Article 100. For example, underground metal water pipes are not a unit of an electrical system, they are a unit of a plumbing system. A metal frame of a building or structure is likewise not a unit of an electrical system, but rather a unit of a building structure. The same logic applies to concrete encased grounding electrodes. These are used as grounding electrodes but are a structural component of a building or structure but are not a unit of an electrical system.
250.52(A) lists the grounding electrodes that are required to be used for the grounding electrode system if they are present on the premises. All are objects but all are not an electrical device. Grounding electrodes include:
(1) Metal Underground Water Pipes. (Not a "device")
(2) Metal Frames of the Building or Structure. (Not a "device")
(3) Concrete-Encased Electrodes. (Not a "device"
(4) Ground Ring. (Perhaps a "device")
(5) Rod and Pipe Electrodes. (Perhaps a "device")
(6) Plate Electrodes. (Perhaps a "device")
(7) Other Local Metal Underground Systems or Structures (Not "devices")
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-14.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-17 Log #3582 NEC-P05 **Final Action: Accept in Principle**
(100.Grounding Electrode)

Submitter: Eugene E. Morgan, Clakamas County, Building Codes Divison
Recommendation: Revise as follows:
Grounding Electrode. A device that establishes an intentional electrical connection to earth.
Substantiation: Addition of the word "intentional" to this definition wold make it clear that devices in casual, or unintentional contact with the earth may not qualify as a grounding electrode. It would also help with consistency between this definition and the definitions in 250.2.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action and statement on Proposal 5-14. The panel concludes that the term "direct connection" is more appropriate.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-18 Log #3554 NEC-P05 **Final Action: Accept in Principle**
(100.Grounding Electrode Conductor)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Code-Making Panel as a public comment.
Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Replace the existing definition with the following
Grounding Electrode Conductor. A conductor used to connect the grounding electrode(s) to a system grounded conductor or to equipment.
~~Grounding Electrode Conductor. The conductor used to connect the grounding electrode(s) to the equipment grounding conductor, to the grounded conductor, or to both, at the service, at each building or structure where supplied by a feeder(s) or branch circuit(s), or at the source of a separately derived system.~~
Substantiation: The grounding electrode conductor should be simply described without the existing limited components where is can be connected. This will help provide clarity so this term can be used instead of the term "grounding conductor" which is sometimes used to include equipment grounding conductors, grounding electrode conductors and in other situations is used instead of the term "grounding electrode conductor."
Panel Meeting Action: Accept in Principle
Replace the existing definition with the following
Grounding Electrode Conductor. The conductor used to connect the grounding electrode(s) to a system conductor or to equipment.
~~Grounding Electrode Conductor. The conductor used to connect the grounding electrode(s) to the equipment grounding conductor, to the grounded conductor, or to both, at the service, at each building or structure where supplied by a feeder(s) or branch circuit(s), or at the source of a separately derived system.~~
Panel Statement: "The conductor" is more appropriate than "a conductor." The term "grounded" was removed from the recommendation because it is not a grounded conductor until it is connected.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 11 Negative: 4
Explanation of Negative:
BOKSINER, J.: The proposal to broaden the definition of Grounding Electrode Conductor was intended to be editorial, but the acceptance of this proposal will result in significant changes to NEC requirements unless additional correlating revisions are made.
NEC section 250.62, 250.64, 250.66, and 250.68 are titled Grounding Electrode Conductor Material, Grounding Electrode Conductor Installation, Size of Alternating-Current Grounding Electrode Conductor, and Grounding Electrode Conductor and Bonding Jumper Connection to Grounding Electrodes. These sections have specific requirements that make sense only for the grounding electrode conductors that ground the service or the separately derived system as such conductors perform an essential safety function. However, certain installations, particularly installations for information technology and communications technology equipment, often have various supplementary (auxiliary) grounding conductors installed for reasons of electromagnetic compatibility, lightning protection, establishing ground planes for antennas, etc. The proposed change in the definition would define these supplementary grounding conductors as grounding electrode conductors. Thus, the proposed definition would imply that requirements of 250.62 through 250.68 apply to these supplementary grounding conductors.
I do not believe that CMP 5 intended to change the application of 250.62 through 250.68. Therefore if this proposal is accepted, the term grounding electrode conductor in 250.62 through 250.68 should be qualified by the phrase "at the service, at each building or structure where supplied by a feeder(s) or branch circuit(s), or at the source of a separately derived system."
I cannot support this proposal until its unintended ramifications for other NEC requirements are corrected.
BRETT, JR., M.: I agree with the other explanations of negative votes.
MELLO, C.: The revised definition effectively prevents the connection of the grounding electrode conductor to the building "master" or "central" ground bus that is specifically permitted in 250.64(C) and 250.64(F). Under the revised definition the ends of the grounding electrode conductor can terminate only either on a grounding electrode, defined in Article 100 and specified in 250.52, or on a system conductor, to establish a system grounded conductor, or on equipment enclosures. A better definition would be as follows which does not limit the terminations that are allowed by prescriptive text:
Grounding Electrode Conductor. A conductor used to connect the system grounded conductor or the equipment to a grounding electrode or to a point on the grounding electrode system.
WHITE, C.: This proposal should have been rejected. This new definition is overly restrictive and would not permit a connection of the grounding electrode conductor to some other place on the grounding electrode system such as that permitted by 250.64(C) or 250.64 (F).
Comment on Affirmative:
HARDING, G.: I agree with the panel action of Accept in Principle. However, though I agree that the panel statement is technically correct, I believe the elimination of the word "grounded" from the recommnedation will add confusion rather than improve clarity. Suggestion for text: "The conductor used to connect the grounding electrode(s) to a system grounded conductor or to equipment."

(Note: Sequence 5-19 was not used)

9-3 Log #439 NEC-P09 **Final Action: Accept**
(100. Handhole Enclosure)

Submitter: John D. Minick, National Electrical Manufacturers Association
Recommendation: Revise the definition to read as follows:
Handhole Enclosure. An enclosure ~~identified~~ for use in underground systems, provided with an open or closed bottom, and sized to allow personnel to reach into, but not enter, for the purpose of installing, operating, or maintaining equipment or wiring or both.
Substantiation: The NEC TCC requested that NEC Panel 1 submit a proposal for the 2008 Code cycle to correct the wording in the definition of "handhole enclosure" so that the definition complies with the NEC Style Manual. A joint effort was undertaken by CMP-1 members John Troglia and John Minick to resolve the issue. This effort resulted in a proposal to delete the word "identified", which is a word that is in violation of NEC Style Manual Section 2.2.2. A companion proposal has also been made to revise Section 314.30 by adding the word "identified" plus additional wording for clarification so that this section will read, "Handhole Enclosures. Handhole enclosures shall be identified for use in underground systems and shall be designed and installed to withstand all loads likely to be imposed." These revisions should not affect the current intended requirements in or uses permitted in 314.30 for such enclosures and retains the requirement that handhole enclosures be identified as well as being designed and installed to withstand all loads likely to be imposed.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-4 Log #3375 NEC-P09 **Final Action: Accept**
(100.Handhole Enclosure)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the word "identified."
Substantiation: This is a companion proposal to one that locates the identification requirement in 314.30. Definitions are not permitted to contain requirements, per 2.2.2 of the NEC Style Manual. This proposal and its companion taken together do not change any requirements in the NEC.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

18-4a Log #2317 NEC-P18 **Final Action: Reject**
(100.High mA Cathode/HMC (New))

Submitter: Jimmie Evanisko, National Cathode Corporation
Recommendation: Add a new definition to read:
High mA Cathode/HMC. An electric discharge lighting system utilizing one inch (25 mm) diameter lamps or larger used as a luminare for general illumination that are physically connected to the output of a ballast or transformer with operating currents of 96 mA to 240 mA (120 mA to 300 mA rated currents) through the means of ferrule or Slimline lamp caps into ferrule or Slimline lampholders. Any other lighting systems with less than 25 mm diameter lamps, lower mA currents, and no ferrule/Slimline caps or lampholders are not used for general illumination.
Substantiation: Over the past few years and the recent IEC proposal #60958-2-27 34/D 843/CD, the lighting consultants, architects, engineers and myself have seen an unbelievable amount of miniature fluorescent used in displays, computers, LCD backlights and neon power sources with very low mA current markings being marketed as cold cathode components which contradicts UL, CSA, NEC, 410.73 through 410.87 and does not fall into the scope of electric signs or outline lighting in Article 100 Definitions.
To substantiate please review the IESNA 8th edition pages 203, 205, 206, and 307, IESNA 9th edition pages 6-21, 6-26, 6-27, 6-29, 6-30, 6-41, and 6-42 which both describe in depth the definition of cold cathode as the IESNA has described in all of their previous editions since 1948.
Panel Meeting Action: Reject
Panel Statement: Parts XIII and XIV of Article 410 are not intended to address the installation of electric discharge lighting in appliances. The rules in Parts XIII and XIV provide guidance for safe installations of electric discharge lighting based on the limitations specified. No safety reason is given for excluding electric discharge lighting systems that operate within the limitations.
The IEC proposal referenced in the substantiation is subject to change. Also, it does not contain a definition for high mA cathode / HMC.
How products are marketed is not valid substantion to change a safety standard.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-33 Log #1213 NEC-P01 **Final Action: Reject**
(100.In Sight From (Within Sight From, Within Sight))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
In Sight From (Within Sight From, Within Sight). Where this code specifies that one equipment shall be "in sight from," "within sight from," or "within sight", and so forth, of another equipment, the specified equipment is to be visible, accessible from , and not more than 15 m (50 ft) distant from the other.
Substantiation: This term appears multiple times throughout the NEC and installations required to meet the objectives of the defined term should be consistent where this term is used for that given requirement. There are many instances that arise in the field where a window or transparent obstruction is located between the motor and the disconnecting means as an example, yet if a workman had to access it or monitor it from being closed (turned on) while he or she were working on the motor or driven machinery, it could present a safety issue. Adding the proposed text in the definition that equipment must not only be visible and meet the distance parameters in the definition, but also be accessible from each other, would provide enforcement and industry clear guidelines as to the intended objectives of the requirements continuing the term and promote more consistent application of the rules containing these terms in the field by installers and inspectors.
Panel Meeting Action: Reject
Panel Statement: Adding the words "accessible from" in essence places unnecessary restriction on the term "in sight from." The NEC requires that switches and circuit-breakers used as switches be readily accessible. The submitter's substantiation is apparently based on the presumption that a worker should be able to change the on-off position of a disconnecting means from the point where the worker is performing his/her function. This is incorrect. The purpose of in-sight-from requirements is to ensure that the worker knows the position of the disconnecting means (i.e., open or closed).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-33. Our explanation is as follows:
This proposal should have been accepted. Accepting this Proposal will, in our opinion, greatly enhance electrical safety. We agree with submitter that the proposal "would provide enforcement and industry clear guidelines as to the intended objectives of the requirements continuing the term and promote more consistent application of the rules containing these terms in the field by installers and inspectors." We do not agree with the entire Panel Statement. For example, we do not agree that this proposal would place an unnecessary burden on the definition. We feel that having the disconnecting means accessible from the equipment being worked on will enhance safety.

1-34 Log #1642 NEC-P01 **Final Action: Reject**
(100.In Sight From (Within Sight From, Within Sight))

Submitter: L. Keith Lofland, International Association of Electrical Inspectors
Recommendation: Add new text as follows:
In Sight From (Within Sight From, Within Sight). Where this Code specifies that one equipment shall be "in sight from," "within sight from," or "within sight," and so forth, of another equipment, the specified equipment is to be readily accessible , visible and not more than 15 m (50 ft) distant from the other.
Substantiation: Consider this scenario. A motor is located at grade level on the outside of a building. The disconnecting means for this motor is located inside on the second floor beside a window. The disconnecting means is within 15 m (50 ft) and is also visible from the outside motor. 430.102(B) requires the disconnecting means for this motor to be located in sight from the motor location and the driven machinery location. If the safety and the control of the disconnecting means for the worker is the purpose of this definition, it would seem that this is not being accomplished in the scenario described above, yet it meets the current definition as describe in Article 100. The addition of the phrase "readily accessible" would eliminate a disconnecting means from being located on one side of a glass door, window or partition and the equipment located on the other side.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 1-33.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-34. This proposal should have been accepted. See our Explanation of Negative on Proposal 1-33.

13-2 Log #2579 NEC-P13 **Final Action: Accept in Principle**
(100. Interactive System)

Submitter: Timothy M. Croushore, Allegheny Power
Recommendation: Please add new definition to Article 100 for Interactive System. The definition is as follows:
Interactive System. An electric power production system that operates in parallel with and capable of delivering energy to an Electrical Power Production and Distribution Network.
Substantiation: The purpose of this change is to add a new definition of Interactive System that will be used in Article 690, 692, and Article 705. Code Making Panel 13 should be given authority for this definition to appear in Article 100. The definition is the same as the definition in section 2.41 of Underwriter Laboratory Standard 1741 – Inverters, Converters and Controllers for Use in Independent Power Systems.
This new definition will replace the three different definitions of "Interactive System" used in Article 690, 692 and Article 705. This change is being proposed as part of a re-write of Article 690, 692 and Article 705 with respect to the interconnection of systems and equipment for use with distributed energy resources.
UL 1741 is currently under revision with a title change from "Inverters, Converts, and Controllers for Use in Independent Power Systems" to "Inverters, Converters, Controllers and Interconnection Systems Equipment for Use with Distributed Energy Resources." However the definition of Interactive System remains unchanged.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel action and statement on Proposal 13-184 should satisfy the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

5-20 Log #1885 NEC-P05 **Final Action: Accept in Principle**
(100. Intersystem Grounding Termination (New))

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Propose new definition:
Intersystem Grounding Termination. Terminal, bar or bus that provides a means of grounding for Communications System(s) at the premises and permits

connection between equipment of different systems such as connection between Communications System(s) and the service equipment or the disconnecting means for any additional buildings or structures.
Substantiation: This is one of several correlated proposals (100 Definitions, 250.95, Chapter 8 Articles) to improve the requirements related to intersystem bonding and grounding of communication systems. The intent is to create a dedicated and well-defined location for terminating the grounding conductors required in Chapter 8 Articles and 770.93. These grounding conductors also provide between communication and power systems (intersystem bonding). The proposed termination would have sufficient capacity to handle multiple communication systems (telecom, satellite, CATV) on premises. See the illustrations which I have provided.

Intersystem bonding accomplished by connection of a communication grounding conductor to the power system is an important safety measure to prevent occurrences of voltages between communication system and power system. However, the existing requirements are not adequate. Bonding is becoming difficult to implement due to changes in building construction practices such as increased prevalence of flush construction and use of PVC conduits. Frequently, in new construction, the grounding electrode, the raceway and the grounding electrode conductor are hidden behind walls and not accessible for bonding connection.

Even in older construction with accessible equipment, the requirement for installation of intersystem bonding connection is subject to varying interpretation because there is not a clearly defined dedicated bonding location. The connection to the power system is sometimes haphazard. Installers are sometimes confused over where the connection should be made especially if multiple Communication Systems are present on premises.

Note that the Intersystem Grounding Termination might have been called the Intersystem Bonding Termination since it performs both bonding and grounding functions. The term Intersystem Grounding Termination is proposed for consistency with the results of the Task Group on Grounding & Bonding.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle

Revise the recommended definition to read as follows:
Intersystem Bonding Termination. A device that provides a means of bonding communications equipment at the service equipment or the disconnecting means for any additional buildings or structures.
Panel Statement: "Terminal bus and bars" was changed to "device" to make it more general. "Grounding" was changed to "bonding" to accurately reflect the definitions.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

BRETT, JR., M.: There was no substantiation to add the word "device". This adds a requirement and expense to the contractor (installer) that is not necessary and will not be used in many normal installations. When this section was added, it was to ensure that the communications installers could tie their ground to the structure grounding electrode system. On most installations, there is nothing required of the electrical installer, only where all connections and service equipment are concealed is a means required to be added to make the connection accessible. For example, in my new home all service equipment is concealed, however, the contractor elected to run a separate conductor for the telephone and the CATV. If this change is accepted, he would be forced to add a device for these connections on an exterior wall.

This proposal should be rejected as the present language is sufficient and the change is not necessary.
Comment on Affirmative:

HAMMEL, D.: I agree with the panel action. I would, however, like the panel to consider the recommended definition to read as follows:

Intersystem Bonding Termination: A means of bonding communications equipment at the service equipment or the disconnecting means for any additional building or structures.

1-35 Log #1738 NEC-P01 **Final Action: Reject**
(100.Isolated, Separate, & Dedicated)

Submitter: Ray C. Mullin, Ray C. Mullin Books
Recommendation: Add definitions for the words isolated, separate, and dedicated.
Substantiation: I propose that the staff at NFPA headquarters do an entire editorial study of NFPA 70.

The purpose of my proposal is to establish a clear cut, easy to understand the meaning of certain terms. There is too much confusion out there. Many hours of discussion time is wasted because of the cloudiness of the meaning of certain words. Webster defines all of these terms, but the definitions do not necessarily describe the intent of the NEC.

In Article 100, we find a very precise definition of an individual branch circuit specifically aimed at the electrical arena.

Elsewhere in the NEC we find use of the terms isolated, separate, and dedicated. But these words are not defined, leading to interpretations all over the map.

At electrical inspector meetings, we listen to discussions about what an individual branch circuit is...such as the receptacle for a refrigerator. Is it a single receptacle...or could it be a duplex receptacle? It all depends on the intent of the individual.

Webster's definitions very well are met by the term separate and dedicated. But since these words have specific meaning for the electrical industry, we need to have definitions added to Article 100 for each of these words to define the true intent of the meaning as applied to the NEC.

I sincerely believe that adding definitions for isolated, separate, and dedicated found throughout the NEC will reduce wasted time on the part of electrical inspectors, electricians, consulting engineers, etc. and will reduce if not eliminate "Red Tags" relative to these terms.
Panel Meeting Action: Reject
Panel Statement: The proposal does not include proposed text as required by 4-3.3(c) of the Regulations Governing Committee Projects.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-36 Log #356 NEC-P01 **Final Action: Accept**
(100. Kitchen (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for action. This action will be considered by Code-Making Panel 2 as a public comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Add a new definition to read as follows:

Kitchen. An area with a sink and permanent facilities for food preparation and cooking.
Substantiation: The word kitchen as used in 210.8(B)(2) is described as provided in the proposed new definition. The word kitchen is used many more times in the Code which necessitates a common definition for this word so uniform and consistent application of rules in the Code can be established. CMP-2 found this definition to be sufficient for use in 210.8(B)(2).
Panel Meeting Action: Accept
Panel Statement: The panel recommends that the TCC forward this proposal to CMP-2 for comment relative to removing 210.8(B)(2).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-37 Log #2110 NEC-P01 **Final Action: Reject**
(100.Labeled)

Submitter: Herbert Moulton, Masters Technology Inc.
Recommendation: Revise the definition of "Labeled" and add a new FPN as follows:

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction. ~~and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.~~

FPN: A product may be identified for use having met the requirements of its labeling such as listed, recognized, or classified.
Substantiation: The deleted text is unnecessary as the requirements for certification and/or accredited would entail these actions as part of their acceptance for licensing. In addition to clarifying the use of the word "listed" in the NEC, the use of the wording "certified and/or accredited organization" is consistent with larger efforts to harmonize with standards and conformance assessment internationally.
Panel Meeting Action: Reject
Panel Statement: The panel rejects the substantiation that the deleted text is not necessary. The deleted text constitutes an essential element of a labeling program. Additionally, the word "Labeled" is an official NFPA definition -- see the NFPA Regulations Governing Committee Projects, Section 3.3.6.1, and the NFPA Glossary of Terms. Official definitions shall not be altered unless approved by the Standards Council.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-38 Log #573 NEC-P01 **Final Action: Reject**
(100.Lighting Outlet)

Submitter: Alan H. Nadon, City of Elkhart, IN
Recommendation: Revise as follows:

Lighting Outlet. An outlet having ~~intended for the direct connection of~~ a lampholder, a luminaire (lighting fixture), or a pendant cord terminating in a lampholder, that is directly connected .
Substantiation: Intent cannot be determined during an inspection. A junction box with a blank cover, even one containing switched conductors, does not provide the illumination needed for persons to move about safely thus preventing accidents.
Panel Meeting Action: Reject

Panel Statement: The proposed definition would require a luminaire wherever a lighting outlet is installed. Code rules dictate where lighting is required. CMP-1 refers the submitter to the panel action and statement on Proposal 1-39.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-39 Log #1299 NEC-P01 **Final Action: Accept in Principle**
(100.Lighting Outlet)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 2 and 18 for comment.
Submitter: Joseph Whitt, JW Electric
Recommendation: Revise text to read:

Lighting Outlet. An outlet intended for the direct connection of ~~a~~ or a permanently installed cord and plug connected lampholder, ~~a~~ luminaire (lighting fixture), or a pendant cord terminating in a lampholder.

Substantiation: As worded, a lighting outlet would require a direct connection to the premises wiring. This could be interpreted to mean that the luminary would be required to be installed to a box with wire nuts which would leave out a cord and plug connected luminary as outlined in 410.30.

This would also negate Exception No. 1 of 210.70(A)(1).

This would also clear up the confusion for inspectors and electrical contractors as to whether a receptacle used for the sole purpose to supply current to a luminary is a lighting outlet or not. This will help in clearing up the confusion over the use and switching of small appliance and laundry receptacles for permanently installed under cabinet luminaries.

As an instructor of inspector classes in the state of North Carolina, I see those inspectors coming through my classes are split about fifty/fifty on this issue. This issue needs clarity.

Panel Meeting Action: Accept in Principle

Revise the definition to read as follows:

"Lighting Outlet. An outlet intended for the connection of a lampholder, a luminaire (lighting fixture), or a pendant cord terminating in a lampholder.

Panel Statement: The panel concludes this action meets the intent of the submitter. CMP-1 agrees that the definition may conflict with the requirement in 410.30(C)(1) and other code sections that allow for the use of attachment plugs for the connection of luminaires. CMP-1 disagrees that the existing definition negates 210.70(A)(1), Exception No. 1. CMP-1 has revised the definition by deleting the word "direct." The panel recommends that the TCC forward this action to CMP-18.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-40 Log #2109 NEC-P01 **Final Action: Reject**
(100.Listed)

Submitter: Herbert Moulton, Masters Technology Inc.
Recommendation: Revise the definition of "Listed" and FPN as follows:

Listing ~~Listed~~ . Equipment, materials, or services included in a list published by a certified and/or accredited ~~an~~ organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services. ~~that maintains periodic inspection of production of listed equipment or materials or periodic evaluation f service,s and whose listing states that the equipment, materials, or services either meets appropriate designated standards or has been tested and found suitable for a specified purpose.~~

The listing states that the equipment materials or services meets the appropriate designated standards or has been tested and found suitable for the intended use.

~~FPN: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled.~~ Use of the system employed by the listing organization allows the authority having jurisdiction to identify a listed product for the intended use .

Substantiation: The deleted text is unnecessary as the requirements for certification and/or accredited would entail these actions as part of their acceptance for licensing. In addition to clarifying the use of the word "listed" in the NEC, the use of the wording "certified and/or accredited organization" is consistent with larger efforts to harmonize standards and conformance assessment internationally.

The words "for the intended use" need to be incorporated in this FPN. Many products are being used in applications that the product has not been evaluated for the intended use. This will allow the authority having jurisdiction to request that the intended use has met the certified and/or accredited organizations conditions of acceptability in the manner being used.

Panel Meeting Action: Reject
Panel Statement: The panel rejects the substantiation that the revised text is necessary. The deleted text constitutes an essential element of a listing program. Additionally, the word "Listed" is an official NFPA definition -- see the NFPA Regulations Governing Committee Projects, Section 3.3.6.1, and the NFPA Glossary of Terms. Official definitions shall not be altered unless approved by the Standards Council. Furthermore, the proposal includes a requirement in a definition, in violation of 2.2.2 of the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-4b Log #CP1800 NEC-P18 **Final Action: Accept**
(100.Luminaire)

Submitter: Code-Making Panel 18,
Recommendation: Luminaire – A complete lighting unit consisting of a light source such as a lamp or lamps, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source, ballast, or distribute the light. A lampholder itself is not a luminaire.
Substantiation: This revised definition will address the concerns expressed in the substantiation of Proposals 18-4 and 18-5. The panel reiterates that "lampholders" are not "luminaires."
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-5 Log #1030 NEC-P18 **Final Action: Reject**
(100.Luminaire)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete present definition and substitue the following:

LIGHTING FIXTURE. A lighting unit (fixture) consisting of a lampholder(s), with or without integral switching means, which may have provisions for enclosing the lamp(s) or distributing the light, and with provisions for connection to a lighting outlet.

Substantiation: Edit. There is no definition for a lighting unit that doesn't conform to the definition of luminaire. A chandelier with unenclosed (unprotected) lamps, a fluorescent fixture without a lens (unprotected lamps), pendant fixtures without a lens (unprotected lamps), porcelain and plastic type lampholders designed for mounting on an outlet box, lampholders for floodlight lamps, do not conform to the present definition and the requirements for luminaires in Article 410 literally do not apply to lighting units that do not conform to the definition of luminaire.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 18-4.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-6 Log #1412 NEC-P18 **Final Action: Accept**
(100.Luminaire)

Submitter: George Stolz, II, Pierce, CO
Recommendation: Remove the parenthetic term "Fixture" from "Luminaire (Fixture)" and use only the term "Luminaire" for all related references.
Substantiation: The wording of this term is redundant and adds nothing to the interpretation or use of the NEC. The use of the term "Lighting Fixture" or "Fixture" should have been removed during the 2005 cycle.
Panel Meeting Action: Accept
Panel Statement: See panel action and statement on Proposal 18-44.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-7 Log #3413 NEC-P18 **Final Action: Reject**
(100.Luminaire)

Submitter: Fred Tyler, Minneapolis, MN
Recommendation: Revise text to read:

Luminaire (fixture) (lighting fixture) . A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light to position and protect the lamps and ballast (where applicable), and to connect the lamps to the power supply.

Substantiation: Every other instance of luminaire in the Code (ex: 410.1, 410.3) is followed by "fixture" or "lighting fixture" in parenthesis. To prevent confusion, the term in the definition should also be followed by the parenthesis.
Panel Meeting Action: Reject
Panel Statement: The parenthetical use of the term "fixture" in the 2005 NEC was provided to assist in transitioning the replacement term "luminaire." The panel action on 18-44 eliminates the parenthetical terms "fixture" and "lighting fixture."
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

9-5 Log #2323 NEC-P09 **Final Action: Accept in Principle in Part**
(100.Metal Enclosed Power Switchgear, FPN (New))

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.
Recommendation: Add a FPN to the definition of Metal Enclosed Switchgear to read:

FPN: Metal Enclosed Switchgear is available in non-arc resistant or Arc Resistant construction (See IEEE C37.20.1 and C37.20.2 for testing requirements of non-arc resistant and C37.20.7 for testing requirements of arc resistant switchgear).

Substantiation: Metal enclosed switchgear is available in various constructions with different testing requirements for enclosure integrity. Non arc resistant switchgear is tested to withstand effects of the three phase bolted faults. Arc resistant switchgear enclosure is designed and tested to withstand effects of internal arcing faults in addition to the three phase bolted faults.
Panel Meeting Action: Accept in Principle in Part
Add new last sentence to the current defiintion of "Metal-Enclosed Power Switchgear" as follows:
Metal Enclosed Power Switchgear is available in Non-arc Resistant or Arc Resistant constructions.
Panel Statement: Identification of both Arc Resistant and Non-arc Resistant Switchgear is appropriate. This information should be included as part of the definition.
References to product safety standards should be included in Annex A. This Annex documents those standards used for product listing where listing is required by the Code. As listing of Metal-Enclosed Power Switchgear is not required by the Code, inclusion of the referenced standards is not appropriate. As such, CMP-9 added a new last sentence.
CMP-9 does not accept the submitter's request to include the testing documents.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-6 Log #3520 NEC-P09 **Final Action: Accept in Principle in Part**
(100.Metal-Enclosed Power Switchgear, FPN (New))

Submitter: James R. White, Shermco Industries, Inc.
Recommendation: Add a FPN to the definition of the Metal Enclosed Switchgear.
FPN: Metal enclosed switchgear is available in non-arc resistant or Arc Resistant construction (See IEEE C37.20.1 and, C37.20.2 for testing requirements of non arc resistant and C37./20.7 for testing requirements of arc resistant switchgear.)
Substantiation: Arc-resistant, metal enclosed switchgear is available and has been tested to withstand the effects of an internal arcing fault in addition to a three phase bolted fault. Non arc resistant switchgear is tested to withstand effects of a three phase bolted fault only.
Panel Meeting Action: Accept in Principle in Part
Panel Statement: See panel action and statement on Proposal 9-5.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

5-21 Log #3568 NEC-P05 **Final Action: Accept in Principle**
(100.Neutal Conductor (New))

Submitter: Fred W. Brown, HI Electron
Recommendation: Add a new definition:
Neutral Conductor. A grounded conductor that is connected to the common point of a symmetrical electrical system and carries the vectorial summation currents of the ungrounded to grounded conductor loads in multiwire branch circuit, feeder, and service entrance conductors.
Substantiation: The use of the terms "grounded conductor" and "neutral conductor" are problematic in nature in the electrical industry. It is a concept that needs to be distinguishing between the two principles in order to properly apply the National Electrical Code. In a single branch circuit which contains an ungrounded conductor (black in color) and a grounded conductor (white in color) the grounded conductor is frequently called a "neutral". In this application, the grounded is not a neutral and leads to miss applications by electricians.
In the past, the electrical industry has envisioned the "neutral" as neutralizing voltages or neutralizing currents. I have seen multiwire branch circuits installations that were installed with six three-phase conductors (two A-phase, two B-phase, and two C-phase conductors) and one grounded conductor all the same size. The electricians were convinced that the grounded conductor would neutralize all the currents.
The code is in dire need of an accurate definition of this conductor.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-22 Log #166 NEC-P05 **Final Action: Accept in Principle**
(100. Neutral)

NOTE: The following proposal consists of Comment 1-136 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:
Add a new definition as follows:
Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.
Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Accept the proposal as submitted.
Substantiation: The revision made does not improve usability and could cause confusion as indicated in the negative ROP ballot comments.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-23 Log #167 NEC-P05 **Final Action: Reject**
(100. Neutral)

NOTE: The following proposal consists of Comment 1-137 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:
Add a new definition as follows:
Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.
Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Panel should reject this proposal.
Substantiation: While I tend to agree that a definition of the term "neutral" should be in the code, I don't think this is the one that we need. The acceptance of this proposal would require that the grounded conductor of a 120/240 volt 3 phase 4 wire high leg delta system be counted as a current carrying conductor for the purpose of ampacity adjustment because the grounded conductor of this system does not meet the proposed definition of "neutral."
Panel Meeting Action: Reject
Panel Statement: This panel concludes that the definition of the neutral conductor will add clarity to the understanding and use of the NEC. See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-24 Log #168 NEC-P05 **Final Action: Accept in Principle**
(100. Neutral)

NOTE: The following proposal consists of Comment 1-138 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:
Add a new definition as follows:
Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Accept the proposal in principle and in part. Accept the need to define a neutral conductor. Reject the definition developed by CMP 1 and replace it as follows:
"The conductor (where one exists) of a polyphase circuit or single-phase three-wire circuit that is intended to have a voltage such that the nominal voltage between it and each of the other conductors are equal, and less than the nominal voltage between any two of the other conductors."
Substantiation: The definition in the panel action on the proposal misapplies the IEEE definition and is technically incorrect. A two-wire circuit does not and never will have a neutral conductor because the circuit has no neutral point. Nevertheless, CMP 1 has proposed misapplying the term "neutral" to one of those conductors only because it eventually connects to a neutral point of something. This will make countless training manuals obsolete. This is not the time to lose our intestinal fortitude and rationalize inaccurate trade slang.
This comment adapts a successful and long-standing definition in the Canadian Electrical Code, modified only editorially to accommodate our distribution systems and NEC editorial practice. It is technically correct without the complexities (over 100 words) in the IEEE definition.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel does not necessarily agree with the submitter's substantiation. See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-25 Log #2826 NEC-P05 **Final Action: Reject**
(100.Neutral)

Submitter: Mick Erickson, Minnesota State Community & Technical College
Recommendation: Define neutral.
Substantiation: As an educator of new entrants to the Electrical Industry, I have come to loathe some of the language of the NEC. Please don't misunderstand my comment. I am in awe of the NEC and the job the CMPs do. I have had the privilege to get to know some of the members and have great respect for them and their work.
This is my first proposal and I will make it brief. Switzerland remained neutral (or so we were taught) during the Great War. This meant they were not involved with any "side." The neutral position of the shifting leveler on my truck removes the transmission from any involvement with the engine. Yet, we

use the word "neutral" in an entirely different fashion and do so ***without a clear definition.*** If I could have my druthers, I would get rid of it entirely. I believe it has steadily crept into the code and now appears in at least 180 places.

Try teaching this to a young student day after day and explain to him/her: That when the code mentions the "Neutral or Grounded Conductors" it is talking about a conductor that is intentionally grounded but no, it is not the EGC or the GEC or an EBJ. Teach them that the neutral is "common" to some other conductors that are ungrounded but, no, this common isn't always grounded. I know this because the code specifically rules about a "Grounded Neutral" and leads me to believe that this, not-so-common conductor is sometimes "not grounded." Of course the code also talks about a "solidly" grounded neutral so I guess it is sometimes grounded but not "solidly" grounded. And then there is the "Common neutral" talked about in other references.

The only time any conductor is neutral is when it is common to two or more other conductors and NOT carrying current...unbalanced or otherwise. Since the EGC only carries current when a fault occurs, it technically is far more "neutral" and it is grounded so why don't you call it the neutral? If this "common" conductor of a single-phase 3-wire Edison or a Polyphase system begins to carry any current it is no longer neutral. Yet we continue to call it neutral.

I haven't mentioned all of the terms/phrases such as "High-impedance grounded neutral systems as specified in 250.36." But you get the picture. In addition, the function of the "neutral" is grossly misunderstood by many licensed electricians. This miss-understanding has brought us to the place where safety is an issue. MANY journeymen electricians believe there is little or no danger from the neutral as they do not clearly understand its function.

STOP THE MADNESS!! Define the term and all of its variants, so we can all get on the same page. We know definitions are extremely important to a good understanding of grounding, overcurrent protection and so on.

There seems to be two options:

1. DEFINE NEUTRAL and all variants. Include in Article 100.
2. Get rid of the term altogether.

I understand that the effort to rename the EGC to the EBC (just when we thought there was progress) is moving forward. Defining the neutral (dare I say neutrals) should have such attention.

Panel Meeting Action: Reject

Panel Statement: No specific text was proposed. The proposal does not meet the requirements of Section 4.3.3 of the NFPA Regulations Governing Committee Projects.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-26 Log #110 NEC-P05 **Final Action: Accept in Principle**

(100. Neutral Conductor (New))

Submitter: Matthew Karpuk, Chesaning, MI

Recommendation: Add a new definition of neutral conductor:

"Neutral Conductor. A conductor other than a grounding conductor, that is connected to the common point of a wye connection of a polyphase system, the center-tap of one portion of a delta, four-wire polyphase system, the center-tap of a three-wire single-phase system, or one conductor of a two-wire single-phase system."

Substantiation: The term neutral is used in numerous locations in the Code and there needs to be a definition so that it is clear which conductor is intended when the term is used. The problem arises in 250.26(2) and (5) where the instructions are to ground the neutral conductor with no indication which conductor is the neutral. It is rather obvious to a trained person which conductor is the neutral for a single-phase, 3-wire system, but not so obvious with respect to a 4-wire, delta, polyphase system. There are licensed electricians all across the country that do not understand this latter polyphase system. The code needs to be specific on this issue.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-36.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-27 Log #169 NEC-P05 **Final Action: Accept in Principle**

(100. Neutral Conductor)

NOTE: The following proposal consists of Comment 1-139 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Accept but append "to ground".

Substantiation: "Zero voltage" needs a reference.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-36.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-28 Log #170 NEC-P05 **Final Action: Accept in Principle**

(100. Neutral Conductor)

NOTE: The following proposal consists of Comment 1-140 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Recommendation: Continue to "Accept in Principle" Proposal 1-122. Modify wording of proposal for definition of neutral conductor to read:

Neutral Conductor. The common conductor in a multi-wire, grounded or ungrounded, circuit or system that carries the current caused by an unbalance of the load on the phase conductors of a multi-wire circuit or system and by high harmonic neutral currents in a 3-phase, 4-wire, wye-connected power supply to nonlinear loads.

Substantiation: This definition will maintain the technical correctness that a two wire circuit cannot contain a neutral conductor. The panel may want to review the definition of a "Branch Circit Multiwire" and in the first sentence after the comma where it says "and a grounded conductor that has equal" etc. change the words "grounded conductor" to "common conductor". The present wording incorrectly implies that multiwire circuits can only be used in grounded systems.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-36.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-29 Log #171 NEC-P05 **Final Action: Accept in Principle**

(100. Neutral Conductor (New))

NOTE: The following proposal consists of Comment 1-141 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: The **Final Action** should be accept rather than accept in principle.

Substantiation: The definition as modified by the panel is too complex and is technically flawed. The "common point wye connection" as noted in the modified definition does not apply to all polyphase systems. Also, it is not clear what "zero voltage" is referenced to in the second condition of the definition. The "point of a symmetrical system which is normally at zero voltage" is likely not to be zero voltage under normal conditions unless it is grounded. The ACC believes that Mr. Dobrowsky's originally proposed definition provides more clarity to the term "neutral conductor" than the panel's proposed definition.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-36.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-30 Log #172 NEC-P05 **Final Action: Accept in Principle**

(100. Neutral Conductor)

NOTE: The following proposal consists of Comment 1-142 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: This proposal should continue to be accepted in principal as modified by panel action.

Substantiation: This definition is still imperfect, but it does recognize and address certain important points that are not in the original proposal. First, a definition is needed. The term "neutral" is used in many places in the code, in some places incorrectly. (For example, as noted by Minick in the comment on negative, a grounded conductor in a delta system is not a symmetrical system. However, Section 250.26(5) calls such a conductor a neutral.) Panel 1 has often referred to IEEE 100 in the past, but the edition mentioned in the panel statement is no longer available from IEEE, and the new edition of IEEE 100 now only applies to IEEE standards according to its introduction and the revised title: " The Authoritative Dictionary of IEEE Standards Terms."

Second, the original proposal refers to the neutral point of a system, and that term would require another definition. The revised definition covers this issue. The "zero voltage" is not clear, as noted by Barrios, but I cannot offer a solution to that problem. Third, the definition proposed may help to clear up some misconceptions and provide a term around which the rest of the NEC can become consistent in the future. For example, the comment that "all neutrals are grounded conductors" is incorrect. Obvious examples are given in 250.21 and 250.22, and ungrounded 480 volt wye systems are permitted in the NEC as long as the neutral is not used as a circuit conductor. Fourth, the proposed language "intended for carrying current during normal operations" will produce conflicts in other code language. For example, 250.21(4) refers to impedance grounded neutral systems, and according to 250.36, these systems have neutral conductors, but those neutral conductors are not permitted to be normal current-carrying conductors.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-31 Log #173 NEC-P05 **Final Action: Reject**
(100. Neutral Conductor (New))

NOTE: The following proposal consists of Comment 1-143 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.
Submitter: James M. Naughton, IBEW
Recommendation: Panel 1 should reconsider and reject the proposal.
Substantiation: This comment is the work of a Task Group from Panel 4 assigned to recommend an action, by direction of the Technical Correlating Committee.

The definition of neutral, as submitted, does not accurately reflect a neutral. The revised definition from Panel 1 does not deal with the neutral conductors from a 120/240v single phase system since these are not necessarily considered to be symmetrical systems of zero voltage.

A definition should provide an accurate method to define the word and neither the proposal nor the revised provides an accurate or clear definition of neutral.

Panel Meeting Action: Reject
Panel Statement: This panel concludes that the definition of Neutral Conductor will add clarity to the understanding and use of the NEC. See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-32 Log #174 NEC-P05 **Final Action: Accept in Principle**
(100. Neutral Conductor)

NOTE: The following proposal consists of Comment 1-144 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.
Submitter: D. Thomas Branson, Madison Gas & Electric
Recommendation: Panel proposed revised text:

Neutral Conductor. A conductor, other than a grounding conductor, that is connected to the common point of a wye connection in a polyphase system or the point of a symmetrical system which is normally at zero voltage.

We suggest that the word "normally" be replaced by the word "virtually", and adding the words "under ideal conditions" after the word "voltage".

Substantiation: Only under perfectly balanced conditions, will there be no voltage on the neutral. This condition is recognized in the NESC definition, which acknowledges the current flow in the neutral. We also support the negative comment made by Mr. Barrios in Log #2457.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-33 Log #2692 NEC-P05 **Final Action: Accept in Principle**
(100. Neutral Conductor (New))

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Add a definition of Neutral conductor to read:

Neutral Conductor. The common conductor in a multiwire circuit that carries the unbalanced load between the phase conductors.

FPN: Refer to 220.61 for further information.

Substantiation: The term neutral is inaccurately used. As an example, the identified conductor in a 2-wire circuit is often called the neutral conductor. To be neutral something must not be aligned with any side. To be neutral a conductor must be a part of a multi-wire circuit.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-34 Log #176 NEC-P05 **Final Action: Accept in Principle**
(100. Neutral Conductor (New))

NOTE: The following proposal consists of Comment 1-147 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.
Submitter: Fred W. Brown, HI Electron
Recommendation: Revise the current text by adding "and carries the vectorial summation currents of the ungrounded to grounded conductor loads in multiwire branch circuit, feeder, and service entrance conductors."
Substantiation: I find the use of the terms "grounded conductor" and "neutral conductor" to be problematic in nature in the electrical industry. It is a concept used to distinguish between the two principles in order to properly apply the National Electrical Code (NEC).

Just by he nature of being grounded does not make a conductor neutral by the NEC. A neutral is a grounded conductor that carries the vectorial summation of line to neutral current loads.

310.15(B)(4) gives us some direction as to the use of the term, "neutral conductor." The basic application of this article is not to count the neutral conductor as a current-carrying conductor in 120/240 volt, single phase, 3 wire; 120/208 volt, 3 phase, 4 wire; 277/480 volt, 3 phase, 4 wire, and 120/240 volt 3 phase, 4 wire multiwire branch circuit, feeder, and service entrance conductor systems. The reason for this is that if the line to neutral loads are balanced per 210.11(B), the vectorial summation of the currents carried by the neutral will be zero. When contrasted with 115/230 volt, 2 phase, 3 wire and 5 wire systems, the neutral will carry a vectorial summation of the line to neutral loads at 140 percent of the ungrounded conductors. It is important to distinguish the true role of a neutral conductor in multiwire systems and circuits.

The term "neutral conductor" is only applicable in some multiwire circuits. Circuits consisting of two or more ungrounded conductors and have a voltage between them, a grounded conductor that has equal voltage between it and each ungrounded conductor, and the grounded conductor carries the vectorial summation of the ungrounded to grounded conductor loads, have neutral conductors. Systems like 240 volt, 3 phase, 3 wire Grounded B phase are multiwire but do not contain neutral conductors. A single two wire circuit that consists of an ungrounded and grounded conductor also does not have a neutral conductor.

I have watched code making committees clean up the use of neutral conductors for the past fifteen years. I would like to commend these efforts to finally put a clear definition in place which the electrical industry can use to apply the NEC correctly.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-35 Log #175 NEC-P05 **Final Action: Reject**
(100. Neutral Conductor (New))

NOTE: The following proposal consists of Comment 1-146 on Proposal 1-122 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-122 was:

Add a new definition as follows:

Neutral Conductor. A conductor that is connected to the neutral point of a system and is intended for carrying current during normal conditions.
Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Reconsider and reject the proposal.
Substantiation: The addition of this definition will add unnecessary confusion to code users. The technical issues noted in the negative voting amplify the need to reject this proposal and should be considered carefully by the panel.
Panel Meeting Action: Reject
Panel Statement: This panel concludes that the definition of "Neutral Conductor" will add clarity to the understanding and use of the NEC. See panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-36 Log #1554 NEC-P05 **Final Action: Accept in Principle**
(100.Neutral Conductor and Neutral Point)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Add the following definitions to Article 100:
Neutral conductor. A circuit conductor connected to the neutral point of a system.
Neutral point. The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The definition of ``neutral conductor'' and the associated definition for "neutral point" is needed in the NEC so that the appropriate conductor can be identified whenever this term is used in a requirement such as in 250.26 and 250.36. The proposed definition is derived from the IEC definition of "neutral conductor" and IEEE Std C57.12.80-2002 definition of "neutral point." The proposed definition was adapted into the NEC language and was expanded to cover the various cases relevant to the NEC.
The attached figures illustrate the meaning of the proposed definition. Note that according to the proposed definition "neutral conductor" exists even where it does not function as a neutral conductor (that is, where the conductor is not shared by two or more circuits in the system) as long as it is connected to the neutral point of the system.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Add the following (two) definitions to Article 100 as follows:
Neutral Conductor. The conductor connected to the neutral point of a system that is intended to carry current under normal conditions.
Neutral point. The common point on a wye-connection in a polyphase system or midpoint on a single-phase, 3-wire system, or midpoint of a single-phase portion of a 3-phase delta system, or a midpoint of a 3-wire, direct current system.
FPN: At the neutral point of the system, the vectorial sum of the nominal voltages from all other phases within the system that utilize the neutral, with respect to the neutral point, is zero potential.
Panel Statement: The revised wording removes the term "circuit" as was pointed out in the TCC ballot, there is no definition for a "circuit conductor" and the "neutral conductor" could be in a branch circuit, feeder or otherwise. The revised text also establishes a differentiation between the "neutral conductor" and the "equipment grounding conductor" which are in fact both ultimately connected to the neutral point of a system. The differentiation is that under some normal conditions, the "neutral conductor" is expected to be current carrying while under normal conditions the equipment-grounding conductor is never a current carrying conductor.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

10-1 Log #1294 NEC-P10 **Final Action: Reject**
(100.Overload)

Submitter: Jeffry Campbell, WM. Clinger Corp. / Rep. IBEW Local Union 654
Recommendation: Revise definition of overload to include within normal circuit path . Also create new definition for short circuit.
Substantiation: Definition of overload should include "within normal circuit path" to separate it from ground faults and short circuits which are "outside normal circuit path." Shorts and grounds clearly create more damaging overcurrents than overloads.
Panel Meeting Action: Reject
Panel Statement: No specific proposal is made for "Short Circuit". The existing definition clearly states that short circuits or ground faults are not overloads. The addition of "within normal circuit path" will not add to the clarity of either "Overload" or "Short Circuit" since both terms are common in the industry and are well understood.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-41 Log #3118 NEC-P01 **Final Action: Reject**
(100.Physical Damage, Severe)

Submitter: Jeremy Enders, East Lansing, MI
Recommendation: Add a new definition of severe physical damage. This term is used in various sections of the Code and it is subject to a wide range of interpretation. A suggested definition is as follows:
Physical Damage, Severe. Wiring, raceway, and equipment is located such that it can be contacted by equipment, animals, or human activity capable of inflicting a permanent change of shape.
Substantiation: There needs to be some definition of the meaning of severe physical damage to avoid conflicts in the field. Wiring materials and equipment may be exposed, but the probability of suffering damage may be very small, but because in some manner it can be reached, it is sometimes ruled as being exposed to severe physical danger.
Panel Meeting Action: Reject
Panel Statement: The evaluation of exposure to physical damage must be considered on the specific instance. Limiting the evaluation to "permanent change of shape" is overly restrictive. The use of the word "severe" is generally dependent on the requirements and intent of the Code sections where it appears.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-42 Log #1008 NEC-P01 **Final Action: Reject**
(100.Premises Wiring (System))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
WIRING (permanent), (Permanently connected), (permanently installed), (fixed. Installations intended for an indefinite period of time, not covered by 527.3(A), and employing wiring methods permitted or required by this Code.
Substantiation: These phrases are used throughout the Code, e.g. 422.31(A), 501.11, 520.5(A), 525.20(A), 530.11, 530.31, and 553.13(2)(1). It may be inferred that they refer to wiring methods of Chapter 3 since there is no Code definition. However, flexible cords and cables covered by the proposed definition are permitted for indefinite periods, e.g., 410.30(B) and (C), 430.42(C), 501.4(A)(2) and (B)(2), 501.11, 502.4(A)(1)(e), 503.10, 550.10, 555.13(2)(1), 610.11(C), (D), and (E), 620.11(B), 620.21(A)(1), (C, and)(B)(3), 668.30(C)(1), 680.7, 680.21(A)(5), 680.22(B)(5), 680.23(B)(3), 680.42(A)(2), and 690.31(C).
Panel Meeting Action: Reject
Panel Statement: The proposal refers to a nonexistent Code section. In addition, it is not necessary to provide a unique definition of this term apart from its common usage. "Not covered by 527(A)" is considered a requirement, which is not permitted in a definition by 2.2.2 of the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-43 Log #1315 NEC-P01 **Final Action: Accept in Principle**
(100.Premises Wiring (System))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Edit the definition of "Premises Wiring" as follows:
~~That~~ Interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed, that extends from the service point or separately derived system, ~~source of power, such as a battery, a solar photovoltaic system, or a generator, transformer, or converter windings~~ to the outlet(s). Such wiring does not include wiring internal to appliances, luminaires (fixtures), motors, controllers, motor control centers, and similar equipment.
Substantiation: This proposed change brings the definition of "Premises Wiring" into alignment with the 2005 definition change of "Separately Derived System." In 2005, the list of example sources was taken out of the definition. This list of sources is the same list that appears in the definition of "Premises Wiring," lending further credence to the thought that the intent all along was "Service Point or Separately Derived System."

Panel Meeting Action: Accept in Principle
Revise the definition of "Premises Wiring" as follows:
Interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed. This includes: (a) wiring from the service point or power source to the outlets; or (b) wiring from and including the power source to the outlets where there is no service point.
Such wiring does not include wiring internal to appliances, luminaires (fixtures), motors, controllers, motor control centers, and similar equipment.
Panel Statement: The panel concludes that this revision meets the submitter's intent since premises wiring can exist on the supply side of a separately derived system such as supply conductors originating from another system noted in the definition. If there is no service point, all wiring is premises wiring.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
BARRIOS, JR., L.: The panel action should have been "accept" rather than "accept in principle". The panel's revised definition does not add clarity to the original proposal and may introduce more confusion.
MCMAHILL, L.: This proposal should have been accept. The submitter's substantiation justified the change as proposed. The proposal was to simply eliminate the list of "source of power" examples and to use the definition of "separately derived system" in place of those examples. The proposed change

makes sense and is beneficial to code consistency and understandability. The panel action of revising the definition simply adds confusion. The panel statement notes that the reason for revising the submitter's proposal is that "premises wiring can exist on the supply side of a separately derived system." This is a true statement. However, "where there is no service point," premise wiring is usually supplied by a separately derived system or some other source of power. The definition of "separately derived system" states "A premises wiring system whose power is derived from a source of electric energy or equipment other than a service." In addition, the source of electric energy on the supply side of a separately derived system, such as a transformer, is typically from a feeder - see the definition of feeder. Again, the proposal as submitted makes sense!

Comment on Affirmative:

LABRAKE, JR., N.: Premises wiring can exist on the supply side of a separately derived system such as supply conductors originating from another system noted in the definition. If there is no service point, all wiring is premises wiring.

1-44 Log #675 NEC-P01 **Final Action: Reject**
(100.Qualified Person)

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:

100 Qualified Person. One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved. The name(s) of the qualified person(s) shall be kept in a record at the office of the place the Qualified Person performs work and made available to the Authority Having Jurisdiction upon request.

Substantiation: So the Authority Having Jurisdiction can verify there is a qualified person and who that person is.
Panel Meeting Action: Reject
Panel Statement: Section 2.2.2 of the NEC Style Manual states: "Definitions shall not contain requirements or recommendations."
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-45 Log #2589 NEC-P01 **Final Action: Accept**
(100.Qualified Person)

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Revise text to read as follows:

Qualified Person. One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training ~~on~~ to recognize and avoid the hazards involved.

Substantiation: This revision to the definition for a qualified person corresponds with the text from NFPA 70E, Section 110.6(D)(1). It will help to better define what the focus of the safety training needs to be.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

HITTINGER, D.: The submitter's reference to the text in NFPA 70E 110.6(D)(1) is not the same as the definition for "Qualified Person" as found in NFPA 70E. When it is possible, NFPA would prefer to have definitions correlate in each code.

1-46 Log #2646 NEC-P01 **Final Action: Reject**
(100.Qualified Person)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Revise text to read:

~~Qualified Person. One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.~~

~~FPN: Refer to NFPA 70E-2004, Standard for Electrical Safety in the Workplace, for electrical safety training requirements.~~

Qualified person. One who has verifiable training (including safety), skills and knowledge related to the construction, installation and operation of the electrical equipment and the potential hazards involved.

FPN: Refer to NFPA 70E-2004, Standard for Electrical Safety in the Workplace, for electrical safety training requirements.

Add definition:

Verifiable (as applies to training). Proven true by demonstration or evidence by certificate.

Substantiation: Safety not only stems from being trained on being safe, but also on ensuring that the person performing the work function will not cause the installation to be unsafe after it is completed. For example, an installer may fully understand how to install communications cabling from a protector in a building to a communications outlet. However, this same installer may not know to extend the continuity of the entrance cable shield across a splice to the protector, which could cause a hazard at a later time. Hence, the addition of "approved and verifiable training" to be a qualified person.

Providing this additional language will allow the AHJ to become informed of appropriate training opportunities that are acceptable within their jurisdiction and that will not cause harm to building occupants or other technicians in the future due to an unqualified person doing a job function they are not trained to do. By producing a completion of training certificate, the AHJ will understand the capability of the technician and thereby approve their competence for certain job functions.

Panel Meeting Action: Reject
Panel Statement: The substantiation addresses errors in work performed by an unqualified person. The proposed definition does not resolve this issue. The word verifiable as used in the proposed revision is a requirement and thus in violation of 2.2.2 and 2.2.2.1 of the NEC Style Manual. See panel action on proposal 1-45 relative to the suggested NFPA 70E reference.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

HICKMAN, P.: While we agree with agree that CMP1 was justified in rejecting this proposal because it contained a requirement, we continue to support the concept that there should be a means for the AHJ to verify that a qualified person has received safety training.

8-1 Log #1173 NEC-P08 **Final Action: Reject**
(100.Raceway)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:

Cablebus and auxiliary gutter.

Substantiation: Edit. Although the definition is not limited to raceways listed, it would be more comprehensive if cablebus and auxiliary gutters are included, and remove any perception they are not raceways, and not covered by raceway rules that may apply, for example 230.7.
Panel Meeting Action: Reject
Panel Statement: While cablebus and auxiliary gutters are used in some ways like other raceways, their restriction of use prevents them from automatically being grouped with the others. Cablebus is ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer, and auxiliary gutters shall be permitted to supplement wiring spaces at meter centers, distribution centers, switchboards, and similar points of wiring systems.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-2 Log #1913 NEC-P08 **Final Action: Reject**
(100. Rigid Nonmetallic Conduit (RNC))

Submitter: William Wagner, Certification Solutions
Recommendation: Add definition for Rigid Nonmetallic Conduit (RNC) as follows:

Rigid Nonmetallic Conduit (RNC). A non-flexible thermoplastic or thermosetting resin raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables. Includes Rigid Polyvinyl chloride Conduit (Type PVC), High Density Polyethylene Conduit (Type HDPE), and Reinforced Thermosetting Resin Coundit (Type RTRC).

Substantiation: This is a companion proposal to the revised Article 352 for Type PC and the proposed new Article 355 for Type RTRC.

In the 2002 edition of the National Electrical Code, Article 352; Rigid Nonmetallic Conduit (RNC) included PVC, RTRC, and HDPE products. However, for the 2005 edition of the NEC, HDPE was separated from these other conduit types and located in new Article 353. This left two very dissimilar products grouped together as RNC under Article 352 and technically eliminated HDPE as an acceptable wiring method in all applications where rigid nonmetallic conduit was specified. The separation of the PVC and RTRC products, and the definition of RNC as including rigid PVC, HDPE, and RTRC will correct this situation.

Panel Meeting Action: Reject
Panel Statement: See panel action and statements on Proposals 8-53 and 8-78. The panel doesn't believe it is appropriate to put the definitions in Article 100. No other raceway has its definition included in Article 100. The panel took exception to including HDPE as RNC due to any potential references to use of RNC in Chapters 5, 6, and 7 without public review.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

KENDALL, D.: This proposal should be accepted. Panel Proposal 8-68a did not define a HDPE Conduit as a Rigid Nonmetallic Conduit. HDPE Conduit was under Artical 352 prior to the 2005 NEC. Article 352 scope included all rigid nonmetallic conduits.

1-47 Log #2590 NEC-P01 **Final Action: Reject**
(100.Secured)

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Add text to read as follows:
Secured. Held rigidly in place by means of an identified strap, clamp, or other identified means.
Substantiation: In several of the Articles in Chapter 3, securing and supporting are referred to (.30) but no real definition is given as to what differentiates the two. Often times just passing the raceway through the building construction is allowed to satisfy this requirement. This will allow for better installations.
Panel Meeting Action: Reject
Panel Statement: Section 2.2.2 of the NEC Style Manual states: “Definitions shall not contain requirements or recommendations.”
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

4-1 Log #1703 NEC-P04 **Final Action: Reject**
(100.Service Conductors)

Submitter: Charles M. Trout, Maron Electric Company
Recommendation: Revise the definition of Service Conductors to read:
Service Conductors. The conductors from the ~~service point~~ last pole or other aerial support to the service disconnecting means.
Substantiation: The definition as written conflicts with the definition of service drop which includes the conductors from the last pole or other aerial support as service conductors.
Panel Meeting Action: Reject
Panel Statement: The crucial point for service conductors is the point where the utility company connects to the premises wiring, as defined in the phrase “service point” in Article 100. Any conductors on the utility company side are under the jurisdiction of the utility company (NESC), and any conductors from that point are considered premises wiring and under the jurisdiction of the NEC. The service point may be at the last pole and include any service drop conductors, but the service point for an overhead service drop often is at the weatherhead and does not include the drop conductors. This definition does not conflict with the definition of Service Drop. It is written to include both service drop and service lateral.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10
Comment on Affirmative:
BECK, C.: See my Affirmative Comment on Proposal 4-3.
ROGERS, J.: The submitter is not correct in his substantiation, service conductors could be either overhead or underground as defined in Article 100 Service Conductors are any conductors between the Service Point and the Service Disconnect Means.

10-2 Log #1743 NEC-P10 **Final Action: Accept in Principle**
(100.Short-Circuit Current Rating)

Submitter: David Sroka, Turner Falls, MA
Recommendation: Short-Circuit Current Rating.
The maximum short-circuit current that a piece of equipment or a component can safely withstand.
Substantiation: This definition is important and should be included.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
“Short-Circuit Current Rating. The prospective symmetrical fault current at a nominal voltage to which an apparatus or system is able to be connected without sustaining damage exceeding defined acceptance criteria.”
Panel Statement: The panel has met the intent of the submitter with the definition, as modified.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-48 Log #3213 NEC-P01 **Final Action: Reject**
(100.Structure, FPN (New))

Submitter: Gus Bryan, Deputy ELectrical Inspector State of TN
Recommendation: Add text to read as follows:
FPN: Pole, columns, pedestals, and similar forms installed solely to support electrical equipment external to the main structure shall not be considered as structures themselves.
Substantiation: Literal meaning and enforcement of this section as written requires pedestals, poles etc. placed for mounting of service equipment disconnects, to be considered as structures, thus the premises served becomes a separate structure. Example: A mobile home with adjacent service equipment pedestal should not be considered a separate structure from the pedestal.
Panel Meeting Action: Reject
Panel Statement: The proposed FPN contains a requirement not permitted by Section 3.1.3 of the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

5-37 Log #3542 NEC-P05 **Final Action: Reject**
(100.Supplemental Grounding Electode Conductor)

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Revise as follows:
Supplemental Grounding Electrode Conductor. A conductor used to directly connect equipment ~~or the grounded circuit of a wiring system~~ to a signal reference grid grounding electrode or electrodes.
Substantiation: The term “grounding conductor” as currently defined does not distinguish itself from a grounding electrode conductor and is therefore redundant. Additionally, there are numerous places in the code that use the term “grounding conductor” that do not adhere to the current definition in Article 100.
Panel Meeting Action: Reject
Panel Statement: The proposed definition introduces terms that are not used in the NEC.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

3-3 Log #866 NEC-P03 **Final Action: Reject**
(100.Task Lighting)

Submitter: Grant Guymon, Comforce Technical Services
Recommendation: Add a new definition as follows:
Task Lighting (as applied to construction and maintenance). Listed task lights approved for use during temporary construction and maintenance activities that requires GFCI protection for personnel.
Substantiation: Please see related proposal for new definition for “Temporary String Lights.” Many inspectors and contractors do not have an understanding of the difference between Temporary String Lighting and Task Lighting definition or uses. This misunderstanding causes inspectors to require GFCI protection for temporary string lights in violation of the NEC and OSHA requirements.
Panel Meeting Action: Reject
Panel Statement: Adding a new definition for a commonly used phrase, such as “task lighting” is not necessary since, users of the NEC are very familiar with this phrase and this type of lighting. The submitter stated incorrectly that providing GFCI protection on task lighting is a violation of the NEC. Section 590.4(D) does not permit receptacles on a branch circuit that supplies temporary lighting on construction sites, nor does it permit receptacles to be connected to the same ungrounded conductor of multiwire branch circuits that supply temporary lighting.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-4 Log #867 NEC-P03 **Final Action: Reject**
(100.Temporary String Lighting)

Submitter: Grant Guymon, Comforce Technical Services
Recommendation: Add a new definition as follows:
Temporary String Lighting (as applied to construction and maintenance). Listed temporary string lighting approved for use during temporary construction and maintenance activities that is prohibited from connection to the load side of a ground-fault circuit interrupter.
Substantiation: Many inspectors and contractors do not have an understanding of the difference between Temporary String Lighting and Task Lighting definitions or uses. This misunderstanding causes inspectors to require GFCI protection for temporary string lights in violation of the NEC and OSHA requirements.
Panel Meeting Action: Reject
Panel Statement: Adding a new definition for a commonly used phrase, such as ”temporary string lighting” is not necessary since users of the NEC are very familiar with this phrase and this type of lighting. The submitter stated incorrectly that providing GFCI protection on a temporary string light is a violation of the NEC. Section 590.4(D) does not permit receptacles on a branch circuit that supplies temporary lighting on construction sites nor does it permit receptacles to be connected to the same ungrounded conductor of multiwire branch circuits that supply temporary lighting.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

5-38 Log #1518 NEC-P05 **Final Action: Accept**
(100.Ungrounded (new))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Add the following new term and definition in Article 100 as follows:
Ungrounded. Not connected to ground or a conductive body that extends the ground connection.

Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed Article 100 revised definition "grounded (grounding)" and other proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

It is proposed that a new definition for ungrounded be added to differentiate this term from the term grounded. An ungrounded system is a system that is not intentionally connected to ground solidly or through an impedance. Examples of ungrounded systems are covered by Sections 250.21 and 250.22. An ungrounded conductor is a circuit conductor that is not intentionally connected to ground. Examples of ungrounded conductors are line and phase circuit conductors that are not intentionally grounded. The phrase "… that extends the ground connection" is included to emphasize that the conductive body actually extends the ground connection such as the items in 250.118 for the purpose of "grounding" in premises wiring.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

DOBROWSKY, P.: The proposal should be accepted in part as follows" Ungrounded. Not connected to ground. See my comment on 5-9.

TOOMER, R.: This definition is not needed and merely restates the common meaning of the word by taking the definition of grounding and adding the word "not". The prefix "un-" means 'not' or 'opposite of.'

Comment on Affirmative:

HARDING, G.: I agree with the proposed changes except that I think that the word "body" should be replaced with"object" to be consistent with the revised definition for Grounding Electrode on Proposal 5-14.

1-49 Log #3376 NEC-P01 **Final Action: Reject**
(100.Utility)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Add a new definition to read:

Utility. An organization, typically recognized by law as a common carrier and regulated by public service/utility commissions or other public authorities, that installs, operates, and maintains electric supply (such as generation, transmission, or distribution systems) or communication systems (such as telephone, CATV, Internet, satellite, or data services).

FPN: Entities designated as common carriers are bound to serve whoever will pay for their services, and are subject to comprehensive regulation by public authorities. As part of that process, they are subject to codes and standards covering those activities relevant to their industry. Refer to the appropriate governmental bodies, such as state regulatory commissions, for specific information applicable in a particular jurisdiction.

If this proposal is accepted, delete 90.2(B)(5) FPN.

Substantiation: This proposal places the concepts in the 2005 FPN into Article 100 where they belong, since the term is used in many NEC locations. It makes the following improvements in the content of the FPN:

1) Laws are only enacted by governments, and therefore the phrase "governmental law" is a redundancy and is not included in this proposal.

2) The definition includes the critical term "common carrier." Common carriers enjoy partial monopoly status in exchange for a greater level of regulation because competition is restricted, either due to government regulation, or in the case of power and communications utilities due to the existence of a natural monopoly, and they have the obligation to serve all who are willing to (in these cases) be connected. Until it somehow becomes feasible for competing utilities to run power and communications down the same street, electric and communications utilities will monopolize local distribution subject to regulation and the duty to serve. Their generation activities are becoming more competitive under deregulation, but not the local utility poles or telephone frame room. This concept is crucial to the understanding of how utilities operate.

3) The FPN captures the remaining concepts in the existing FPN, but much more simply worded. For emphasis this comment uses the phrasing "subject to comprehensive regulation by public authorities" to emphasize the regulatory constraints utilities operate under. The language mentioning FERC and the FCC, etc. was deleted because the concepts are universal and those agencies do not apply outside of the U.S. The NEC should be written from an international viewpoint where possible.

Panel Meeting Action: Reject

Panel Statement: The panel concludes that the determination of what constitutes a utility and what standards apply is solely within the purview of the regulatory authorities having jurisdiction over such entities under state or federal or other national laws. Such determination is beyond the scope of the NEC, and the Code itself cannot usurp such authority. Proper application of the Code depends upon what entities and activities are subject to the National Electrical Safety Code or its equivalent, and what entities and activities are subject to the National Electrical Code. This varies from jurisdiction to jurisdiction and the user of the Code should be referred to the proper regulatory authority for determination. The fine print note to 90.2(B)(4) and 90.2(B)(5) adequately explains this point. In addition, there is no applicable reference to the meaning of the term "common carrier" that would be recognized by the regulatory authorities.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

ANTHONY, M.: I see changes that friends of the NEC will either have to make themselves--or have made upon them. The appearance of this definition will clear the air for the next leg of growth of our industry. It also is justifiable because it meets the necessary conditions for inclusion in the NEC because of its appearance in the NEC 29 times.

Comment on Affirmative:

HICKMAN, P.: While we agree with the Panel Action, we do not necessarily agree with the entire Panel Statement.

13-3 Log #2580 NEC-P13 **Final Action: Accept in Principle**
(100.Utility-Interactive Inverter)

Submitter: Timothy M. Croushore, Allegheny Power

Recommendation: Please add new definition to Article 100 for Utility-Interactive Inverter. The definition is as follows:

Utility-Interactive Inverter. An inverter intended for use in parallel with an electric utility to supply common loads and sometimes deliver power to the utility.

Substantiation: The purpose of this change is to add a new definition of Utility-Interactive Inverter that will be used in Article 690, 692, and Article 705. Code Making Panel 13 should be given authority for this definition to appear in Article 100. The definition is the same as the definition in section 2.41 of Underwriter Laboratory Standard 1741 – Inverters, Converters and Controllers for Use in Independent Power Systems.

This new definition will be used in the definition of "Interactive System" used in Article 100, 690, 692 and Article 705. This change is being proposed as part of a re-write of Article 690, 692 and Article 705 with respect to the interconnection of systems and equipment for use with distributed energy resources.

UL 1741 is currently under revision with a title change from "Inverters, Converts, and Controllers for Use in Independent Power Systems" to "Inverters, Converters, Controllers and Interconnection Systems Equipment for Use with Distributed Energy Resources." However the definition of Utility-Interactive Inverter remains unchanged.

Panel Meeting Action: Accept in Principle

Accept the proposal with one revision:

change "sometimes" to "that may".

Panel Statement: The action clarifies the submitter's intent.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

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ARTICLE 110 — REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

1-50 Log #2107 NEC-P01 **Final Action: Reject**
(110.3(A)(1))

Submitter: Herbert Moulton, Masters Technology Inc.

Recommendation: Revise the definition in FPN as follows:

~~FPN: Suitability of equipment use may be identified by a description marked on or provided with product to identify the suitability of the product for a specific purpose, environment, or application. Suitability of equipment may be evidenced by listing or labeling.~~

Revised Text: <u>FPN: Refer to Article 100 definitions listing or labeled.</u>

Substantiation: The deleted text is unnecessary as the reference made to Article 100 definitions clearly states the conditions required for Listing and Labeling. This is also referenced in 110.2, FPN as part of the approval process.

Panel Meeting Action: Reject

Panel Statement: The proposed change to the FPN would come unacceptably close to making "approval" contingent on listing or labeling. If that were the case, there would be no need for 110.3(A). CMP-1 disagrees that the fine print note is unnecessary, as it provides the Code user with explanatory information regarding the suitability of equipment for installation and use.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-51 Log #2324 NEC-P01 **Final Action: Reject**
(110.3(A)(6), FPN (New))

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.

Recommendation: Add a new FPN to read:

FPN: Listed Arc-resistant switchgear is designed and tested to withstand the effects of an internal arcing fault. See IEEE C37.20.7 for description and details of testing.

Substantiation: Arc flash hazard to the operating personnel requires mitigation to protect personnel from arc flash hazards such as thermal, shrapnel due to blast, and pressure wave caused by the internal arcing. Switchgear

designed and tested per IEEE C37.20.1 and 20.2 is tested under bolted fault conditions and not for effects of internal arcing faults. Switchgear designed and tested per IEEE C37.20.7 is tested to withstand effects of internal arcing faults in addition to the bolted fault conditions.
Panel Meeting Action: Reject
Panel Statement: Section 110.3(A)(6) is less about arc flash withstand of the equipment than it is about the effects of arcing. The fine print note as proposed is specific to arc-resistant switchgear only and provides no explanation of "arcing effects" as noted in item (6). Fine print notes are for explanatory information per the NEC Style Manual, Section 3.1.3.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
FLOYD, II, H.: The application of Arc Resistant Switchgear in US markets has grown over the past decade, to the point that all major manufacturers now offer this design. Experience in installations in the US and longer-term experience in other global regions demonstrates that arc resistant designs can reduce the frequency of personnel exposure to hazardous arcing faults. While I support the concept of recognizing this type of equipment in the NEC, I agree with the panel action for rejection.

1-52 Log #1395 NEC-P01 **Final Action: Reject**
(110.3(B) (New))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Add new text to read:
(B) Installation and Use. When listed or labeled equipment is installed, it shall be installed and used in accordance with any instructions included in the listing or labeling.
Substantiation: As this section is currently written, it seems to require that listed or labeled equipment is required to be used. This would add clarity that unlisted equipment can be used, if it is approved by the authority having jurisdiction.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that the proposed text does not add clarity to the NEC. The panel does not accept the premise that listed and labeled equipment is unilaterally required.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-53 Log #2108 NEC-P01 **Final Action: Reject**
(110.3(B))

Submitter: Herbert Moulton, Masters Technology Inc.
Recommendation: Revise text as follows:
(B) Installation and Use. ~~Listed or labeled~~ equipment shall be installed and used in accordance with any instructions included in the listing or labeling.
Revised Text: Equipment shall be installed and used in accordance with any instructions included in the listing and labeling.
Substantiation: The deleted text is unnecessary as the reference to listed and labeled is redundant.
Panel Meeting Action: Reject
Panel Statement: The existing language is intentional, designed to illuminate the difference between Sections 110.3(A) and 110.3(B). Section 110.3(A) contains criteria for authorities having jurisdiction to examine equipment. Listed equipment, covered by 110.3(B), is presumptively in satisfaction of 110.3(A)(1) through (8) by virtue of its conformity to product safety standards.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-54 Log #1768 NEC-P01 **Final Action: Reject**
(110.3(C))

Submitter: David Sroka, Turner Falls, MA
Recommendation: Add text to read as follows:
110.3(C) Nameplate Data. The short-circuit current rating shall be included on the nameplate for battery inverters, HVAC equipment, elevator and lighting controllers.
Substantiation: This data is hard to obtain after the original installation. It is important information. The nameplate is the best place for the equipment's rating.
Panel Meeting Action: Reject
Panel Statement: Article 110 contains general requirements for electrical installations. It would be more appropriate to place the marking requirements for specific types of equipment in the individual Code articles covering those types of equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-55 Log #1767 NEC-P01 **Final Action: Reject**
(110.3(C) and FPN)

Submitter: David Sroka, Turner Falls, MA
Recommendation: New text to read:
110.3(C) Nameplate Data. Applicable labeled equipment shall include ambient temperature rating and terminal temperature rating on the nameplate.
FPN: Applicable equipment defined as: Switchboards, panelboards, motor control centers, busway, disconnect and transfer switches, control cabinets.
Substantiation: Granted, this data is also available in equipment manuals. However, temperature considerations are critical to a piece of equipment being installed and wired as intended.
Panel Meeting Action: Reject
Panel Statement: The term "Applicable labeled equipment" is vague and unenforceable. The proposed text is not clear as to the temperature rating to include on the nameplate and the fine print note contains a definition. Fine print notes are explanatory and informational only and are not enforceable. See the NEC Style Manual Sections 3.1.3 and 3.2.1, and NEC Section 90.5(C) Explanatory Material. CMP-1 refers the submitter to Section 110.14(C) temperature rating associated with the ampacity of a conductor for clarification.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-56 Log #3119 NEC-P01 **Final Action: Reject**
(110.6)

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: Add a new first paragraph as follows:
Add wire size in square millimeters to the section to read as follows:
110.6 Conductor Sizes. Conductor sizes are expressed in American Wire Gage (AWG), ~~or in~~ circular mils, or in square millimeters .
Substantiation: Wire sizes are included throughout the Code in square millimeters and this needs to be added to this section.
Panel Meeting Action: Reject
Panel Statement: Section 310.11 requires conductors and cables to be marked in AWG size or circular mil area. The requirements and applications contained in Chapters 1 through 8 generally do not use square millimeters as a requirement methodology. The panel recognizes that square millimeters are provided in Chapter 9 as reference material. The panel concludes that adding the submitter's suggested recommendation adds no clarity to the Code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
ANTHONY, M.: The NEC should evolve into a standard that can be used internationally. Rejection of this proposal does nothing to hasten that evoluation.

1-57 Log #555 NEC-P01 **Final Action: Reject**
(110.7)

Submitter: R. K. Varma, State of PA, DCED
Recommendation: Add new text to read:
Completed wiring installations shall be tested by hi-pot ac or dc meters and shall be free from short circuits and from grounds other than as required or permitted in Article 250.
Substantiation: Completed installations have been seen to have been literally punctured by over driven staples causing shorts or even shocks to unaware personnel. (A Pastor of a church got a shock). We need to assure one and all that all installations are tested. We make them test with 1080 volts section in our housing program.
Panel Meeting Action: Reject
Panel Statement: The proposed testing method is not appropriate for all installations and could damage utilization equipment and controls. The substantiation is insufficient to support a requirement for hi-pot testing of all electrical installations.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-58 Log #617 NEC-P01 **Final Action: Accept in Principle in Part**
(110.7)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
110.7 Insulation Integrity. Completed wiring installations shall be free from short circuits and from ground faults or any connections to ground ~~grounds~~ other than as required or permitted in Article 250 or elsewhere in the Code .
Substantiation: This proposal is for clarification purposes. The Code uses the term "ground fault" and various connections to ground or "grounding connections" are either permitted or required by Article 250 or even elsewhere in the NEC. The term ground fault is defined in 250.2, where as the word

"grounds" is not. The proposal is part of a larger effort to correct how the words and terms related to grounding are used in the NEC and promote uniform and consistent use of such defined words and terms. Article 250 is not the only article that requires or permits grounding connections so expanding the definition to apply to the rest of the Code is appropriate as well.

Panel Meeting Action: Accept in Principle in Part

Revise text to read as follows:

110.7 Insulation Integrity. Completed wiring installations shall be free from short circuits and from grounds other than as required or permitted ~~in Article 250 or~~ elsewhere in the Code .

Panel Statement: CMP-1 disagrees with the submitter that the revised and new text "from ground faults or any connections to ground" clarifies the provisions of this section. The additional text is redundant as Article 100 defines "ground" as "a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth or to some conducting body that serves in place of the earth." Use of the plural "grounds" is appropriate in the sentence and per the NEC Style Manual, Section 3.3.5, for parallel construction. Further, the term "ground fault" is specific to Article 250. CMP-1 accepts the proposed new text "elsewhere in the Code" and has removed the text "in Article 250 or" as it is redundant and unnecessary -- the use of "elsewhere" includes Article 250. CMP-1 believes the action on this proposal meets the intent and concerns of the submitter. CMP-1 requests that Panel 5 review and comment on the proposed action.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BARRIOS, JR., L.: The panel action should have been "accept in principle" rather than "accept in principle in part". CMP1 should have accepted the submitter's intent to clarify the term "grounds". The following wording is proposed which should meet the submitter's intent. "110.7 Insulation Integrity. Completed wiring installations shall be free from short circuits and ~~from grounds~~ ground faults and from any connections to ground other than as required or permitted ~~in Article 250~~ elsewhere in the Code."

LABRAKE, JR., N.: This proposal should be accepted. The text "from ground faults or any connections to ground" is a proper description of this Code requirement. The term "grounds" indicates a safety application to purposely ground a deenergized circuit to perform work.

1-59 Log #568 NEC-P01 **Final Action: Reject**
(110.9)

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona

Recommendation: Revise as follows:

Equipment intended to interrupt current at fault levels shall have interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment.

Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at nominal circuit voltage sufficient for the current that must be interrupted.

Equipment that has an available fault current in excess of 10,000 amperes shall be field marked with the actual fault current available at the line terminals of the equipment. The marking shall be located so as to be clearly visible to qualified personnel before any overcurrent devices can be installed in the equipment.

Substantiation: This will ensure compliance with 110.9 with the ability to verify that the equipment is rated for the proper fault levels. It will also compliment the requirements of Section 110.16 for Flash Protection, 110.22 for the marking of equipment enclosure(s) applied with a series combination rating and 240.86(B) which requires end use equipment to be marked when the combination of the line-side overcurrent device and the load-side circuit breaker(s) is tested as a series combination.

There currently is no identification or marking requirements for Fully Rated installations. The problem is if we have 18K available at a panelboard with 22 K AIC rated breakers installed, the person performing work on the equipment would not know that a 10 K AIC rated breaker listed for use in the enclosure could not be installed. In fact, if the 10 K AIC rated breaker was installed, we would be in violation of 110.9, and have an unknown hazard due to the fact that most manufacturers have terminology on their equipment stating the withstand rating of the equipment, however it is limited to the lowest rated device installed within the enclosure.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The actual fault current at an installation is a variable and must be determined with knowledge of the system parameters (including those of the utility supply system) at any given time. Marking of the equipment with "actual" fault current would be misleading.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-59. Our explanation is as follows:

This proposal should have been accepted. Accepting this Proposal will, in our opinion, greatly enhance electrical safety. We feel that the submitter's proposal is a reasonable recommendation and we agree with the submitter that this will help ensure compliance with the present requirements of 110.9.

In addition, we strongly disagree with the Panel Statement. We submit that the statement "marking of the equipment with "actual" fault current would be misleading" is not accurate. Clearly, the actual fault current is not static. However, if the intent of this panel statement is to convey to those that who look to the written record for guidance of what a Code Panel meant when it wrote a rule, then this panel statement could be sending a message that evaluating series combination systems and determining motor contribution is not achievable. The industry simply cannot continue to hide behind this argument and not help protect inspectors, electricians, and others who install and maintain electrical equipment. It is reasonable to mark equipment with values that are present at the time of installation. As an alternative, we suggest the submitter's proposal be modified as follows: Equipment shall have an interrupting rating of not less than 65,000 amperes and be marked with the location, type, size or setting of the upstream overcurrent protective device.

MCMAHILL, L.: This proposal should have been accepted. The proposed requirement is reasonable and necessary for safety and code enforcement. This section requires that "Equipment intended to interrupt current at fault levels shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment." If there is nothing on the equipment to indicate what is available at the line terminals, how does one comply with minimum code? For new installation, the available fault-current at the line terminals of the equipment is generally noted on the engineered plans; however, for existing installations such information is not readily available. Is it the intent that interrupting ratings are only important for new installations? CMP-1 should reconsider this proposal as the marking requirement is for in excess of 10,000 amperes. As noted, the proposed marking will compliment the marking requirements for flash protection and series combination rating. Such marking will also provide reasonable information to qualified persons when working on the equipment. The panel statement notes "The actual fault current at an installation is a variable and must be determined with knowledge of the system parameters (including those of the utility supply system) at any given time." Obviously, the actual fault current is a variable, but this is not a good reason for rejecting this proposal. Most electrical systems are designed with fixed and albeit conservative available fault current values that allow for any variable in the supply system. If not, it would be difficult to apply any electrical equipment within its rating. In addition, if CMP-1 believes the fault current value is a variable, then how does one attain compliance with the marking requirement for series combination systems and the motor contribution rule? CMP-1 should have accepted this proposal in principle to read, "Equipment intended to interrupt current in excess of 10,000 amperes shall be field marked with not less than the maximum current that is available at the line terminals of the equipment." This action meets the intent of the proposal, but most importantly provides the necessary language in meeting the intent of "Interrupting Rating." The proposal should have been referred to CMP-10 for consideration too.

1-60 Log #2846 NEC-P01 **Final Action: Reject**
(110.9)

Submitter: Doug Eckelkamp, Bell Electric

Recommendation: Add a new third paragraph to the existing two paragraphs as follows:

<u>An enclosure containing equipment intended to interrupt current at fault levels shall be field marked with the available short-circuit current.</u>

Substantiation: The problem is that it is next to impossible for inspectors to obtain the information on the available short-circuit current and then correlate that information at the job site with the specific overcurrent protective devices. This proposal will solve that problem by providing that necessary information right at the location where it is needed. This type of data must be field marked because the manufacturer will never know where their equipment will be installed.

Panel Meeting Action: Reject

Panel Statement: The actual fault current at an installation is a variable and must be determined with knowledge of the system parameters (including those of the utility supply system) at any given time. Marking of the equipment with "actual" fault current would be misleading.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-60. See our explanation of negative on Proposal 1-59.

MCMAHILL, L.: The submitter is correct in that field marking is important for the inspector and provides necessary information for selecting the appropriate interrupting devices for the equipment. In addition, see my comments to proposal 1-59 (Log 2846), as they are applicable here too.

1-61 Log #1981 NEC-P01 **Final Action: Accept**
(110.11)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 11 for comment.
Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise as follows:

110.11 Deteriorating Agents. Unless identified for use in the operating environment, no conductors or equipment shall be located in damp or wet locations; where exposed to gases, fumes, vapors, liquids, or other agents that have a deteriorating effect on the conductors or equipment; or where exposed to excessive temperatures.

FPN No. 1: See 300.6 for protection against corrosion.

FPN No. 2: Some cleaning and lubricating compounds can cause severe deterioration of many plastic materials used for insulating and structural applications in equipment.

Equipment not identified for outdoor use and equipment identified only for indoor use, such as "dry locations ", ~~"Type 1," or~~ "indoor use only" , "damp locations", or Enclosure Types 1, 2, 5, 12, 12K and/or 13, shall be protected against permanent damage from the weather during building construction.

FPN No. 3: See Table 110.20 for appropriate enclosure type designations.

Substantiation: The proposal is made as a part of a suggestion for dealing with Comments that were HELD during the 2005 cycle. Four Comments (1-229, 1-230, 1-231, and 1-233) on Proposal 1-157 were held, with the Panel Statement on the other three referring back to the Panel Action and Statement on 1-231. This proposal builds upon Proposals 1-152 and 1-157 of the 2005 cycle, and is essentially the same as Comment 1-231.

One difference from Comment 1-231 is the acknowledgment that moving the last paragraph of 110.11 into 110.20 would diminish its effectiveness for enclosures not marked with an enclosure Type number. Instead, the paragraph should remain here, with the clarifications suggested in Comment 1-231 incorporated and a FPN reference to 110.20 added.

A companion proposal proposed creating a new 110.20 from 430.91 and Table 430.91. If the should happen not to be enacted, the FPN reference here should be to 430.91, instead of 110.20.

Panel Meeting Action: Accept
Panel Statement: The panel recommends that the TCC forward this proposal to CMP-11 for comment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-62 Log #435 NEC-P01 **Final Action: Reject**
(110.12)

Submitter: Clarence Young, Ludvick Electric
Recommendation: Revise text to read as follows:

110.12 Manual Execution of Work.

Electrical equipment shall be installed in a ~~neat and workmanlike~~ manner consistent with industry practices outlined in ANSI/NECA 1-2000, Standard Practices for Good Workmanship in Electrical Contracting, and other ANSI approved installation standards.

~~FPN: Accepted industry practices are described in ANSI/NECA 1-2000, Standard Practices for Good Workmanship in Electrical Contracting, and other ANSI approved installation standards.~~

Substantiation: Currently, 110.12 includes the FPN referring ANSI/NECA 1-2000 and other documents, but this only adds to the confusion of what is enforceable and what is not enforceable by "the authority having jurisdiction". By deleting "neat and workmanlike" and adding the additional documents to the Code, we can eliminate any confusion as to what is and what is not acceptable in terms of inspection for safety. I do realize that this adds even more for professionals in the electrical industry to read through and understand, however, the additional documents provided will add an element of safety as to the installation of electrical equipment.

Panel Meeting Action: Reject
Panel Statement: Section 4.2 of the NEC Style Manual states, "References to other standards shall not be in mandatory Code text... References to other standards shall be in the Fine Print Notes."
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

MCMAHILL, L.: This proposal should have been accept in principle in part. The submitter's intent was to eliminate the confusion of enforcing this section. "Neat and workmanlike" is an undefined performance requirement and, theoretically, a work practice issue that can vary throughout industry. For enforcement purpose, the critical attribute of neat and workmanlike is that the installation is mechanically safe, sound and code compliant. CMP-1 should have revised the text to read "Electrical equipment shall be installed in a manner consistent with the requirements of this code and accepted industry practices." This revised text eliminates vague and unenforceable terms as required by the NEC Style Manual Section 3.2.1. Further, the revised text allows industry, with the authority having jurisdiction's concurrence, to make the determination on what constitutes accepted industry practices. The existing fine print note provides information on one example of an industry practice.

1-63 Log #3369 NEC-P01 **Final Action: Reject**
(110.12)

Submitter: Mark Miller, Plumechtrics Consulting Engineering
Recommendation: Delete the FPN as shown:

~~FPN: Accepted industry practices are described in ANSI/NEC 1-2000, Standard Practices for Good Workmanship in Electrical Contracting and other ANSI approved installation standards.~~

Substantiation: The ANSI/NECA Standards are generic in nature and are not widely adopted stanards. There has been a movement within the NEC and other codes to keep the minutia out of the code. This is one more example of extra material that does not benefit the NEC or the user. As mentioned on the NECA website "these are the first quality and performance standards for electrical construction, and contain requirements over and above the minimum safety rules of the National Electrical Code (NEC). They are intended to be referenced by consulting engineers in plans and specifications for electrical construction projects". This purpose stated on the NECA website does not reflect the sole purpose of the National Electrical Code as a safety document. Design and quality issues should be included elsewhere. The NFPA organization should not place extra material within the document which may lead to more stringent requirements and higher costs. Individuals of companies who seek more stringent requirements may do so on their own.

For these reasons the FPN should be deleted.

Panel Meeting Action: Reject
Panel Statement: Fine print notes contain explanatory information and are not an enforceable part of the Code. The reference to ANSI/NECA 1-2000 provides additional information to illustrate what is meant by 110.12.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

HITTINGER, D.: This proposal should have been accepted. The fine print note reference to the ANSI/NECA 1-2000 standard contains information on the installation, handling and storage of certain products and hardware. This information is generic. It is misleading to direct users of the code to a single standard that may not be suitable, practical, or accepted in all industry practices. The fine print note should be deleted.

1-64 Log #2256 NEC-P01 **Final Action: Accept**
(110.12, FPN)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Update the publication date of the referenced standard as follows:

FPN: Accepted industry practices are described in ANSI/NECA 1-2006, Standard Practices for Good Workmanship in Electrical Contracting, and other ANSI-approved installation standards.

Substantiation: ANSI/NECA 1-2000 is currently being revised, and the 2008 NEC should reference the latest edition.

ANSI/NECA 1-2006 will be published prior to the Public Comment deadline.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:

BARRIOS, JR., L.: The panel action should have been "reject" rather than "accept". The 2006 revision of ANSI/NECA 1 was not an approved document at the time of the 2008 NEC ROP meeting. CMP1 should not consider modifying the FPN date reference to this standard until it is an approved document and the committee has an opportunity to review the final changes.

HITTINGER, D.: This proposal should be rejected. The revised ANSI/NECA 1-2006 standard was not available to Panel 1 members for consideration. Not knowing the content makes it difficult to make an informed decision on whether this document is truly an accepted industry standard that should be included in a fine print note.

1-65 Log #2886 NEC-P01 **Final Action: Reject**
(110.12, FPN)

Submitter: Ron Alley, ELECTRICO
Recommendation: Delete the following FPN:

~~FPN: Accepted industry practices are described in ANSI/NECA 1 2000, Standard Practices for Good Workmanship in Electrical Contracting and other ANSI approved installation standards.~~

Substantiation: Numerous consensus standards from organizations such as Underwriters Laboratories Inc. NEMA and IEC/ISO could be added as a Fine Print Note throughout the Code to assist the reader of the NEC as the existing FPN note does. There are just as many publications such as American Electricians Handbook, Electricians Pocket Manual, UGLY's Electricians Reference, Conduit Bending and Electricians Instant Answers to benefit the reader. Also, there are safety regulations, pertaining to installations such as OSHA 1910 and OSHA 1926 that could be added as a Fine Print Note to assist readers to make their companies and workers safer. However, adding a Fine Print Note for the purpose of informing the reader of all related standard and publications could be cumbersome. For that reason, I recommend, if a FPN is added it should include all documents providing information or none.

The particular standard mentioned in the FPN, (ANSI/NECA 1 2000 Standard Practices for Good Workmanship in Electrical Contracting) contains information on the installation of certain products and hardware. This information is generic. It should never be used instead of manufacturer's instructions.

Manufacturer's instructions are sometimes required to be included as a condition of listing or labeling and to be sent with the listed or labeled products. Manufacturers instructions are updated as needed to keep up with product improvements. The FPN in the 2005 Code most likely will not be as up to date as the manufacturer's instructions.

If the committee decides to keep the FPN, the following words should be added:

ANSI/NECA 1 2000 Standard Practices for Good Workmanship in Electrical Contracting is one source of many that can be used along with manufacturer's instructions.

Panel Meeting Action: Reject

Panel Statement: The Code contains numerous FPN references to ANSI-approved industry standards that provide explanatory information to Code users. Other documents mentioned in the submitter's substantiation, such as the American Electrician's Handbook, UGLY's Electrician's Reference and conduit bending guides, are not appropriate to include in FPNs because they are not industry consensus standards developed with broad participation by Code users. The scope of ANSI/NECA 1-2000 states: "Installers should always follow the NEC, applicable state and local codes, and manufacturers' instructions."

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

HITTINGER, D.: This proposal should have been accepted to delete the fine print note. See my explanation of negative vote on Proposal 1-63.

1-66 Log #177 NEC-P01 **Final Action: Accept in Principle**
(110.12(A))

NOTE: The following proposal consists of Comment 1-198 on Proposal 1-160 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-160 was:

Revise Section 110.12(A) as follows:

Insert additional language to include unused openings for circuit breakers and other overcurrent devices in addition to raceway and cable openings.

10.12 Mechanical Execution of Work.

Electrical equipment shall be installed in a neat and workmanlike manner.

(A) Unused Openings. Unused circuit breaker, cable or raceway, and other similar openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, meter socket enclosures, equipment cases, or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment. Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (1/4 in.) from the outer surface of the enclosure.

The Technical Correlating Committee directs that this Comment be reported as "Hold". See Technical Correlating Committee action on Comment 1-202.

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"Unused ~~circuit breaker, cable or raceway, and other similar~~ openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, meter socket enclosures, equipment cases, luminaires, or housings shall be effectively... enclosure.

Exception: Those openings intended by the manufacturer for purposes such as ventilation, mounting or drainage."

Substantiation: Per Mr. MacMahill's comment.

Panel Meeting Action: Accept in Principle

Panel Statement: The submitter's concerns, noted in Comment 1-198 which was reported as hold by the Technical Correlating Committee for the 2005 NEC cycle, have been addressed. The panel concludes that the defined term "equipment" covers the items in the original text. See CMP-1 action and statement on Proposal 1-71.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-67 Log #178 NEC-P01 **Final Action: Accept in Principle**
(110.12(A))

NOTE: The following proposal consists of Comment 1-199 on Proposal 1-161 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-161 was:

Revise text as follows:

Unused ~~cable or raceway~~ openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, meter socket enclosures, equipment cases, or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment. Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (1/4 in.) from the outer surface of the enclosure. Unused mounting holes with a maximum size of 6-mm (1/4 in) shall not be required to be closed.

Wording that is to be deleted has been struckthrough and new wording is underlined.

The Technical Correlating Committee directs that this Comment be reported as "Hold". See Technical Correlating Committee action on Comment 1-202.

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Panel should accept in principle, in part .

Unused ~~cable or raceway~~ openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, meter socket enclosures, equipment cases, housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment. Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (1/4 in.) from the outer surface of the enclosure. ~~Unused mounting holes with a maximum size of 6 mm (1/4 in.) shall not be required to be closed.~~

Substantiation: The words "cable or raceway" should be deleted from the section. All unused opening should be closed. The safety hazard is caused by the opening itself and not by the purpose of the opening.

Panel Meeting Action: Accept in Principle

Panel Statement: The submitter's concerns, noted in Comment 1-199 which was reported as hold by the Technical Correlating Committee for the 2005 NEC cycle, have been addressed. The panel concludes that the defined term "equipment" covers the items in the original text. See CMP-1 action and statement on Proposal 1-71.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-68 Log #179 NEC-P01 **Final Action: Accept in Principle**
(110.12(A))

NOTE: The following proposal consists of Comment 1-200 on Proposal 1-160 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-160 was:

Revise Section 110.12(A) as follows:

Insert additional language to include unused openings for circuit breakers and other overcurrent devices in addition to raceway and cable openings.

10.12 Mechanical Execution of Work.

Electrical equipment shall be installed in a neat and workmanlike manner.

(A) Unused Openings. Unused circuit breaker, cable or raceway, and other similar openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, meter socket enclosures, equipment cases, or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment. Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (1/4 in.) from the outer surface of the enclosure.

The Technical Correlating Committee directs that this Comment be reported as "Hold". See Technical Correlating Committee action on Comment 1-202.

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: The proposal should be rejected contingent on the new provisions being added to Article 408; if that does not happen, then it should continue to be accepted.

Substantiation: Circuit breaker knockouts, etc., involve considerations of panelboard dead fronts and other issues unique to Article 408. At the January ROP meetings, CMP 9 (Proposal 9-111) voted that this change should be made in 110.12(A), and Proposal 1-160 does exactly that. This comment is a companion to one submitted to create a new Section 408.7 as follows:

"408.7 Unused Openings. Unused openings for circuit breakers and switches shall be closed using listed closures, or other approved means that provide protection substantially equivalent to the wall of the enclosure."

In general, it is unwise to repeat code information in different articles because discrepancies can crop up in future cycles. That is why this comment suggests a conditional rejection based solely on jurisdiction and not on the technical merit of the originating proposal.

Responding to the comments in the voting, the reason this material has been recently restricted to cable and raceway openings is that before that modification CMP 9 had to deal with a series of Proposals similar to 1-161 from people who wanted reassurance that we weren't going to make them close bolt holes, weep holes, etc.

Panel Meeting Action: Accept in Principle

Panel Statement: The submitter's concerns, noted in Comment 1-200 which was reported as hold by the Technical Correlating Committee for the 2005

NEC cycle, have been addressed. The panel concludes that the defined term "equipment" covers the items in the original text. See CMP-1 action and statement on Proposal 1-71.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-69 Log #180 NEC-P01 **Final Action: Accept in Principle**
(110.12(A))

NOTE: The following proposal consists of Comment 1-201 on Proposal 1-160 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 1- (Log #179)]

The Technical Correlating Committee directs that this Comment be reported as "Hold". See Technical Correlating Committee action on Comment 1-202.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Reject the proposal.
Substantiation: We agree with Mr. McMahill. There is no need to expand the list of unused openings that must be closed. The wording is clear that unused openings be effectively closed to provide substantially equivalent protection to that of the original enclosure. UL or equivalent standards development organizations develop the required product standards to ensure that the intent of the Code is met. This ensures that all new products meet the intent of the Code without having to continuously revise the Code for every new product that is introduced.
Panel Meeting Action: Accept in Principle
Panel Statement: The submitter's concerns noted in Comment 1-201 reported as hold by the Technical Correlating Committee for the 2005 NEC cycle have been addressed. The Panel concludes that the defined term "equipment" covers the items in the original text. See CMP-1 action and statement on Proposal 1-71.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-70 Log #181 NEC-P01 **Final Action: Accept in Principle**
(110.12(A))

NOTE: The following proposal consists of Comment 1-202 on Proposal 1-160 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 1- (Log #179)]

The Technical Correlating Committee directs that this Comment and Proposal 1-160 be reported as "Hold" in conformance with 4-4.6.2.2 and 4-4.6.2.3 of the Regulations Governing Committee Projects.

Submitter: Lanny G. McMahill, Phoenix, AZ
Recommendation: Reject this proposal and revise the section to read as follows: "(A) Unused Openings. Unused ~~cable or raceway~~ openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, ~~meter socket~~ enclosures, and equipment ~~cases, or housings~~ shall be effectively closed...".
Substantiation: Reject this proposal based on the submitter's substantiation that states "By addressing only cable and raceway openings, other unused openings that also require closing appear to be left out of the 2002 edition." Adding the words "circuit breaker" does not change that concern. In theory, if the list continues to expand, only the specific openings listed are required to be closed. For example, if a voltmeter, switch or pilot light were removed from the front door of an enclosure, what code section requires the openings to be closed? A list is always limiting. Generally, there should be no unused openings in electrical enclosures, raceways and equipment except for those that are required for the normal operation or function of the equipment or installation. Instead of adding items to a list, delete the words "cable or raceway", "meter socket", and "case, or housings" from the existing definition. The remaining terms are clearly defined in Article 100. Using these terms eliminates the need to continue to expand the list of "unused openings" that must be closed and allows for a realistic enforcement practice.
Panel Meeting Action: Accept in Principle
Panel Statement: The submitter's concerns, noted in Comment 1-202 which was reported as hold by the Technical Correlating Committee for the 2005 NEC cycle, have been addressed. The Panel concludes that the defined term "equipment" covers the items in the original text. See CMP-1 action and statement on Proposal 1-71.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-71 Log #2677 NEC-P01 **Final Action: Accept in Principle**
(110.12(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 9 for comment.
Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:
110.12(A) Unused Openings
Unused ~~cable or raceway~~ openings other than opening intended for mounting, ventilation or drainage in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, meter socket enclosures, equipment cases, control panels or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment. Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (1/4 in.) from the outer surface of the enclosure.
Substantiation: The current wording would allow unused openings other than those for cable or raceways to be left open. The revised wording would cover all openings and still allow for openings for mounting, ventilation and drainage.
Control panels are not included in the equipment list. Article 409 does not contain a requirement for closing openings. As an example, a device installed through the wall of a control panel could be removed and there would be no requirement in the NEC to require the opening to be closed.
Panel Meeting Action: Accept in Principle
Revise text to read:
"110.12(A) Unused Openings. Unused ~~cable or raceway~~ openings other than those for the operation of equipment or for mounting purposes shall be closed to afford protection substantially equivalent to the wall of the equipment ~~in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, enclosures, and equipment shall be effectively closed to afford protection substantially equivalent to the wall of the equipment~~ . Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (¼ in.) from the outer surface of the enclosure."

Panel Statement: The panel concludes that all unused openings should be closed except for those required for the functional operation of the equipment or enclosure or for the proper mounting of such equipment or enclosure. The defined term "equipment" covers the items in the original text. The revisions made meet the intent of the Submitters of Comments 1-198, 1-200, 1-201, 1-202, and 1-203, found in the 2004 Report on Comments, as well as Proposal 1-71.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LABRAKE, JR., N.: This proposal should be forwarded by the TCC to CMP-9 for comment.

1-72 Log #2352 NEC-P01 **Final Action: Accept in Part**
(110.12(B))

Submitter: John S. Whitney, Newton Sq., PA
Recommendation: Delete requirements for subsurface enclosures and move requirements for racking cables into Article 110 V - Manholes and other Electric Enclosures Intended for Personnel Entry, All Voltages.
Substantiation: There is no NEC definition for "Subsurface Enclosures". The requirement for racking clearly applies to Article 110 V, "Manholes and other Electric Enclosures Intended for Personnel Entry, All Voltages". Hazards associated with manholes and other enclosures intended for personnel entry are directly related to the confined nature of the space within and limited access/egress. The hazards are independant of the location of the enclosure. Manholes and other enclosures intended for personnel entry are installed below grade, above grade, suspended below bridge decks, etc. Cable assemblies and conductors shall be racked to provid ready and safe access/egress. Cable assemblies and conductors shall not obstruct the standing area of the enclosure floor and shall be effectively secured to racks to safely withstand magnetic forces when subjected to short circuit current.
Panel Meeting Action: Accept in Part
Panel Statement: The panel accepts the deletion of 110.12(B) but does not accept relocation of the text in 110.12(B) to Article 110, Part V, since 110.74 presently contains the requirements for conductor racking. The panel concludes this action meets the intent of the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-73 Log #804 NEC-P01 **Final Action: Reject**
(110.12(D))

Submitter: Joe Tedesco, Boston, MA
Recommendation: 110.12(D)Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels, including suspended ceiling panels.
Substantiation: This requirement can be found in Chapters 6, 7, and 8 (search for denied) and should be added as a new rule in Article 110.
Panel Meeting Action: Reject
Panel Statement: The submitter describes a design and workmanship issue. Section 110.26 requires that access to electrical equipment be maintained. By 90.1(C), the NEC is not intended to be a design specification. Adding the proposed Section 110.12(D) would have an immediate impact on Code articles in Chapters 1, 2, 3, 4, and 5 without substantiation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

Comment on Affirmative:

HICKMAN, P.: We agree that the submitter has identified a problem in the industry and appreciate his attempt to address it. We recognize that the problem of accumulation of wires and cables is widespread and does not only occur with Chapter 6, 7 and 8 wires and cables. While we agree that it may be easier to have one general requirement in Article 110 prohibiting the accumulation of wires and cables on ceiling tiles in Chapters 1-7, we agree with portion of the Panel Statement recognizing that this proposal would have an immediate impact on articles in Chapters of the NEC that CMP1 was not prepared to investigate. Since the proposal is to Article 110 and would therefore apply to Chapters 1-7, we encourage the submitter to further substantiate this concept in a Comment.

1-74 Log #426 NEC-P01 **Final Action: Reject**
(110.13(A))

Submitter: Kenneth Wilee, Wilee Electric Inc.
Recommendation: Add new text as follows:

In outdoor locations, equipment shall be mounted not less than (600 mm) 2 ft above grade level.

Substantiation: It is becoming practice to mount disconnecting means for a/c equipment and panelboards within inches of grade. This poses a hazard of damage, possible water entry from floods and unreasonable working space. This would apply to all electrical equipment.
Panel Meeting Action: Reject
Panel Statement: The requirement is too restrictive, as it would apply to all outdoor equipment including equipment designed to be mounted at or below grade. Equipment is a general term that includes materials, fittings, devices, luminaires, apparatus, etc. as part of an electrical installation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-75 Log #383 NEC-P01 **Final Action: Reject**
(110.14(A))

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Add to the end of the first paragraph:

The tightening torque of terminations shall be made per the manufacturer's instructions. Delete the Fine Print Note following 110.14.

Substantiation: Fine Print Notes are not enforceable and the requirement of 110.3(B) is too general as torque specifications are often overlooked but are extremely important.
Panel Meeting Action: Reject
Panel Statement: Section 110.14 does not require that the manufacturer's instructions be followed when making up compression lugs or splicing wire connectors. There would seem to be no reason for the section to require torquing per manufacturer's instructions. In addition, the proposal does not contain a statement of the problem and substantiation for the change as required by Section 4.3.3(d) of the Regulations Governing Committee Projects.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-76 Log #2059 NEC-P01 **Final Action: Reject**
(110.14(A))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add a third paragraph as follows:

Terminals, lugs, or connectors intended for use with flexible, fine-stranded cables shall be marked and listed for such use.

Substantiation: UL Standard 486 A and B requires that connectors, lugs, and terminals intended for use with flexible, fine-stranded cables be so marked for use with such cables. Very few connectors and terminals have been listed for such use and few are so marked. The vast majority of connectors and terminals are unsuitable for use with flexible, fine-stranded cables. However, the limited distribution and wording of the standard has resulted in these non-marked connectors being used improperly with flexible, fine-stranded cables. Connector/conductor failures in several widely different industries (e.g. uninterruptible power systems, motor drives, electric vehicles, photovoltaic power systems) have been reported. The existence of the UL Standard alone is not sufficient to prevent the misuse of these conductors and unmarked connectors, terminals, and lugs.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The term "fine-stranded cable" is not used or defined in the NEC. This proposal is adequately covered in 110.3(B).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-77 Log #3307 NEC-P01 **Final Action: Reject**
(110.14(A), FPN (New))

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Add text to read as follows:

FPN: For additional requirements see 408.41.

Substantiation: Requirements for terminations contained in 408.41 have a direct relationship to the material covered by 110.14.
Panel Meeting Action: Reject
Panel Statement: Section 408.41 is specific to grounded conductor terminations in panelboards. Section 110.14(A) is a general requirement for all electrical installations. A fine print note referencing 408.41 for additional requirements does not improve clarity of the section. See the NEC Style Manual, Section 4.1.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-78 Log #2334 NEC-P01 **Final Action: Reject**
(110.14(B))

Submitter: Charles Carmical, Complete Services
Recommendation: Revise text to read:

Conductors shall be spliced or joined with splicing devices identified for the use or by brazing, welding, or soldering with a fusible metal or alloy. Soldered splices shall first be spliced or joined by twisting together, #10 gauge wire or smaller so as to be mechanically and electrically secure without solder and then be soldered.

Substantiation: I have soldered wire splices for forty-one years with 40/60 resin core solder with "0" failures, but have had an instructor teaching inspectors that a mechanical connector must be used when soldering.

In my opinion, twisting the free ends of up to #10 gauge wire together meets the definition of spliced or joined, mechanically and electrically secure until soldering with a fusible metal or alloy takes place as 110.14(B).

According to World Book Encyclopedia and Merriman/Websters Dictionary the definitions are:

Spliced or joined - to unite by interweaving the strands or wire.

Fusible metal or alloy - an element usually possessing hardness, malleability, fusibility, and conductivity of being fused.

Mechanically - of or relating to machinery or tools, of or relating to manual operations.

Electrically - relating to or operated by electricity.

I have found wire nuts burned from loose connections, crimp sleeves oxidized, split and become loose from heat, but have never had any soldered wire come apart, burned, oxidized, or cause any more resistance than other connectors.

In my opinion, I believe that this meets or exceeds the intent of this code section and after forty-one years of this practice with "0" failures, it has proven to be a superior and effective means of connecting splices to give the quality of workmanship that I strive to give my customers.

Nowhere in the NEC does a wire splice need more than one connector, and the interpretation of a mechanical connector before soldering is not mentioned or needed in 110.14(B) as I interpret this code.

I ask this board for consideration of this option if it meets code section 110.14(B) to give more effective options and choices of a good and lasting connection for years to come or render an interpretation of this code section.

Copper water lines were soldered for years with 40/60 solder before lead free was introduced, and it holds pressure so it will sure hold wire with no problem.

PC Boards are soldered with 40/60 resin core with no mechanical connectors or loss of conductivity in computers, automobiles, HVAC equipment, and many other items with no problems.

Audel Guide to the 2005 NEC makes reference to soldered splices with no mention of a mechanical connector, but a mechanical connection which is twisting as I understand this reference.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The submitter's substantiation does not explicate how the requirement would be clarified by adding the proposed language. In addition, the proposal would mandate twisting wires together, to the exclusion of all other methods of securing the conductors. The substantiation says that PC boards are soldered "with no mention of a mechanical connector" in computers, automobiles, and HVAC equipment. The fact is, standards for computers (ANSI/UL 60950) and HVAC equipment (ANSI/UL 1995) specifically require that the conductors be mechanically secured to their terminals before soldering.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-79 Log #3560 NEC-P01 **Final Action: Reject**
(110.14(C)(1))

Submitter: Robert Alexander, Laguna Hills, CA
Recommendation: Revise as follows:

110.14(C) Ampacity and Temperature Limitations of Electrical Connections. The ampacity of a conductor shall be selected and coordinated so as not to exceed the ampacity or temperature rating of any connecting device or equipment terminal to which it is connected.

(1) Provision for 0-600V Connecting Devices or Equipment Terminals. Temperature limitations of conductors, required by 0-600V rated connecting devices or equipment terminals, shall be based on 110.14(C)(1)(a), (b) or (c). Unless marked otherwise, the conductor ampacity at a connecting device or equipment terminal shall be based on Table 310.16 without further adjustment except as required by the appropriate ambient correction factor of the

conductor.

(a) Connecting devices or equipment terminals rated 100 amperes or less, or marked for conductors 14 AWG through 1 AWG, shall be used only for one of the following:

(1) Conductors with temperature ratings of 60°C (140°F).

(2) Conductors with higher temperature ratings, provided the ampacity of such conductors at the connecting device or equipment terminal is limited to the ampacity of a 60°C (140°F) temperature rated conductor of the same size.

(3) Conductors with higher temperature ratings if the connecting device or the equipment terminal and host equipment is identified for use with such conductors.

(B) Terminations rated over 100 amperes, or marked for conductors larger than 1 AWG, shall be used only for one of the following:

(1) Conductors with temperature ratings not more than 75°C (167°F)

(2) Conductors with higher temperature ratings, provided the ampacity of such conductors at the connecting device or equipment terminal is limited to the ampacity of a 75°C (167°F) temperature rated conductor of the same size

(3) Conductors with higher temperature ratings if the connecting device or the equipment terminal and host equipment is identified for use with such conductors.

(c) For motors marked with NEMA design letters B, C, or D, field terminated conductors shall have a temperature rating not more 75°C (167°F) or conductors with higher temperature ratings shall be permitted to be used provided the ampacity at the termination of such conductors is limited to the ampacity of a 75°C (167°F) temperature rated conductor of the same size.

Substantiation: This subsection is still widely misunderstood and needs clarification that these are ampacity and temperature limitations placed on conductors solely at the connections or terminations.

In the context of the primary (110.14) the purpose of this subsection is to define the appropriate temperature limitations of conductors at connections. The temperature limitations of the conductors in other conditions of use are appropriately defined in Section 310.10 and other parts of Article 310. It is important to note no additional adjustments are required by a connection itself unless marked otherwise, but ambient conditions are to be considered.

A coordinating proposal is being made to 310.15(A)(2) [Selection of Ampacity] to specifically recognize 110.14(C) and that the exception to 310.15(A)(2) does not apply to it.

The revised text also notifies the user that both the host equipment and its terminals must be identified for a higher temperature rating.

Termination devices in 110.14(C)(2) are both amp and temperature rated so ampacity restrictions are also recognized in the 110.14(C) general statement.

Nonlisted NEMA rated motors are identified as the basis for 110.14(C)(1)(c).

Panel Meeting Action: Reject

Panel Statement: The present text is clear. The proposal does not add clarity to the present requirements and suggests that equipment terminals or connecting devices have an "ampacity", a term limited to conductors. The substantiation does not indicate where the present text is unclear.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-80 Log #3658 NEC-P01 **Final Action: Reject**
(110.15)

Submitter: George Rohanna, Local Union #98 IBEW

Recommendation: New word (Purple).

Delete (Orange).

Substantiation: Orange is a "B" phase color for all 480 volt systems, wye or delta. The color purple should be used to identify a high leg on a 4-wire delta system.

Panel Meeting Action: Reject

Panel Statement: The submitter has provided no technical substantiation supporting a change of the high-leg color on a 4-wire delta connected system from orange to purple. See Section 4.3.3(d) of the Regulations Governing Committee Projects. CMP-1 notes to the submitter that orange has been the standard color code for high-leg systems for many years, and that there is no requirement in the NEC to identify the "B" phase of all 480 volt delta or wye systems as orange.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-81 Log #1316 NEC-P01 **Final Action: Reject**
(110.16)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Editing to clarify intent

Flash protection . Switchboards, panelboards, industrial control panels, meter socket enclosures and motor control centers that are in other than dwelling occupancies and are likely to ~~require examination, adjustment, servicing, or maintenance~~ be examined, adjusted, serviced, or maintained while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Substantiation: As written, this provision is unenforceable. The phrase "likely to require," when taken literally, would mean to " ***command or insist on*** " working on energized equipment (see "require" in the American Century Dictionary). This would be in direct opposition to the standards put forth by OSHA. In fact, the existence of a remote means of disconnect could be used to argue that the equipment need not be worked on while energized. It is obvious that this is not the true intent of the ***Code*** .

110.16 is very important for maintaining the safety of electrical workers and must be written in enforceable language.

Panel Meeting Action: Reject

Panel Statement: CMP-1 disagrees with the submitter that the section is unenforceable and that the phrase "likely to require" implies "to command or insist on" in the context of the sentence. The word "require" also implies "having a compelling need for". In addition, the NEC Style Manual, Section 3.3.4, requires the use of clear and emphatic language and Section 3.3.5 requires parallel construction with other code sections. CMP-1 agrees with the submitter that Section 110.16 is important for maintaining safety of electrical workers. The panel has concluded that the section is written in enforceable language in accordance with the NEC Style Manual.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

ANTHONY, M.: The submitter's proposed language seems more enforceable because it uses the verb form of examination, adjustment, service and maintenance. This proposal could have been accepted in principle.

1-82 Log #1651 NEC-P01 **Final Action: Accept in Principle**
(110.16)

Submitter: Joe Tedesco, Boston, MA

Recommendation: Revise text to read as follows:

110.16 Flash Protection. Switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Substantiation: Removing the words: "that are in other than dwelling occupancies" makes sense because the hazards exist dwelling occupancies too.

Many dwellings have services that are 400 amperes or more, and some services are located within commercial occupancies where there are stores and dwelling units all served by the same electrical utility system. I believe that this change will be in the best interest of safety. With the warning sign present a qualified person who may be a Home Inspector or NACHI member will be aware of the need for some form of PPE, probably Catagory 2.

Panel Meeting Action: Accept in Principle

Revise text to read as follows:

110.16 Flash Protection. Switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than <u>one- and two-family</u> dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Panel Statement: The panel has revised the proposal to only include one- and two-family dwelling occupancies rather than all dwelling occupancies because one- and two-family dwellings provide a reasonable demarcation for occupancies where arc flash hazards may exist. The panel does not necessarily agree with all of the substantiation of the submitter.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 8 Negative: 3 Abstain: 1

Explanation of Negative:

LABRAKE, JR., N.: This proposal should be rejected. Qualified persons understand that equipment is to be placed in an electrically safe work condition before maintenance is performed. Generally, this can be readily accomplished in dwellings. Unlike some instances in commercial and industrial installations, it is not likely that electrical equipment in dwellings typically operated at less than 300 volts would have to be maintained while energized, and, therefore, do not need to be marked as to arc flash hazards.

MCMAHILL, L.: Although I agree that arc flash hazard exists in dwelling occupancies, I disagree that it exists at the same level as in other than dwelling occupancies. Panelboards and meter sockets in dwelling occupancies are not subject to the same scrutiny as commercial and industrial type occupancies, and the potential arc flash energy is generally less too. Expanding the marking requirement to include dwellings other than one- and two-family is excessive. The marking requirement will apply to all panelboards and meter sockets in multi-family dwellings. This is over restrictive and provides no useful purpose. Flash protection warnings are intended for "qualified persons" working on energized equipment, such as in commercial and industrial type facilities. Adding such marking on dwelling equipment appears to only encourage working on equipment while energized. Equipment in dwelling occupancies should always be deenergized before servicing!

MINICK: NEMA continues to support the position that personnel safety can best be assured when equipment is de-energized before performing any work.

Explanation of Abstention:

FISKE, W.: We are abstaining from voting on Proposals 1-82, 1-83, 1-84, and 1-85, as they relate to field marking of arc flash hazards. There is no role for conformity assessment bodies (i.e., nationally recognized testing laboratories) to play in fulfilling the existing or proposed requirements. As we are not an affected party, Intertek has elected not to take a formal position on the four proposals identified above.

1-83 Log #2220 NEC-P01 **Final Action: Reject**
(110.16)

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:

110.16 Flash Protection. Switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be ~~field~~ marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Substantiation: The requirement that this be a field applied label is left over from the original proposal that called for the label to contain arc flash information that was specific to the installation. Now that only a "generic" warning tag is required there is no reason that it must be field applied. The warning label will have the same effectiveness whether applied in the field or applied by the equipment manufacturer.

Panel Meeting Action: Reject

Panel Statement: The panel concludes that marking of every item may weaken the safety aspects of the marking to warn qualified people where the instances of exposure to arc flash hazards are pronounced. Equipment manufacturers will not know if their equipment will need to be maintained while energized in a particular installation, therefore necessitating field marking. Also, the requirement in 110.16 applies when changes are made to existing equipment.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Abstain: 1

Explanation of Abstention:

FISKE, W.: We are abstaining from voting on Proposals 1-82, 1-83, 1-84, and 1-85, as they relate to field marking of arc flash hazards. There is no role for conformity assessment bodies (i.e., nationally recognized testing laboratories) to play in fulfilling the existing or proposed requirements. As we are not an affected party, Intertek has elected not to take a formal position on the four proposals identified above.

1-84 Log #2338 NEC-P01 **Final Action: Accept**
(110.16)

Submitter: Lanny G. McMahill, Phoenix, AZ
Recommendation: Revise text to read:

<u>Electrical equipment, such as s</u> ~~S~~ witchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked...

Substantiation: Add the words "Electrical equipment, such as" to the sentence. This change eliminates the need to add equipment to the list and correlates with the requirements in 110.26. It also allows the AHJ flexibility in enforcement. As currently worded, there is no marking requirement for a 1600A fusible wall switch.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 1 Abstain: 1

Explanation of Negative:

MINICK: The proposed wording actually makes the section more ambiguous. The submitter proposes the new wording to all the AHJs to make determination as to where the labeling is required. However, there is absolutely no guidance given as to when it might make sense. For example, is a 30A general duty safety switch required to have an arc-flash marking? What about a fractional horsepower manual motor controller? Will AHJs end up extending this requiremnt to snap switches, wireways, etc.? This is a case where the laundry list of equipment might actually make sense.

Explanation of Abstention:

FISKE, W.: We are abstaining from voting on Proposals 1-82, 1-83, 1-84, and 1-85, as they relate to field marking of arc flash hazards. There is no role for conformity assessment bodies (i.e., nationally recognized testing laboratories) to play in fulfilling the existing or proposed requirements. As we are not an affected party, Intertek has elected not to take a formal position on the four proposals identified above.

1-85 Log #2672 NEC-P01 **Final Action: Reject**
(110.16)

Submitter: C. E. Gibson, III, Lawson Electric Company Inc.
Recommendation: Revise to read as follows:

Switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. <u>The marking shall indicate the incident energy, the flash protection boundary, and the shock protection boundaries</u> . The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Substantiation: I am the Safety Director for a large contractor and a proud member of the National Electrical Contractors Association. We, like all contractors, are committed to providing a safe workplace for the employees. Toward that end, we have found it imperative to have labels installed on electrical equpment indicating the incident energy, the flash protection boundary, and the shock protection boundaries. The simple fact that 110.16 exists assures me that the hazards of arc flash are well understood by the committee acting on this proposal.

While we are committed to having our employees place equipment in an electrically safe work condition before they work on or near it, we understand that even tasks such as voltage testing and placing equipment in an electrically safe work conditon is energized work. Therefore, there is no escaping the fact that workers are being exposed to the hazards of working on or near exposed energized parts. I offer Annex K of the 2004 edition of NFPA 70E as evidence and substantiation that recognized hazards exist when workers are working on or near exposed energized parts.

There is no better time than when the electrical equipment is installed to know key information necessary to determine incident energy, the flash protection boundary, and the shock protection boundaries.

The shock protection boundaries are fairly straightforward. These are based on voltage and a qualified peson should have no trouble determning that and determining the associated boundaries.

Both the incident energy and flash protection boundry require available fault current and clearing time. 110.9 and 110.10 of the NEC already require knowledge of the available fault current. Electrical inspectors are already requried to be sure these requirements are being complied with. This is certainly not new information or a new requirement. Clearing time is another piece of information that an overcurrent protective device manufacturer has readily available. This is not being applied retroactively, so we do not have to worry obtaining this information for Zinsco breakers.

While some may argue that using different calculation methods will give different results, there is no question that flash protection boundaries and incident energy calculations are beng done today. A few calculaton methods that come to mind are IEEE 1584, Easy Power, and SKM. All widely used and readily available. Major manufacturers of overcurrent protective devices such as Bussmann and Square D offer this service as part of the business. These are well respected members of the National Electrical Manufacturers Associaiton. If they are doing these calclations, then it is clear that it can be done. Even if the Tables of NFPA 70E were to be used to protect workers, the avalable fault current and clearing time needs to be known to use those tables.

The bottom line is that workers need to be protected. OSHA requires workers to be protected from recognized hazards. Even if it is to place equipment in an electrically safe work condition. An employer needs to know the incident energy, the flash protection boundary, and the shock protection boundaries to accomplish this. Is it better to have that informtion put on a label on equipment when it is installed and all the required information is readily avalaible on deenergized equpment so that is clearly visible to a qualified worker approaching the equpment before they work on it, or should we expect qualified persons to try to find wire size and length, type of conduit, and clearing time on energized equpment when that information is not necessarily readily available and workers are put at increased exposure to obtain that information?

Clearly labels would need to be updated when anyone makes changes to the system. That will ensure that the label reflects the latest information. If facilities or contractors do not want to, or are not able to, there are well respected companies such as Bussmann and Square D that are quite capable. That is part of their business.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: It may be misleading to mark equipment with the incident energy available at the time of installation. Electrical system configurations and parameters are subject to change on both the supply system and the premises wiring resulting in varying incident energy levels at a work location at a given time. Safety dictates that the determination of incident energy must be made prior to performing the work at the time the equipment is energized. The panel concludes that shock protection boundaries are outside the scope of this section. FPNs 1 and No. 2 provide information where to find these work practices.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 1 Abstain: 2

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-85. Our explanation is as follows:

This proposal should have been accepted. Accepting this Proposal will, in our opinion, greatly enhance electrical safety. Knowledge of the available short-circuit current is absolutely necessary for proper compliance with 110.9 and 110.10. We feel that the submitter's proposal is a reasonable recommendation. We recognize that the actual fault current is not fixed. The industry simply cannot continue to hide behind this argument and not help protect inspectors, electricians, and others who install and maintain electrical equipment. It is reasonable to mark equipment with values that are present at the time of installation.

As an alternative, since key components to determining the incident energy are overcurrent device clearing time and available fault current, we suggest the submitter's proposal be modified to include the following:

Switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall indicate the incident energy, the flash protection boundary, the location, type, size or setting of the upstream overcurrent protective device, and the shock protection boundaries. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Explanation of Abstention:

ANTHONY, M.: Because arc-flash has been a controversial issue our interest group will abstain--as it did in the 2002 and 2005 code cycles--in order to keep the door open for more discussion. It is plain that good minds disagree on this. Nothing has changed since I last observed that our membership appears divided in its opinion about the practical effect of this proposal. Workgroups within the higher education facilities industry seem to divide along the same lines as the interest groups within CMP-1 itself.

In the 2005 cycle incident energy proposals were not adopted because of the abstention from our industry. The 2005 vote was 7 FOR, 4 AGAINST, with APPA's 1 ABSENTION resulting in failure to adopt the incident energy proposals. (8 votes are needed to change the NEC on CMP-1) Our abstention was based upon the belief that our industry needed more time to grasp the implications of the incident energy proposals.

Now the straw voting at the CMP-1 2008 ROP indicates substantially weakened support for an incident energy marking on arc flash labels. What has happened in the three years since? We look forward to comment from other industries and from the public.

FISKE, W.: We are abstaining from voting on Proposals 1-82, 1-83, 1-84, and 1-85, as they relate to field marking of arc flash hazards. There is no role for conformity assessment bodies (i.e., nationally recognized testing laboratories) to play in fulfilling the existing or proposed requirements. As we are not an affected party, Intertek has elected not to take a formal position on the four proposals identified above.

Comment on Affirmative:

FLOYD, II, H.: I am in support of the concept of providing more information to people who are at risk of exposure to arc flash hazards, however, there are other approaches that may be more useful in that they are less dependent on variations in available short circuit current. For example, if the label were to indicate the performance rating of personal protective equipment required, it could be specified to cover anticipated variations in the available short circuit current.

1-86 Log #2839 NEC-P01 **Final Action: Reject**
(110.16)

Submitter: Tracy Missey, Midlothian, VA

Recommendation: Revise 110.16 to read as follows:

110.16 Flash Protection. ~~Switch boards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are~~ Equipment , in other than dwelling occupancies ~~and are~~ that is likely to require examination, adjustment, servicing, or maintaining while energized shall be field marked to warn ~~qualified persons~~ of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment. The marking shall include (1) the available short-circuit current in amperes and, (2) the available arc-flash energy in calories per centimeter squared (cal/cm 2).

The FPNs remain unchanged.

Substantiation: (1) The phrase "Switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers" was replaced with "equipment" as suggested by Comment 1-224 in the ROC stage of the 2005 NEC in the comment by Lanny McMahill.

(2) The phrase "qualified persons" was deleted because it is not only qualified persons that need to be warned. Unqualified persons also need to be warned, even if they should not be in the energized equipment.

(3) The final sentence was added to be in agreement with Proposal 1-172a from the ROP for the 2005 NEC.

(4) The "available short-circuit current" was added to be in agreement with ROC 1-220 as submitted by Mark Miller. The available short-circuit current is a necessity, whether calculating the arc-flash energy or using the tables in 70E to determine the weight of PPE to wear.

(5) There is no need to tell the user how to calculate the arc-flash energy, just as there is no need to tell the user how to calculate the available short-circuit current.

Panel Meeting Action: Reject

Panel Statement: See panel actions on Proposals 1-84 and 1-85 and panel statement on 1-85.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-86. This proposal should have been accepted. See our Explanation of Negative on Proposal 1-85.

1-87 Log #2890 NEC-P01 **Final Action: Accept in Principle**
(110.16)

Submitter: B. Wiltse, Mandeville, LA

Recommendation: Revise the list in 110.16 by adding bus plugs, enclosed disconnect switches, enclosed circuit breakers, and transfer switches, as follows:

110.16 Flash Protection. Switchboards, panelboards, industrial control panels, meter socket enclosures, bus plugs, enclosed disconnect switches, enclosed circuit breakers, transfer switches , and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards.

The second sentence and the FPNs are to remain unchanged.

Substantiation: Additional equipment should be added to the list as pointed out by Mr. McMahill in the ROP stage for the 2005 NEC. (See proposal 1-172a from the 2005 NEC cycle).

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 1-84. The types of equipment recommended by the submitter are covered by the new wording on Proposal 1-84.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-88 Log #2325 NEC-P01 **Final Action: Reject**
(110.16, FPN (New))

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.

Recommendation: Add a new FPN to read:

FPN: Listed Arc-resistant switchgear is designed and tested to withstand the effects of an internal arcing fault. See IEEE C37.20.7 for description and details of testing.

Substantiation: Arc flash hazard to the operating personnel requires mitigation to protect personnel from arc flash hazards such as thermal, shrapnel due to blast, and pressure wave caused by the internal arcing. Switchgear designed and tested per IEEE C37.20.1 and 20.2 is tested under bolted fault conditions and not for effects of internal arcing faults. Switchgear designed and tested per IEEE C37.20.7 is tested to withstand effects of internal arcing faults in addition to the bolted fault conditions.

Panel Meeting Action: Reject

Panel Statement: The proposed FPN is not explanatory information to the marking requirement contained in 110.16.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-88. This proposal should have been accepted. We feel that the proposal is related to arc flash hazard. A FPN referring users of the NEC to IEEE C37.20.7 for description and details of testing of listed arc-resistant switchgear designed and tested to withstand the effects of an internal arcing faults is appropriate. It would improve awareness of this type of equipment and likely reduce damage to equipment and property and enhance worker safety.

Comment on Affirmative:

FLOYD, II, H.: The application of Arc Resistant Switchgear in US markets has grown over the past decade, to the point that all major manufacturers now offer this design. Experience in installations in the US and longer-term experience in other global regions demonstrate that arc resistant designs can reduce the frequency of personnel exposure to hazardous arcing faults. While I support the concept of recognizing this type of equipment in the NEC, I agree with the panel action for rejection.

1-89 Log #2137 NEC-P01 **Final Action: Reject**
(110.17)

Submitter: Russell LeBlanc, Peterson School of Engineering

Recommendation: Add new text to read:

The working space area described in 110.26(A) or 110.34(A) shall contain a warning sign mounted on or adjacent to the equipment requiring working space. The sign shall be clearly legible and contain the following:

WARNING! Working space is required for this electrical equipment. Clear space shall be maintained for a minimum of Depth Width Height

Substantiation: Obstructed working spaces place the lives of electrical workers in jeopardy. It can also hinder emergency personnel from quickly reaching disconnecting means when the power needs to be turned off or on in an emergency situation. This is much more than an enforcement issue. This is a serious safety concern when an emergency happens and equipment needs to be reached quickly. See photos which I have provided.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Requiring a warning sign on or adjacent to the working space may not prevent infringement on such space. Such a requirement is overly restrictive, as the marking would apply to all items in the list. The proposed language is vague and unenforceable. See the NEC Style Manual, Section 3.2.1.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-90 Log #3664 NEC-P01 **Final Action: Reject**
(110.17)

Submitter: Wayne Clevenger, Durham City/ County Inspections
Recommendation: New 110.17
Marking of Meterbases and CI cabinets
All meterbase and/or CI cabinets shall be field marked after insulation to reflect voltage rating for application which applied. Marking shall be clearly and legible marked on face of enclosure.
Substantiation: Being utility company sub out much of the work in our area. After approving a job recently for a 120/208 application - utility company connected 277/180v and you can guess the rest. This could be avoided in the future with this section.
Panel Meeting Action: Reject
Panel Statement: This proposal addresses a local work method issue not related to the Code requirements according to 90.1(C).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-90. Our explanation is as follows:
This proposal should have been accepted. The submitter has reported a safety issue and offered a reasonable method to help prevent future incidents of this nature. We recognize that this recommendation to mark all meterbases would require marking of meterbases covered under the scope of the NEC, including those installed on the load side of service equipment.

1-91 Log #182 NEC-P01 **Final Action: Accept in Principle**
(110.20)

NOTE: The following proposal consists of Comment 1-229 on Proposal 1-157 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-157 was:
Move the existing text and table from Section 430.91 to a new Section 110.12 with editorial modifications as follows:
110.12 Enclosure Types.
Table 110.12 provides the basis for selecting enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings. These internal conditions shall require special consideration by the installer and user.
Equipment identified only as "dry locations," "Type 1," or "indoor use only" shall be protected against permanent damage from the weather during building construction.
Submitter: J. Philip Simmons, Simmons Electrical Services / Rep. National Armored Cable Manufacturers Association
Recommendation: Revise 110.20 from the 2005 NEC ROP Draft as follows:
110.20 Enclosure Types. Table 110.20 provides the basis for selecting enclosures for use in specific locations other than hazardous (classified) locations for the following equipment:
(1) Power distribution and control equipment enclosures such as cabinets and cutout boxes
(2) enclosed panelboards and switches
(3) meter sockets
(4) enclosed circuit breakers or switches
(5) industrial control equipment
(6) motor controllers.
The enclosures are not intended to protect against conditions, such as

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Table 110.12 Enclosure Selection

For Outdoor Use

Provides a Degree of Protection Against the Following Environmental Conditions	**Enclosure Type Number[1]**									
	3	**3R**	**3S**	**3X**	**3RX**	**3SX**	**4**	**4X**	**6**	**6P**
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Rain, snow, and sleet	X	X	X	X	X	X	X	X	X	X
Sleet2	—	—	X	—	—	X	—	—	—	—
Windblown dust	X	—	X	X	—	X	X	X	X	X
Hosedown	—	—	—	—	—	—	X	X	X	X
Corrosive agents	—	—	—	X	X	X	—	X	—	X
Temporary submersion	—	—	—	—	—	—	—	—	X	X
Prolonged submersion	—	—	—	—	—	—	—	—	—	X

For Indoor Use

Provides a Degree of Protection Against the Following Environmental Conditions	**Enclosure Type Number[1]**									
	1	**2**	**4**	**4X**	**5**	**6**	**6P**	**12**	**12K**	**13**
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	—	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings	—	—	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings	—	—	X	X	X	X	X	X	X	X
Hosedown and splashing water	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	X
Corrosive agents	—	—	—	X	—	—	X	—	—	—
Temporary submersion	—	—	—	—	—	X	X	—	—	—
Prolonged submersion	—	—	—	—	—	—	X	—	—	—

[1]Enclosure type number shall be marked on the motor controller enclosure.
[2]Mechanism shall be operable when ice covered.

Renumber the existing Section 110.12 and following sections.

condensation, icing, corrosion, or contamination, that may occur within the enclosure or enter via the conduit or unsealed openings. These internal conditions shall require special consideration by the installer and user.

Equipment identified only as "dry locations," "Type 1," or "indoor use only" shall be protected against permanent damage from the weather during building construction.

Change footnote Number 1 below the table to read:

1 Enclosure type number shall be marked on the ~~motor controller~~ enclosure.

Substantiation: This Comment intends to clarify the application of Table 110.20 as contained in the substantiation for the Proposal that was accepted by CMP-1. Several previous editions of the NEC have located the Table as Table 430.91 where it applied to only motor controllers. UL has had similar requirements for many years for other types of equipment in the White or Green Directories in Electrical Equipment for Use in Ordinary Locations (AALZ). Other equipment categories in the UL directories contain similar requirements.

It makes sense to locate this Table in Article 110 so it clearly has application to all types of distribution and control equipment

Panel Meeting Action: Accept in Principle

Panel Statement: The panel concludes that the action taken on Proposal 1-95 addresses the submitter's concerns.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-92 Log #183 NEC-P01 **Final Action: Accept in Principle**
(110.20)

NOTE: The following proposal consists of Comment 1-230 on Proposal 1-152 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-152 was:

Move the last paragraph of 110.11 to new Section 110.12 as follows:

110.11 Deteriorating Agents.

Unless identified for use in the operating environment, no conductors or equipment shall be located in damp or wet locations; where exposed to gases, fumes, vapors, liquids, or other agents that have a deteriorating effect on the conductors or equipment; or where exposed to excessive temperatures.

FPN No. 1: See 300.6 for protection against corrosion.

FPN No. 2: Some cleaning and lubricating compounds can cause severe deterioration of many plastic materials used for insulating and structural applications in equipment.

~~**Equipment identified only as "dry locations," "Type 1," or "indoor use only" shall be protected against permanent damage from the weather during building construction.**~~

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Revise the proposed 110.20 to read as follows:

110.20 Enclosure Types. Enclosures (other than surrounding fences or walls) of all switchboards, panelboards, industrial control panels, meter sockets, motor control centers, enclosed switches, enclosed circuit breakers, transformers, and motor controllers, rated not over 600 volts nominal intended for such locations shall be marked with a Type number as shown in Table 110.20.

Table 110.20 provides the basis for selecting the above enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings. ~~These internal conditions shall require special consideration by the installer and user.~~

Equipment not identified for outdoor use and equipment identified only for indoor use, such as "dry locations" "Types 1 , 2, 5, 12, 12K, or 13 ," or "indoor use only" shall be protected against permanent damage from the weather during building construction.

Proposed Table 110.20 to be placed here

(Table 110.20 to be the same as existing 430.91, with the following modifications:

- Change title to "Enclosure Selection"
- Delete footnote 1
- Renumber footnote 2 as footnote 1)

Substantiation: Rationale for changes:

The proposal is a good start, but needs some additional modifications to make it acceptable as a general rule in the NEC. The following revisions are recommended:

1. The last sentence of the first paragraph is proposed to be deleted because it "requires" an action that is not specified or enforceable by the AHJ.
2. A new second paragraph is recommended that will limit the application of the table to specific equipment. Inserting the requirement into 110 without some limitation will result in it being applied to equipment that is not required to carry a Type number. There are many categories of equipment which use generic markings - Outdoor, Damp Locations, Rainproof, Raintight, Waterproof, etc. - instead of Types. All of the equipment included in this new paragraph is presently required by their respective product standards to be marked with Type numbers corresponding to the proposed table.
3. The words "other than surrounding fences and walls" are proposed because the NEC definition of enclosure includes the use of fences and walls, which are clearly not intended to be covered by the proposed table.
4. The third paragraph comes from Proposal 1-152. The revision is to make it more inclusive of other enclosures which need protection.
5. The table itself would need to be changed only in title and through deletion of footnote 1, which is now covered by the new second paragraph.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel concludes that the action taken on Proposals 1-61 and 1-95 addresses the submitter's concerns.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-93 Log #184 NEC-P01 **Final Action: Accept in Principle**
(110.20)

NOTE: The following proposal consists of Comment 1-231 on Proposal 1-157 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 1-92 (Log #182)]

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Revise the proposed 110.20 to read as follows:

110.20 Enclosure Types. Enclosures (other than surrounding fences or walls) of all switchboards, panelboards, industrial control panels, meter sockets, motor control centers, enclosed switches, enclosed circuit breakers, transformers, and motor controllers, rated not over 600 volts nominal intended for such locations shall be marked with a Type number as shown in Table 110.20.

Table 110.20 provides the basis for selecting the above enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings. ~~These internal conditions shall require special consideration by the installer and user.~~

Equipment not identified for outdoor use and equipment identified only for indoor use, such as "dry locations", "Types 1 , 2, 5, 12, 12K, or 13 ," or "indoor use only" shall be protected against permanent damage from the weather during building construction.

Proposed Table 110.20 to be placed here

(Table 110.20 to be the same as existing 430.91, with the following modifications:

- Change title to "Enclosure Selection"
- Delete footnote 1
- Renumber footnote 2 as footnote 1)

Substantiation: Rationale for changes:

The proposal is a good start, but needs some additional modifications to make it acceptable as a general rule in the NEC. The following revisions are recommended:

1. The last sentence of the first paragraph is proposed to be deleted because it "requires" an action that is not specified or enforceable by the AHJ.
2. A new second paragraph is recommended that will limit the application of the table to specific equipment. Inserting the requirement into 110 without some limitation will result in it being applied to equipment that is not required to carry a Type number. There are many categories of equipment which use generic markings - Outdoor, Damp Locations, Rainproof, Raintight, Waterproof, etc. - instead of Types. All of the equipment included in this new paragraph is presently required by their respective product standards to be marked with Type numbers corresponding to the proposed table.
3. The words "other than surrounding fences and walls" are proposed because the NEC definition of enclosure includes the use of fences and walls, which are clearly not intended to be covered by the proposed table.
4. The third paragraph comes from Proposal 1-152. The revision is to make it more inclusive of other enclosures which need protection.
5. The table itself would need to be changed only in title and through deletion of footnote 1, which is now covered by the new second paragraph.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel concludes that the action taken on Proposal 1-95 addresses the submitter's concerns.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-94 Log #185 NEC-P01 **Final Action: Accept in Principle**
(110.20 (New))

NOTE: The following proposal consists of Comment 1-233 on Proposal 1-157 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 1-92 (Log #182)]

Submitter: Timothy M. Croushore, Allegheny Power

Recommendation: The proposal should be accepted in principle. Locate the table as a new Table 3, with the same title and footnotes, in Chapter 9. To accomplish this, perform the following additional actions:

1. Delete the phrase "motor controller" from Footnote 1. Locate the first paragraph of text accepted in the ROP as 110.20 below the table in Chapter 9, editorially revised as follows, and then include the fine print note accepted by CMP11 in the action on Proposal 11-61 immediately thereafter.

Table 3 ~~110.20~~ provides the basis for selecting enclosures for ~~use~~ certain equipment for which specific protection from various environmental conditions is required in other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings. ~~These internal conditions shall require special consideration by the installer and user.~~

FPN: The term raintight is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 6, 6P. The term rainproof is typically used in conjunction with Enclosure Type 3R, 3RX. The term watertight is typically used in conjunction with Enclosure Types 4, 4X, 6, 6P. The term driptight is typically used in conjunction with Enclosure Types 2, 5, 12, 12K, and 13. The term dusttight is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 5, 12, 12K, 13.

2. Do not create section 110.20 as proposed. Delete the second paragraph of 110.11, as indicated in Proposal 1-152. Create a new 110.28 worded as follows:

110.28 Enclosure Types, Not Over 600 Volts, Nominal. Enclosures of all switchboards, panelboards, industrial control panels, meter sockets, motor control centers, enclosed switches, enclosed circuit breakers, transformers, motor controllers, and other equipment enclosures required to be identified as being suitable for the specific environmental conditions that apply at their location, shall be marked with a type number marked on the enclosure by their manufacturer in accordance with Table 3 in Chapter 9.

Equipment not identified for outdoor use and equipment identified only for indoor use, such as "dry locations", "Types 1, 2, 5, 12, 12K, or 13," or "indoor use only" shall be protected against permanent damage from the weather during building construction.

3. Revise 430.91 to read as follows: "Motor controller enclosures shall be suitable for the specific environmental conditions that apply at their location, as evidenced by an enclosure type number marked on the controller."

FPN: See Table 3 in Chapter 9 for standard enclosure types.

4. Delete Table 430.91.

5. Revise the "Notes to Tables" located after Chapter 9, Table 1 to read: "Notes to Tables 1, 4, 5, and 5A".

Substantiation: This proposal was forwarded to CMP-9 for information and/or comment. The task group responding is comprised of Fred Hartwell, Tim Croushore, Robert Osborne, Jim Carroll, and Hector de Vega.

CMP-9 agrees that making this table available for reference by other code articles is wise, however, CMP-9 also agrees with the comments in the voting that enclosure type designations are not appropriate for many instances of installed equipment. For example, there is no need to require 4 in. sq. boxes on a cinder block interior wall of a store to be marked NEMA 1 or the equivalent. The solution is to place the table in Chapter 9, with the operational text modified to say, "for which specific protection from various environmental conditions is required". This wording allows the various code making panels to decide whether to implicitly (or explicitly) reference the new table in the future. The fifth action suggested in this comment corrects an error in the present Chapter 9 table notes that will only be exacerbated by the inclusion of the new Table 2 in this cycle (Proposal 8-24a).

The present enclosures required to have this designation then go into Article 110 as provided in this comment. Note that this list does not mention surrounding walls or fences because of the wording in this comment that clarifies that Type numbers are to be marked by their manufacturer. The location in Article 110 suggested in this comment differs from the initial CMP-1 action because these Type numbers only apply at 600 Volts and below, and therefore the requirement must be located in Part II of the article. The last sentence of the corresponding paragraph in the ROP is proposed to be deleted because it "requires" an action that is not specified or enforceable by the AHJ.

The principal reason to place this table in Chapter 9 is that it is immune from the Chapter 5 modification provisions of 90.3. This will then allow the inclusion of NEMA 7, 8, and 9 enclosures in a future code cycle, providing a single location for all the enclosure types, which would be very useful for code users. In fact, this location could also include IEC ingress protection tables as well.

CMP-9 understands that this comment crosses panel jurisdictional boundaries and for that reason will require action by the TCC. CMP-9 has made every effort to keep the subjects of this comment within the scope of material that has had public review, in the hope that this can be completed in this cycle. In terms of public review, CMP-9 notes that the exact wording of Proposal 1-157 is to "move" the text and table from 430.91, and not to "copy" it from that location. However, CMP-9 also understands that this comment may introduce sufficient complexity and need for review by other panels that the comment and underlying proposal may require a report as "hold" as allowed by 4-4.6.2.2(c) of the Regulations Governing Committee Projects.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel concludes that the action taken on Proposal 1-95 addresses the submitter's concerns.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-95 Log #1980 NEC-P01 **Final Action: Accept**
(110.20 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 11 for comment.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Add new section as follows:

110.20 Enclosure Types. Enclosures (other than surrounding fences or walls) of switchboards, panelboards, industrial control panels, motor control centers, meter sockets, and motor controllers, rated not over 600 volts nominal and intended for such locations, shall be marked with an Enclosure Type number as shown in Table 110.20.

(Table 110.20 is shown on the following page)

Table 110.20 provides the basis for selecting the above enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings.

Substantiation: This proposal is made as a part of a suggestion for dealing with Comments that were HELD during the 2005 cycle. Four Comments (1-229, 1-230, 1-231, and 1-233) on Proposal 1-157 were held, with the Panel Statement on the other three referring back to the Panel Action and Statement on 1-231. This proposal builds upon Proposals 1-152 and 1-157 of the 2005 cycle, and is essentially the same as Comment 1-231.

Due to lack of any other guidance within the Code, Table 430.91 has been applied to enclosures for numerous kinds of equipment, even though it is stated as applying only to motor controller enclosures. This has resulted in considerable confusion. Bringing the requirements of 430.91 into a general application area of the Code and specifically stating the kinds of equipment to which they apply will add clarity. The equipment types in the list all are required, by existing industry standards, to use a Type number marking.

Companion proposals proposed deleting 430.91 and Table 430.91 and modifying 110.10.

Panel Meeting Action: Accept

Panel Statement: The panel recommends to the TCC that the action taken on proposal 1-95 be forwarded to CMP-11.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

MCMAHILL, L.: I concur with the panel action on this proposal; however, I have a minor concern: Will the manufacturers be up to speed with the marking requirement for Type 1 enclosures for the 2008 NEC? If not, then I encourage the panel to review the code language as the list of items requiring marking includes control panels, panelboards and meter sockets. Requiring these items to be marked as Type 1 enclosures and the manufacturers are unable to provide such equipment places an unreasonable burden on designers, installers and code enforcement officials! At the minimum, CMP-1 should request assurance from the manufactures and testing labs that they can meet this requirement; if not, it would behoove CMP-1 to remove Type 1 enclosures from the Table.

Table 110.20 Enclosure Selection

For Outdoor Use

Provides a Degree of Protection Against the Following Environmental Conditions	Enclosure Type Number									
	3	3R	3S	3X	3RX	3SX	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Rain, snow, and sleet	X	X	X	X	X	X	X	X	X	X
Sleet[1]	—	—	X	—	—	X	—	—	—	—
Windblown dust	X	—	X	X	—	X	X	X	X	X
Hosedown	—	—	—	—	—	—	X	X	X	X
Corrosive agents	—	—	—	X	X	X	—	X	—	X
Temporary submersion	—	—	—	—	—	—	—	—	X	X
Prolonged submersion	—	—	—	—	—	—	—	—	—	X

For Indoor Use

Provides a Degree of Protection Against the Following Environmental Conditions	Enclosure Type Number									
	1	2	4	4X	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	—	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings	—	—	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings	—	—	X	X	X	X	X	X	X	X
Hosedown and splashing water	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	X
Corrosive agents				X			X			

1-96 Log #137 NEC-P01 **Final Action: Reject**
(110.21(A) (New))

Submitter: Donald Weis, Weis Electric Inc.
Recommendation: Add new text to read:
(A) All disconnects, panelboards, load centers, control panels, meter mains, any electrical enclosure that may require any adjustment, service, reset will be marked:
[Warning minimum 3 ft clearance required per NEC Code]

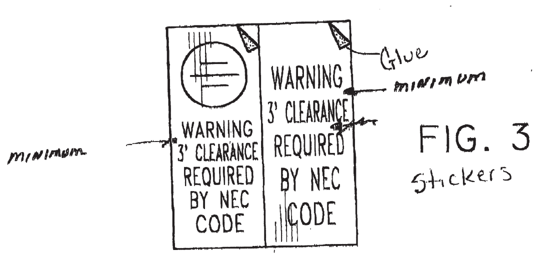


FIG. 3
Stickers

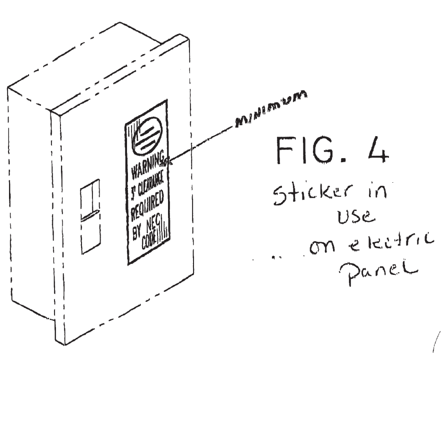


FIG. 4
sticker in use on electric panel

Substantiation: We have many problems, where homeowners or landscapers, will build a wall, fence, in front of a panel or control box or disconnect. I myself have been shocked, and had no where to jump back. When the person is informed of the 3 ft clearance code, they say, they wish they would have known this. This simple signage could prevent costly mistakes and even death.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that such marking would be of little benefit or act as a deterrent to unqualified persons and that qualified persons should be aware of the required spaces about electrical equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-96. Our explanation is as follows:
We do not necessarily agree with all of the panel statement. For example, we disagree that "…such marking would be of little benefit…." We feel the proposed marking would serve as a deterrent to unqualified persons and an important reminder to qualified persons. This point was further substantiated by Chairman Minnick during the deliberations on this issue. My notes indicate that he had personal experience as an inspector with having to require this type of marking in areas where there were repeated violations, and found these markings to be effective remedy.

1-97 Log #564 NEC-P01 **Final Action: Reject**
(110.22)

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise as follows:
Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved.
Where circuit breakers or fuses are applied in compliance with the series combination ratings marked on the equipment by the manufacturer, the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating.
CAUTION – SERIES COMBINATION RATED SYSTEM ~~RATED~~ ——— AMPERES AVAILABLE
IDENTIFIED REPLACEMENT COMPONENTS REQUIRED.
SYSTEM RATED / K .
FPN No. 1: Amperes available is actual fault current at line side terminals (22,300) and System Rated is the series combination rating (10/65K)
FPN No. 2: See 240.86(B) for interrupting rating marking for end-use equipment.

When the series combination rated line side overcurrent device is remotely located from the load side circuit breaker(s), identification of the line side series combination rated device shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating and shall indicate its series rating and replacement type.

CAUTION – SERIES COMBINATION RATED SYSTEM REPLACE WITH:

TYPE BREAKER

TYPE FUSE

Substantiation: By marking the actual fault current on the end use equipment, this would identify what the minimum AIC rating of the circuit breaker(s) that may be installed and considered fully rated.

By requiring the field marking at the line side device of a remotely located series rated combination, this will identify this device as part of a series rated combination. As currently allowed by the NEC, the series rated load side device may be compromised by replacement of the line side series rated device with a device not identified as compatible with the series rated combination.

This will also add clarity to 110.22 "...the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating." I would consider the term enclosure(s) with the (s) to mean where the line side overcurrent device is located remotely from the load side device; both enclosures shall be marked and readily visible. This clarity is needed to limit the confusion and promote consistency within the electrical inspection and installation communities.

Panel Meeting Action: Reject

Panel Statement: The actual fault current at an installation is a variable and must be determined with knowledge of the system parameters (including those of the utility supply system) at any given time. Marking of the equipment with "actual" fault current would be misleading.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-97. Our explanation is as follows:

This proposal should have been accepted. Accepting this Proposal will, in our opinion, greatly enhance electrical safety. We feel that the submitter's proposal is a reasonable recommendation. Knowledge of the available short circuit current at the equipment location is a key component of an installation for both fully rated and series rated systems alike. It makes good sense to have the marking indicate amperes available as the submitter suggests.

We strongly disagree with the Panel Statement. We feel that the statement "marking of the equipment with "actual" fault current would be misleading" is simply not true. Clearly, the actual fault current is not static. However, if the intent of this panel statement is to convey to those that who look to the written record for guidance of what a Code Panel meant when it wrote a rule, then this panel statement could be sending a message that evaluating series combination systems and determining motor contribution is not achievable. The industry simply cannot continue to hide behind this argument and not help protect inspectors, electricians, and others who count on this Code for the practical safeguarding of persons and property from hazards arising from the use of electricity.

We additionally offer the following as revised text to that of the submitter: Equipment shall be marked with the location, type, size or setting of the upstream overcurrent protective device.

MCMAHILL, L.: This proposal should have been accept in principle. For equipment with series combination ratings, I agree with the concept that marking the available short circuit current on the end use equipment will assist the NEC user in identifying the appropriate circuit-breaker(s) for installation and use. Whether the system is series or fully rated, knowing what the available short circuit current is at the equipment location is important in ensuring a safe and code compliant installation. Without this information, how does one meet the minimum code requirements of Sections 110.9 and 10? I disagree with the submitter's statement that Section 110.22 "As currently allowed by the NEC, the series rated load side device may be compromised by replacement of the line side series rated device with a device not identified as compatible with the series rated combination." Section 110.22 clearly requires that "... equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating." Although I agree with the marking concept, I disagree with adding the rule to Section 110.22. Section 110.22 is specific to series combination ratings. A marking requirement for available short circuit current is appropriate for Section 110.9 – Interrupting Rating, and consideration should be given to Section 110.10 – Circuit Impedance and Other Characteristics. Both sections require this information to meet minimum code requirements. Most importantly, this information is necessary to determine that the circuit-protective devices will clear a fault without extensive damage to the electrical components of the circuit. I encourage CMP-1 to reconsider Proposal 1-59 to address the concerns of this proposal and this author. See my comments to Proposal 1-59 (Log 568), as they apply here too.

1-98 Log #1978 NEC-P01 **Final Action: Accept**
(110.22)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for comment.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: In the following section, insert additional text as follows:

110.22 Identification of Disconnecting Means. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved.

Where circuit breakers or fuses are applied in compliance with series combination ratings selected under engineering supervision and marked on the equipment as directed by the engineer, the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. The marking shall be readily visible and state the following:

CAUTION — ENGINEERED SERIES COMBINATION
SYSTEM RATED ________ AMPERES. IDENTIFIED
REPLACEMENT COMPONENTS REQUIRED.

FPN: See 240.86(A) for interrupting rating marking for end-use equipment.

Where circuit breakers or fuses are applied in compliance with the series combination ratings marked on the equipment by the manufacturer, the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. The marking shall be readily visible and state the following:

CAUTION — SERIES COMBINATION SYSTEM
RATED ____ AMPERES. IDENTIFIED
REPLACEMENT COMPONENTS REQUIRED.

FPN: See 240.86(B) for interrupting rating marking for end-use equipment.

Substantiation: CMP 10 made a change in 240.86 in the 2005 NEC allowing Engineered Series Ratings. This change is to coordinate the requirements in 110.22 with that change. As currently worded, 110.22 does not require this cautionary marking if there is an engineered series rating.

Panel Meeting Action: Accept

Panel Statement: The panel recommends that the TCC forward this proposal to CMP-10 for comment.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-99 Log #691 NEC-P01 **Final Action: Reject**
(110.26)

Submitter: Timothy Schultheis, H.F.Lenz Company

Recommendation: Revise as follows:

110.26 Spaces About Electrical Equipment. Sufficient access and working space shall be provided and maintained about all electrical equipment to permit ready and safe operations and maintenance of such equipment. Enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered accessible to qualified persons. Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress, or while open, not interfering with working spaces .

Substantiation: Please see the diagrams that I have provided.

Note: Supporting Material is available for review at NFPA headquarters.

Panel Meeting Action: Reject

Panel Statement: Section 110.26 is a general statement regarding working spaces about electrical equipment. There is no mention in this section of an entrance, so the proposed language would be out of place in the paragraph. CMP-1 refers the submitter to NEC Section 110.26(C)(1) as it requires at least one entrance to working space. Additionally, the proposed language currently exists in Section 110.26(C)(2) for large equipment and repeating the text would cause confusion and conflict. CMP-1 appreciates the diagrams submitted and understands the concerns, but notes that the scenarios presented are work practice issues too. Adding specific requirements to all entrances to working spaces will not prevent poor work practices.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-100 Log #2934 NEC-P01 **Final Action: Reject**
(110.26)

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Delete the last sentence of existing 110.26 as follows:

110.26 Spaces About Electrical Equipment. Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment. ~~Enclosures housing electrical apparatus that are controlled by lock and key shall be considered accessible to qualified persons.~~

Substantiation: This is a companion proposal to add the sentence proposed for deletion here to 230.92 and 240.24(B) where this rule should appropriately be located.

110.26 deals with access to working space about electrical equipment and does not apply to access to the equipment itself.

230.92 covers locked service overcurrent devices and requires additional overcurrent devices where the service disconnecting means is (are) locked. 240.24(B) requires that each occupant have ready access to all overcurrent devices protecting conductors supplying that occupancy. These sections need the sentence identified for deletion above to be added for improved organization of the Code.

Many locations come to mind where electrical equipment is locked to prevent unauthorized access. These include schools, colleges, health care facilities, airport terminals and office buildings that are open to the public. These buildings often have either panelboards with locking covers or electrical equipment located in locked rooms. Electrical inspectors recognize the security that is needed in these and other facilities. Locating this rule with the sections that cover locks on equipment will improve the usability of the Code.

Panel Meeting Action: Reject

Panel Statement: The panel concludes that it does no harm to retain the sentence in 110.26 whether similar language is added to Articles 230 and 240 or not.

Access to electrical equipment within enclosures as defined is of primary importance to the requirements in 110.26. The panel disagrees with the submitter's premise that the current requirements regarding enclosures housing electrical apparatus that are controlled by a lock(s) only apply to the equipment itself.

Proposals 1-45, 1-46, and 1-50, for the 1999 cycle to add a fine print note to the definition of accessible and readily accessible which would have basically addressed a locked door or room where a key in the possession of authorized personnel is still considered accessible or readily, led to public comment 1-253 that placed the current requirement in 110.26 in the 1999 NEC. The accepted added wording was made to clarify the fact that a locked electrical room door was not a Code violation.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

MCMAHILL, L.: The proposal should have been accepted as the submitter's substantiation justifies deletion of the text. I agree with the submitter that this sentence does not belong in this section and removing it will improve usability of the code. The panel statement notes that, "The submitter has not provided adequate technical substantiation that a problem exists." I believe the submitter has provided reasonable substantiation for the change. Section 110.26 addresses "Spaces About Electrical Equipment." A lock and key has nothing to do with these spaces. The sentence more appropriately belongs somewhere else in the code. At the minimum, CMP-1 should have accepted the proposed deletion of the sentence contingent on CMP-4 and 10's positive action on the submitter's companion proposals. CMP-1 should reconsider the action on this proposal.

1-101 Log #3082 NEC-P01 **Final Action: Reject**
(110.26)

Submitter: Michael A. Anthony, University of Michigan Business & Finance / Rep. Association of Higher Education Facilities Officers

Recommendation: Add text to read as follows:

110.26(D) (NEW) Emergency Illumination. The area around all service panels in non-dwelling unit occupancies 200 amperes and above shall be automatically illuminated upon loss of power. For a period of 90 minutes illumination levels shall be

(1) One footcandle (1-fc) along the floor to the established building emergency egress path.

(2) Two footcandles (2-fc) at all vertical surfaces where surface switchgear, permanent service directory, emergency transfer switches, or standby power switches are located.

Substantiation: During a forced outage this proposal will provide an illuminated egress path for the electrician who is working in the service equipment area without a flashlight. Electric service panels are not always installed along the 1-footcandle egress path required by the Life Safety Code for everyone else in the building. The 2 footcandle requirement matches the illumination levels required by the NESC for substations and will provide sufficient illumination of emergency and/or standby power apparatus that may be needed to be operated to start up the emergency and/or standby power systems. Emergency illumination for electricians should be intuitively understandable and should not be left to the building codes. Emergency illumination for electricians should be considered a general requirement for an electrical installation and not a special condition addressable in Article 700. While the per-service panel cost to provide such illumination is on the order of $1000 or less for both labor and materials in most parts of the US, the limitation of 200 amperes for non-dwelling unit occupancies has been selected to minimize the cost impact adoption of this proposal. The size or configuration may be modified by others in futhre code cycles. This proposal is a start in the right direction.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided adequate technical substantiation that a problem exists that would be solved by the proposal.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

ANTHONY, M.: That persons may need to enter, escape, or be rescued from an unlit service equipment location ought to be self-evident. I have no statistics that can be brought to bear upon this proposal but I know that the IBEW supported a similar proposal during the 2005 code cycle. That support was might have been at least partially based upon common sense recognition that electricians do not always carry flashlights and/or that building owners do not always provide illumination in service equipment areas that will work when the power goes out. Anecdotal evidence also suggests that non-electricians will go to service equipment areas during a power outage to diagnose a power problem. Common sense proposals based upon vast but un-compiled body anecdotes by industry professionals are not prohibited from being adopted into the NEC.

Emergency illumination requirements should not be a function of the many competing building codes any more than dedicated space above switchgear should be the function of a building code. Electrical industry professionals should require it for ourselves rather than depend upon other professionals in the building trades such as architects. Article 700 only tells you how to install an emergency lighting system once other codes make such lighting mandatory. Means of entry/escape/egress/rescue as articulated in the life safety and building codes do not contain provisions for emergency lighting for anything but general occupancies where larger numbers of people need to find their way out.

Electrical services are typically not on the escape/egress/rescue path. During an outage both the trained and the untrained would be fetching around in the dark unless the area was designed with lighting adequate for diagnosing; for example, transfer switch auto-manual mode, the odor of a fried solenoid or a loose wire on a starting battery. Arguably, lighting around service equipment during power outages is not emergency lighting at all but a concept closer to optional standby. A start would be the 1-2 foot requirement for a limited class of switchgear.

1-102 Log #3221 NEC-P01 **Final Action: Reject**
(110.26)

Submitter: Robert Carbone, Fischback & Moore Electric Inc.

Recommendation: Revise text to read:

110.26 Spaces About Electrical Equipment. Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment. Enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered accessible to qualified persons. For the purpose of this section an enclosure is considered as an area enclosed by a fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage.

(C ~~**) Entrance to Working Space**~~ **Access to Enclosures Containing Electrical Equipment.**

(1) Minimum Required. At least one entrance of sufficient area shall be provided to give access to working space about electrical equipment.

(2) Large Equipment. For equipment rated 1200 amperes or more that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the enclosure containing electrical equipment ~~required working space~~ not less than 610 mm (24 in.) wide and 2.0 m (6 1/2 ft) high at each end of the working space. Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.

A single entrance to the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (C)(2)(b) is met.

(3) Service Equipment. Where service equipment is installed in an enclosure, personnel door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.

Substantiation: As Safety Director for a large NECA contractor, I have had a number of inspectors express concern that the intent of the existing language is not necessarily clear even though the inspectors that I have spoken with agree that the present language in the 2005 NEC clearly requires panic hardware on doors of electrical rooms to allow workers to quickly exit the room by leaning against the panic hardware rather than fumbling for a door knob. There seems to be some question as to how far away the doors need to be from the equipment before the doors would not need panic hardware.

Discussions with inspectors and fellow safety professionals agreed that the distance where doors that open out and have panic hardware is definitely more that the working distance required by the code. How far away would the doors need to be before they would not need to open out and have panic hardware? Agreement was reached that it would not be reasonable to expect doors 1,000 feet away to have panic hardware. So the distance is somewhere between greater than code required working distance and 1,000 feet.

Presentations given at IAEI meetings and in articles in their magazine, articles by Square D in various trade publications, and at seminars that I have attended make it clear that the hazard workers face extends well beyond the code required working distance. As a matter of fact, testing done by IEEE shows a dark cloud containing massive amounts of toxic vapors that would make it unlikely that a worker could find a doorknob, let alone operate it. The arc ball and toxic cloud clearly extend well beyond code required working distance and would necessitate a door to have panic hardware wherever that door is located. In addition Dupont's Nomex safety wheel requires workers to wear a switching hood to do voltage testing in 480 volt equipment. It would be extremely difficult for a worker to find and operate a doorknob. It makes perfect sense why you wrote the code requiring panic hardware on doors and for them to open out.

Presenters at seminars I attended also indicated that reported electrical injury to workers has occurred well beyond 10 feet. I am sure that people writing these rules have seen this testing and work for companies that have done this testing and could support my position as I know their companies have been part of this testing and have written about and use this information in their training.

Although I have a great deal of experience and have attended a number of seminars and presentations on the electrical hazards workers are exposed to, I know you cannot take my word for it. I know you need proof. I have found Square D's website to be an extremely helpful resource for information associated with these hazards and am providing copies of some of that information as evidence of the hazard. Although I am submitting these publications in their entirety, I will try to point you to a number of quotes. All submitted information is submitted for consideration in its entirety as support of this change.

In the "Arc Flash Overview" paper, it is reported that "five to ten arc flash explosions occur in electrical equipment every day in the United States...". In the section "An Arc Flash Defined" in the provided June 2003 EC&M article by George Gregory of Square D (document number 0613NA0301) titled "Preventing Arc Flash Incidents in the Workplace", Mr. Gregory states that "... an enormous amount of concentrated radiant energy explodes outward from electrical equipment...that can damage their eyesight, and a superheated ball of gas that can severely burn a worker's body...". An example of an explosion and worker wearing protection including a flash hood is shown in Square D's publication "Engineering Services, Power Systems Engineering, Arc Flash Analysys" (order number 0180HO0302). In the publication "Arc Flash: Understanding The Need For Increased Electrical Safety" (order number 0613BR0301) it is reported that "arc flash incidents typically occur in applications above 120V...". Also note the "side view" of an equipment rack during an arc flash explosion" shown in this same publication. Under the "Potential Equipment Damage" heading, note that "...temperatures of the arcing event can typically range form 5,000 degrees Fahrenheit and up...vaporizing the copper and steel components." In the Data Bulletin (0100DB0402) provided, it is reported that "...an "arc flash"...can result in significant damage to equipment or worse, injury or death to workers exposed to the fault." Again, all submitted information is submitted for consideration in its entirety.

I do not necessarily consider myself a code expert. The changes I offer above are the result of discussions, help, and advice from a number of coworkers who were extremely helpful in trying to get the code wording right. I was advised that the concept for panic hardware in this section was based on the concept for doors for transformer vaults. That is the basis for the change of wording. At first it did not make sense to talk about the enclosure. I, perhaps like most, thought of a box when I thought of an enclosure. When I was reminded to look at the definitions it made sense. I also saw that all of the existing definition was not appropriate in this section. That is the reason for making a definition only for this section. Then, mirroring the words for the transformer vault doors to make them work in this section. I see that the rules for high voltage equipment also may not be clear so I submit that the same change be made in 110.33. In addition, rules for service equipment are added as that concept has not been addressed and the hazards are at least as great certainly at least as great as those for other types of equipment.

In summary, it is clear that the present language in the code requires doors to open out and have panic hardware. Because of that, it is clear that people involved in writing this rule already clearly understand the reasons why this rule is important to protect workers in electric rooms. Therefore, it is not my intent to change the rule to have electrical room doors open out and have panic hardware. It is important in my position as a safety professional for a large NECA contractor to support rules that will help improve worker safety. Having rules that are clear to inspectors, engineers, and contractors can only further that goal.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: No substantiation was presented by the submitter for defining an enclosure for the purpose of the subject section and it is unclear how this revision would clarify existing Code requirements. Electrical equipment is not always installed in a separate and specific enclosure or room. It is impractical and overly restrictive to require that all personnel doors, installed in entrances on the way to enclosures, as defined, containing electrical equipment that are subject to the space requirements of 110.26, to open in the direction of egress as a general requirement for all occupancies including dwellings; plus the need for panic hardware for all such installed personnel doors was not substantiated. The panel concludes that the subject matter of 110.26 best remains to be concerned with working space.

The additional text being proposed to Section 110.26 is redundant and unnecessary, as it is basically repeating the Article 100 definition of an "enclosure." Changing the title of 110.26(C) to "Access to Enclosures Containing Electrical Equipment" is unnecessary, as this section is addressing the working space. Working space is separate and distinct from any enclosures containing electrical equipment.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-103 Log #3273 NEC-P01 **Final Action: Reject**
(110.26)

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review

Recommendation: Add text to read as follows:

110.26 Spaces about Electrical Equipment. Sufficient access and working space shall be provided and maintained about all electrical equipment, ***including metering devices*** to permit ready and safe operation and maintenance of such equipment. Enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered accessible to qualified persons.

Substantiation: It is not unusual to find shrubbery, large and small in front of meter cans on the exterior of a single family residence, and other buildings which can pose a hazard to someone wanting to gain access to the meter can for inspection. Recently, here in Palm Beach County Florida, in the process of making an inspection of a meter can that was not supposed to be energized, an electrical inspector received a shock while lying in the shrubbery to open the meter can. This can be extremely dangerous, especially if the shrubbery is wet, which is the case in this part of the country.

Panel Meeting Action: Reject

Panel Statement: All electrical equipment requires sufficient access and working space per 110.26. This includes metering devices. This is an enforcement issue. CMP-1 refers the submitter to the NEC Style Manual, Section 3.3.4.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-104 Log #3274 NEC-P01 **Final Action: Reject**
(110.26(2))

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review

Recommendation: Add text to read as follows:

110.26(2) Width of Working Space. The width of the working space about electrical equipment ***including metering devices*** , shall be the width of the equipment of 750 mm (30 in.), whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of the equipment doors or hinged panels.

Substantiation: It is not unusual to find shrubbery, large and small in front of meter cans on the exterior of a single family residence, and other buildings which poses a hazard when someone wants to gain access to the meter can for inspection. Recently, here in Palm Beach County Florida, in the process of making an inspection of a meter can that was not supposed to be energized, an electrical inspector received a shock while lying in the shrubbery to open the meter can. This can be extremely dangerous, especially if the shrubbery is wet, which is the case in this part of the country much of the time.

Panel Meeting Action: Reject

Panel Statement: All electrical equipment requires sufficient access and working space per 110.26. This includes metering devices. This is an enforcement issue. CMP-1 refers the submitter to the NEC Style Manual, Section 3.3.4.

The panel concluded that 110.26(A)(2) is the section intended by the submitter.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-105 Log #384 NEC-P01 **Final Action: Reject**
(110.26(A))

Submitter: Bryan P. Holland, Holland Electric

Recommendation: Revise text to read as follows:

Working space for ~~equipment~~ <u>switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers</u> operating at 600 volts, nominal, or less to ground ~~and likely to require examination, adjustments, servicing, or maintenance while energized~~ shall comply with the dimensions of 110.26(A)(1), (A)(2), and (A)(3) or as required or permitted elsewhere in this code.

Substantiation: It should be made clear exactly what equipment requires working space. This list mirrors the equipment identified in 110.16. The words "likely to require" should be removed. Per Table 3.2.1 of NEC style manual, "likely" is an unenforceable term. The words "while energized" should be removed. I believe the intent of this section is to provide adequate working space for the safety of the worker and anyone using the equipment whether or not the equipment is energized. One could argue equipment is never "required" to be energized.

Panel Meeting Action: Reject

Panel Statement: Creating a specific list of equipment that require working space is too limiting. As proposed, there is no requirement that working space be provided for equipment such as circuit breakers, fusible switches, control panels, control assemblies and industrial control assemblies, to name a few. Removing "likely to require examination, adjustment, servicing, or

maintenance while energized " is over-restrictive. CMP-1 understands the submitter's concerns about the use of vague or unenforceable language. The NEC Style Manual, however, recognizes and prefers the use of the term "likely" over the term "liable." As an example, "likely to become energized" means "failure of insulation on." Although the NEC Style Manual discourages the use of the term "likely", there are instances where the use is appropriate.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-106 Log #441 NEC-P01 **Final Action: Reject**
(110.26(A))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: Add to (A), starting in line 6:
<u>The grade, floor or platform of the working space shall be horizontal, flat, and level, except where necessarily sloped to drain.</u>
Substantiation: In the 2004 ROP, included in the Panel Comment for similar proposals 1-201, 1-213, and 1-214 appeared this sentence: "If deemed necessary, the qualified person working on the equipment can create a flat and level workspace."
Is it still the opinion of the Panel that a factory worker attempting to operate a disconnect because his mate is caught in the machinery should be required to stop to construct a flat and level place for himself to stand in order to operate the disconnect?
For operation or maintenance, a flat level place to stand in front of the equipment is a basic safety requirement.
Panel Meeting Action: Reject
Panel Statement: The proposed language is too restrictive. For example, it could impact the installation of a disconnect means on the roof of a dwelling unit. The submitter has presented a scenario that is difficult to respond to without further information and detail. Generally, equipment that requires immediate disconnection (i.e., emergency) is specifically noted in the NEC, such as Articles 514 and 680. Additionally, Section 110.26(A) is applicable to the depth, width, and height of the working space.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-107 Log #3606 NEC-P01 **Final Action: Reject**
(110.26(A))

Submitter: Robert Alexander, Laguna Hills, CA
Recommendation: Revise as follows:
110.26 (A) Working Space. Working space for equipment operating at 600 volts, nominal, or less to ground and that requires examination, adjustment, servicing, operation or maintenance of exposed live parts shall comply with the dimensions of 110.26(A)(1), (2), and (3) or as required or permitted for specific installations elsewhere in this Code. Where work is for the operation or inspection of dead-front equipment only or access is required to work on de-energized equipment, a minimum horizontal depth in the direction of the work of 762 mm (30 in.) shall be provided.
Substantiation: The current wording is still too vague that an AHJ "judgment call" is required often well after a design is completed. The Proposed wording gives clear direction to the Design Professional.
Panel Meeting Action: Reject
Panel Statement: No "working space" relative to safety is required for equipment that will not be worked on while energized; insufficient technical substantiation is provided for this change.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-108 Log #1734 NEC-P01 **Final Action: Reject**
(Table 110.26(A)(1))

Submitter: Craig Schumann, Yorkville, IL
Recommendation: Table 110.26(A)(1) should be changed to reflect approach boundaries specified in NFPA 70E-2004, Table 130.2(c).
Substantiation: Table 110.26 (A)(1) is not consistent with NFPA 70E-2004, Table 130.2(c). For example, a limited approach boundary for 240 volts, exposed fixed circuit part is 3 ft 6 in. For condition of Table 110.26(A)(1), the minimum clear distance can be 3 ft, thereby, creating a condition where the requirements imposed by NFPA 70E-2004 could not be met.
Panel Meeting Action: Reject
Panel Statement: The submitter does not provide specific locations for the recommended changes or proposed text, as required by 4-3.3(b) and 4-3.3(c) of the Regulations Governing Committee Projects.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-109 Log #2485 NEC-P01 **Final Action: Reject**
(110.26(A)(1))

Submitter: Michael J. Hittel, General Motors Corporation
Recommendation: Revise text to read as follows:
In 110.26(A)(1), there are three conditions considered. I would recommend the addition of language in Condition 1 that considers equipment designed with IP-2X (finger safe equipment). The specific language would be as follows added to the existing Condition 1 text as follows:
Condition 1 - Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, ~~or~~ exposed live parts on both sides of the working space that are effectively guarded by insulating materials <u>, or effectively insulated parts on one side of the working space and effectively grounded parts on the other side of the working space.</u>
Substantiation: This specific type of installation is not considered in current language. In my opinion, an installation utilizing IP-2X components is a variation of Condition 1 as currently established in NEC 2005. This additional language would clarify the intent of Condition 1.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees that providing finger safe equipment should be used as a basis to reduce the required working space. Ultimately the user is opening the panel to gain access to some level of adjustment or component that may expose himself or herself to an electrical hazard.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
FLOYD, II, H.: IP20 designs provide an inherently safer design that reduces the risk of inadvertent contact having the risk of electric shock or initiation of an arc flash. The NEC should acknowledge that the application of IP20 shrouded terminals provide a safer work environment for both qualified as well as unqualified personnel. These types of designs are addressed in Annexes of NFPA 79, and are widely used outside of the US to reduce the risk of inadvertent personnel contact in industrial control panels and other equipment. I feel the panel would better understand the condition addressed in this proposal if the submitter would provide comment on this action and include a diagram of the conditions currently addressed in this section, as well as the condition he has identified.
Comment on Affirmative:
BARRIOS, JR., L.: While I support the submitter's concept of including provisions for IP-20 "finger-safe" terminals into the NEC, the proposed change introduces additional confusion and an undefined and unenforceable term "effectively insulated" to Condition 1. I disagree with the panel statement that providing finger safe equipment should not be used as a basis for reducing the required working space. Finger safe terminals are inherently guarded against accidental contact and are restricted in size to only permit the entry of small tools and test leads to bare live parts.

1-110 Log #3074 NEC-P01 **Final Action: Accept**
(Table 110.26(A)(1))

Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise as follows:

(Proposal 1-110 (Log #3074))

Table 110.26(A)(1) Working Spaces

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 2
0–150	~~900~~ <u>914</u> mm (3 ft)	~~900~~ <u>914</u> mm (3 ft)	~~900~~ <u>914</u> mm (3 ft)
151–600	~~900~~ <u>914</u> mm (3 ft)	~~1.1~~ 1.07 m (3 ft 6 in.)	~~1.2~~ 1.22 m (4 ft)

Substantiation: A true conversion is essential for applicationof the code in a global business environment where metric system is the only acceptable system.
Panel Meeting Action: Accept
Panel Statement: The panel concludes that the submitter's soft conversion is appropriate in accordance with 90.9(C)(4).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-111 Log #442 NEC-P01 **Final Action: Reject**
(110.26(A)(1)(a))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: In the second sentence, replace "nonelectrical" with "de-energized" as in the 1999 Code so as to read:
Where rear access is required to work on ~~nonelectrical~~ de-energized parts on the back of enclosed equipment, a minimum horizontal working space of 762 mm (30 in.) shall be provided.
Substantiation: In the 2001 ROP, Proposal 1-252(a), CMP-1 made this change for "clarity". An exceedingly weak supporting comment for such a costly change, considering the cost per square foot for new construction.
From the 1965 when there was NO requirement for working space, to the 1996 NEC when 30 inches was introduced for de-energized parts, there were no reported injuries, no property damage. A good safety record.
Also, see 110.34(A) Exception, where for high voltage the 30 inch space is prescribed for de-energized parts. If it is safe for high voltage, it must be safe for low voltage.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide adequate substantiation to support this change from non electrical equipment to electrical equipment. In addition, the panel concludes that de-energized equipment is not as electrically safe as non electrical equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
LABRAKE, JR., N.: This proposal should be accepted. "Deenergized" is the proper industry recognized term for use in this Code section which parallels the similar requirements for over 600 volts in 110.34(A).
MCMAHILL, L.: This proposal should have been accepted. As the submitter noted, the original change for clarity appears weak to say the least. Presently, use of the word "nonelectrical' is unclear and the section may be more restrictive depending on how the authority having jurisdiction enforces the requirement - the intent is unclear. As a note, the section is specific to dead-front assemblies. Dead front being "Without live parts exposed to a person on the operating side of the equipment." Although it may be assumed by the code reader, there is nothing in the section to indicate that dead-front assemblies are required to be enclosed – an assembly could be open frame equipment. This is important to note because as worded, the rear access requirement is specific to enclosed equipment. Therefore, changing the word "de-energized" to "non-electrical" changed the intent of the section without justification. In addition, de-energized is understood as the term "energized" is defined in the code; "non-electrical" is not defined in the code. Further, the panel statement indicates that the submitter's proposal is to change "non electrical equipment to electrical equipment" and "that de-energized equipment is not as electrically safe as non electrical equipment." These statements appear to be incorrect. Again, the text should revert to "de-energized."
Comment on Affirmative:
BARRIOS, JR., L.: In accordance with industry-accepted electrical safety practices, de-energized electrical equipment is assumed energized until verified with test equipment; thus, voltage verification of even de-energized parts may require the same depth of working space associated with Conditions 1, 2 or 3 in Table 110.26(A)(1).
The submitter is correct that there appears to be an unsubstantiated difference in working clearances required in the back of LV and MV equipment. 100.26(A)(1)(a) requires a minimum 30" horizontal clearance to work on non-electrical parts accessible from the back of enclosed LV equipment, while the Exception in 110.34(A) requires a minimum 30" horizontal clearance to work on de-energized parts accessible from the back of MV enclosed equipment. The ACC concludes that the corrective measure to illeminate the disparity is to change "de-energized parts" in the 110.34(A) Exception to "non-electrical parts" instead of what is being proposed by the submitter.

1-112 Log #3075 NEC-P01 **Final Action: Accept**
(110.26(A)(2))

Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise as follows:
762 ~~750~~ mm (30 in.)
Substantiation: This conversion is consistent with the one shown in 110.26(A)(1)(a).
Panel Meeting Action: Accept
Panel Statement: The panel concludes that the submitter's soft conversion is appropriate in accordance with 90.9(C)(4).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-113 Log #1429 NEC-P01 **Final Action: Reject**
(110.26(A)(3))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise Section 110.26(A)(3) as follows:
(3) Height of Working Space. The work space shall be clear and extend from the grade, floor, or platform to the height required by 110.26(E). Stairs or stair treads shall not be permitted as the grade, floor, or platform as referred to in this section . Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment.
Substantiation: While I am mindful of the challenges that CMP-1 has faced in the past with adding stairs to this section, there still is an apparent need and obvious reasons for Code language that addresses the issue. Floors, platforms, and grade are all defined in the building code, and so is stairs. However, stairs are not mentioned in this section. Stairs in the standing area of the required working space create a hazard, and are not a good practice, yet are not currently restricted. Stairs in the standing area of the required working space create a hazard, and are not a good practice, yet are not currently restricted. Stairs in the standing area in front of the electrical equipment covered by this Code rule impacts not only installers, maintenance persons, and inspectors, but also occupants. Having to reset breakers or change fuses in the dark is challenging enough let alone putting stairs into the equation. Safety is a concern here, both during installation and after. Code enforcement jurisdictions have restricted these installations, but have never had a clear Code rule to back up the call. Another meaningful reason to revise this section as proposed is to promote more uniform and consistent application of the requirements in 240.24(A). 240.24(A) requires overcurrent devices to be readily accessible and be installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft 7 in.) above the floor or working platform unless any of the provisions in 240.24(A)(1) through (4) apply. When stairs are the standing area in front of equipment, where do the measurements get taken from when applying the requirements of 240.24(A) to the installation? The conflict between these sections can lead to inconsistent enforcement of the height requirements for overcurrent devices. The proposed changes to this section are not intended to impact equipment requiring working space for equipment that is installed on roofs that include various slopes, or grade that is less than level, understanding very well the challenges that Code enforcement officials and industry would face with such a restriction. I have no deaths or injuries to include in this substantiation, but feel that the changes are necessary for those reasons and the other reasons provided in the statement of the problem and substantiation.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 1-115.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-113. This proposal should have been accepted. See our explanation of negative on Proposal 1-115.

1-114 Log #1639 NEC-P01 **Final Action: Reject**
(110.26(A)(3) (New))

Submitter: L. Keith Lofland, International Association of Electrical Inspectors
Recommendation: Add new text as follows:
(3) Height of Working Space. The work space shall be clear and extend from the grade, floor, or platform to the height required by 110.26(E). Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment. For the purpose of this section, interior stairways do not conform to the grade, floor, or platform .
Substantiation: Floors, platforms, and grade are all defined in the building code, and so is stairs. However, stairways are not mentioned in this section. Local Authorities Having Jurisdictions (AHJs) have prohibited panelboards from being installed in a stairway, but it seems that no clear Code language was present in 110.26 to support this stance. Stairways in the standing area of the required working space create a hazard, and are not a good practice, yet are not currently restricted.
240.24(A) requires overcurrent devices to be readily accessible and be installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft 7 in.) above the floor or working platform unless any of the provisions in 240.24(A)(1) through (4) apply. When a panelboard is installed in a stairway, where does one take this required measurements from to meet the requirements of 240.24(A)? Which stairway tread do you measure from?
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 1-115.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-114. This proposal should have been accepted. See our explanation of negative on Proposal 1-115.

1-115 Log #1892 NEC-P01 **Final Action: Reject**
(110.26(A)(3))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise Section 110.26(A)(3) as follows:

(3) Height of Working Space. The work space shall be clear and extend from the grade, floor, or platform to the height required by 110.26(E). Stairs or stair treads shall not be permitted as the grade, floor, or platform as referred to in this section. Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment.

Substantiation: While I am mindful of the challenges that CMP-1 has faced in the past with adding stairs to this section, there still is an apparent need and obvious reasons for Code language that addresses the issue. Floors, platforms, and grade are all defined in the building code, and so is stairs. However, stairs are not mentioned in this section. Stairs in the standing area of the required working space create a hazard, and are not a good practice, yet are not currently restricted. Stairs in the standing area in front of the electrical equipment covered by this Code rule impacts not only installers, maintenance persons, and inspectors, but also occupants. Safety is a concern here, both during installation and after. Code enforcement jurisdictions have restricted these installations, but have never had a clear Code rule to back up the call. Another meaningful reason to revise this section as proposed is to promote more uniform and consistent application of the requirements in Section 240.24(A). Section 240.24(A) requires overcurrent devices to be readily accessible and be installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft 7 in.) above the floor or working platform unless any of the provisions in 240.24(A)(1) through (4) apply. When stairs are the standing area in front of equipment, where do the measurements get taken from when applying the requirements of Section 240.24(A) to the installation? The conflict between these sections can lead to inconsistent enforcement of the height requirements for overcurrent devices. The proposed changes to this section are not intended to impact equipment requiring working space for equipment that is installed on roofs that include various slopes, or grade that is less than level, understanding very well the challenges that Code enforcement officials and industry would face with such a restriction. I have no deaths or injuries to include in this substantiation, but feel that the changes are necessary for those reasons and the other reasons provided in the statement of the problem and substantiation. Stairs used by unqualified persons while live parts are exposed during maintenance, troubleshooting increases the concern about exposure to a shock and arc flash hazards. It makes it more difficult to barricade the area as required by other standards. (See the graphic illustrations I have provided).

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: The proposed requirement is restrictive and unnecessary. Qualified persons routinely work from various surface areas and conditions that may be within the workspace. If necessary, the qualified person working on the equipment can create a flat and level workspace. Generally, the height measurement would be from the lowest grade, floor, or platform surface. CMP-1 concludes that the proposal does not contain a clear statement of the problem or substantiation for the change. See the Regulations Governing Committee Projects, sections 4.3.3(b) and (d).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-115.
Our explanation is as follows:
This proposal should have been accepted. We disagree that the proposed recommendation is restrictive and unnecessary. A worker that is concentrating on the task at hand could easily be subject to an unnecessary fall or tripping hazard. We recognize that there may be cases where working from an uneven work surface may be necessary. It does not seem prudent to condone it or design it in to an installation.

1-116 Log #2358 NEC-P01 **Final Action: Reject**
(110.26(A)(3))

Submitter: Noel Williams, Herriman, UT
Recommendation: Revise the existing text to read:

"...to the height required by 110.26(E) or to the top of the equipment where a minimum height is not specified by 110.26(E)."

Substantiation: 110.26(E) specifies headroom only for "service equipment, switchboards, panelboards, and motor control centers." As currently worded, other equipment such as industrial control panels will have only the width and depth of the work space defined and no height so that no work space will actually be required. This is true regardless of the likelihood that the equipment will be serviced while energized. This proposal will also help to resolve questions about headroom for equipment such as disconnect switches installed in other spaces for environmental air.
Panel Meeting Action: Reject
Panel Statement: The submitter's intent is met by the reference to 110.26(E) height requirement in 110.26(A)(3).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-117 Log #3078 NEC-P01 **Final Action: Accept**
(110.26(A)(3))

TCC Action: The Technical Correlating Committee directs the panel to reconsider their action relative to the necessity of a soft conversion. This action will be considered by the panel as a public comment.
Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise as follows:

152 ~~150~~ mm (6 in.)

Substantiation: This conversion is consistent with other NFPA standards.
Panel Meeting Action: Accept
Panel Statement: The panel concludes that the submitter's soft conversion is appropriate in accordance with 90.9(C)(4).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-118 Log #3530 NEC-P01 **Final Action: Reject**
(110.26(A)(4) (New))

Submitter: Bradley Butters, City of Reynoldsburg, Ohio IAEI / Rep. City of Reynoldsburg, Ohio IAEI
Recommendation: Add new (4) to read as follows:

(4) An adhesive sign not less than 3 in. x 5 in. shall be affixed to the front of all residential panels with nominal voltage to ground of 150 volts or less, that defines the depth, width, and height of working space. Sticker shall be OSHA yellow background with black letters and a thin black boarder.

Substantiation: It is my experience that most homeowners and many remodelers in our area have no awareness of the NEC rules regarding working space about the panel. We have a chronic problem of unsafe obstructions and flammable materials being placed within the limits of the panel clear work space. Electricians tend to be very tolerant of such customers misdeeds and go ahead and work a panel hot under severely compromised work space conditions, putting themselves at great risk of arc-flash and arc-blast exposure. A simple sticker on the front of residential panels that defines work space dimensions would greatly help this situation.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: Section 110.26(A) is applicable to the working space dimensions only. Requiring specific information related to signage is not necessary for this section. CMP-1 also discourages working on the equipment noted while energized and prefers not to endorse such practice based on signage being added to the equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-119 Log #2169 NEC-P01 **Final Action: Accept in Part**
(110.26(C))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:

(C) Entrance to and Egress From Working Space.

(1) Minimum Required. At least one entrance of sufficient area shall be provided to give access to and egress from working space about electrical equipment.

(2) Large Equipment. For equipment rated 1200 amperes or more that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 (6 1/2 ft) high at each end of the working space. ~~Where entrance has a personnel door(s), the doors(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.~~

A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (b) is met.

(a) Unobstructed Exit. Where the location permits a continuous and unobstructed way of exit travel, a single entrance to the working space shall be permitted.

(b) Extra Working Space. Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located so that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

Where the working space or room designated for electrical equipment has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic hardware, pressure plates, or other devices that open under simple pressure.

Substantiation: CMP-1 has made several major improvements in this section in the past two cycles. This proposal is an effort to revise the existing requirements and attempt to improve the organization of the existing requirements and add clarity. This is a worker safety issue that must be addressed. It seems that more emphasis has been placed on entrance to the working space than the egress from the working space. It seems that it is equally important to be sure that electrical workers can escape the working space or room when an explosion occurs. The proposed revisions would help accomplish this. As the Code is currently worded in this section, the rules allow access but fall short of requiring adequate means to egress the area.

Panel Meeting Action: Accept in Part

The panel accepts only the submitter's recommendation to insert "and egress from" in three places.

Panel Statement: The panel concludes that it is not appropriate to move the requirement from 110.26(C)(2). In addition, the panel does not necessarily agree with all of the submitter's substantiation. The panel further concludes that the technical substantiation provided does not justify this part of the proposal.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-120 Log #2937 NEC-P01 **Final Action: Accept in Part**
(110.26(C))

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Revise 110.26(C) as follows:

(C) Entrance to <u>and Egress From</u> Working Space.

(1) Minimum Required. At least one entrance of sufficient area shall be provided to give access to <u>and egress from the</u> working space about electrical equipment.

(2) Large Equipment. For equipment rated 1200 amperes or more that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the required working space not less than 610 mm (24 in.) wide and 2.0 m (6 1/2 ft) high at each end of the working space. ~~Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.~~

A single entrance to <u>and egress from</u> the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (b) is met.

(a) Unobstructed Exit. Where the location permits a continuous and unobstructed way of exit travel, a single entrance to the working space shall be permitted.

(b) Extra Working Space. Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located so that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

<u>Where the room designated for electrical equipment has a personnel door(s) that provides access to the working space, the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.</u>

Substantiation: This proposal does not intend to introduce new requirements but to improve the organization of the existing requirements and add clarity.

The concept of providing egress from the working space in case of a blowup is contained in the existing language. Adding the language at appropriate locations seems appropriate.

It seems clear the Panel does not intend to require panic hardware for the working space itself but for the doors providing access to and egress from the room housing the large electrical equipment. The working space is a cube of specified width, depth and height. However, electrical equipment is most often located in rooms that are larger than the required working space. For example, a 1200-ampere, 480-volt switchboard that is 12-ft wide and 92 inches high requires a working space cube that is 12 ft by 92 in. by 3 ft for a Condition 1 installation. If this equipment is located in a room that is 20 ft by 40 ft, where are the doors with panic hardware required, at the working space or for the doors to and from the room? (And, we recognize this section does not require doors, a function of building codes, but requires panic hardware if doors are present.) Hopefully, adding the concept of electrical rooms designated for large electrical equipment (often shared with mechanical equipment) will add clarity to the requirement for panic hardware.

The requirement for panic hardware for doors for rooms that house large equipment must not be lost as the reasons for adding the rule – providing a way for electricians who may have burned hands and thus cannot grip and turn a door knob – is as valid as ever. It seems that locating the rule at the end of the section will add clarity.

It is not necessary for this section to specify the size of the personnel door to the room housing large electrical equipment as the number of doors and door sizes are a function of building codes.

Panel Meeting Action: Accept in Part

Panel Statement: See panel action and statement on Proposal 1-119.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-121 Log #3544 NEC-P01 **Final Action: Accept in Principle**
(110.26(C))

Submitter: Redwood Kardon, Code Check Institute

Recommendation: Add "Egress From" to the title of this article to read:

"Entrance to and <u>Egress From</u> Working Space."

Substantiation: The primary safety concern underlying subsection (C)(2) is to assure an unobstructed escape path for the qualified person should a catastrophic electrical fault occur. By including the word egress, the safety concern of this article would be better emphasized.

Panel Meeting Action: Accept in Principle

Add "and Egress from" in the title.

Panel Statement: See panel action and statement on Proposal 1-119. In addition, the panel does not necessarily agree with all of the submitter's substantiation.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-122 Log #120 NEC-P01 **Final Action: Reject**
(110.26(C)(2))

Submitter: Charlie Helmick, AVO Training Institute, Inc.

Recommendation: Revise as follows:

110.26(C)(2) Large Equipment. For equipment rated ~~1200 amperes or more~~ <u>Hazard/Risk Category 3 or higher</u> that contains overcurrent devices...

<u>FPN No. 1: See 110.16 for equipment requirements to be labeled by arc-flash hazard.</u>

<u>FPN No. 2: NFPA 70E-2004, Standard for Electrical Safety in the Workplace. Section 130.3(A) Flash Hazard Analysis shall be done in order to protect personnel.</u>

Substantiation: The hazard for the electrical worker in the room is not related or derived from the size of the equipment by ampacity. It is, however, directly related to the amount of incident energy available in the room. The incident energy values are derived from the amount of available fault current and clearing times on the equipment. The engineering studies that are accomplished based on the electrical one-line should make Hazard/Risk category information available to the planners for the building and the inspector that looks at the plans. If a worker attempts egress during an incident of some kind, the Flash-Hazard Boundary will be far more relevant than the ampacity size of the equipment.

Panel Meeting Action: Reject

Panel Statement: Hazard/Risk Category 3 is undefined in the NEC, and there is no definition proposed by the submitter. Proposed FPN No. 1 is not relevant to the application of the requirements to this section. Proposed FPN No. 2 contains mandatory language and is not in conformance with 3.1.3 of the NEC Style Manual.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-122. Our explanation is as follows:

This proposal should have been accepted in part. We agree with the submitter's recommendation to delete 1200 amps or more. Substantiation indicates that "the hazard for the electrical worker in the room is not related or derived from the size of the equipment by ampacity. It is, however, directly related to the amount of incident energy available in the room."

That substantiation is validated by substantiation submitted by Mr. Ray Jones, current chairman of the NFPA 70E Technical Committee. For example, the submitted IEEE paper entitled Staged Tests increase Awareness of Arc-Flash Hazards in Electrical Equipment (Paper number PCIC 97-34), which was published in the IEEE Transactions on Industry Applications in 1998, is substantiation for proposal 1-125. In Table I on page 3 of this paper, Test # 4 clearly indicates that Size 1 combination starter protected by a 640 amp power circuit breaker did not open when a load side phase to ground fault was created. Furthermore, the results indicated in Tables III and IV on page 5 clearly indicate that the resulting flash and blast from this test on a 640 amp device with a relatively modest 22,000 amps available was quite extensive. Clearly, equipment much smaller than 6 feet and 1200 amps can be extremely dangerous and would warrant the protection of 110.26 (C)(2). Therefore, we propose the following revised text: For equipment rated 600 amperes or more that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the required working space not less than 610 mm (24 in.) wide and 2.0 m (6 1/ 2 ft) high at each end of the working space. Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.

1-123 Log #1198 NEC-P01 **Final Action: Accept**
(110.26(C)(2))

Submitter: Lanny G. McMahill, Phoenix, AZ
Recommendation: Revise second sentence:
Where the entrance has a personnel door(s) <u>that is less than 1.8 m (6 ft) from the working space,</u> the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
Substantiation: The new language clarifies that the personnel door(s) requirement applies to the working space. The 1.8 m (6 ft) distance is reasonable and provides for safe egress from the area. Currently, some are applying the requirement where the doors are a considerable distance from the working space.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-124 Log #2001 NEC-P01 **Final Action: Reject**
(110.26(C)(2))

Submitter: David Sroka, Turner Falls, MA
Recommendation: Add a new paragraph to read:
"A suitable, listed, approved, portable fire extinguisher shall be located at each door to a large equipment working space."
Substantiation: Safety improvement. This idea comes from the National Electrical Safety Code and the IEEE Guide for Substation Fire Protection.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that requirements for fire extinguishers are outside the scope of the NEC.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-125 Log #2291 NEC-P01 **Final Action: Reject**
(110.26(C)(2))

Submitter: Ray A. Jones, ESCS, Inc.
Recommendation: Revise text to read as follows:
~~(2) Large Equipment For equipment rated 1200 amperes or more that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the required working space not less than 610 mm (24 in.) wide and 2.0 m 6 1/2 ft) high at each end of the working space. Where the entrance has a personnel door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.~~
<u>(2) Enclosed spaces containing electrical equipment having sufficient energy to cause blast and thermal injury.</u>
<u>Working spaces in enclosed rooms or fenced enclosures that contain electrical equipment with the energy capacity of at least 5000 ampere-seconds shall be provided with at least one door at each end of the equipment for emergency egress. The door shall be no less than 760 mm (30 in.) wide and 2.0 m (6 1/2 ft) high at each end of the working space. The door shall open out in the direction of egress and be equipped with panic bars, pressure plates, or other devices that normally are latched but open under simple pressure. The door(s) shall be clear and unobstructed. The minimum rating of 5000 ampere-seconds shall be determined as the product of the clearing time of the overcurrent device and the available short-circuit current.</u>
<u>FPN: Equipment with an energy capacity of 5000 ampere-seconds is equivalent to equipment with a flash protection boundary of 4 ft, as defined in NFPA 70E-2004, Article 130.3(A).</u>
Substantiation: The potential for injury from thermal energy and blast has been explored since the early 1960s, as illustrated by the current language in 110.26 (C)(2). An IEEE paper entitled Staged Tests increase Awareness of Arc-Flash Hazards in Electrical Equipment (Paper number PCIC 97-34), which was published in the IEEE Transactions on Industry Applications in 1998, illustrates the hazard (see Supplemental information). Tables III and IV of the referenced paper indicates that a significant amount of pressure and thermal energy is released in an arcing fault in equipment with limited available shout-circuit current. Table V in the referenced paper identifies the amount of let-through current and energy. All tests conducted in the series of staged tests were performed on equipment with current-carrying capacity much less than the 1200 ampere rating specified in the test recommended to be deleted. Code panel 1 is to be congratulated for its early efforts to provide an emergency escape path. However, tests and measurements published in the papers referenced by PCIC 97-34 indicate that current-carrying capacity has little, if any, bearing on the ability of a circuit to deliver injurious thermal or blast energy in event of an arcing fault.
NFPA 70E-2004 suggests a minimum protective boundary of 4 ft, based on the ability of the circuit/equipment to deliver injurious thermal energy to workers. Therefore, workers closer than 4 ft are exposed to injury should an arcing fault occur. An arcing fault will result in a very loud explosion and copious amounts of smoke and other products of combustion. Workers who might be present will have difficulty seeing and may be disoriented. Rapid egress is necessary to ensure that workers are afforded the best opportunity to escape from the area containing the potentially toxic smoke and products of combustion. The photographs included with this proposal illustrate a typical arcing fault and the resulting debris, smoke, and other products of combustion.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel rejects the concept of basing exiting requirements on incident energy levels. This section primarily deals with working space for large equipment rather than arc flash boundaries.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
FLOYD, II, H.: The physical size of equipment and parts should be used in determining the size of doors, but the magnitude of an arc flash event should be used for the basis of determining emergency egress requirements. The panel could have accepted this in principle and incorporate both methods. I would encourage the submitter to consider providing a comment incorporating these two methods to address both equipment and material handling access as well as emergency egress due to an arcing fault event.
HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-125. Our explanation is as follows:
This proposal should have been accepted in principle. We agree with the submitter's recommendations to base the requirement on electrical equipment with the energy capacity of at least 5000 ampere-seconds and to delete "rated 1200 amps or more". Knowledge of the location, type, size or setting of the upstream overcurrent protective device is a crucial piece in determination of the application of this section. Mr. Ray Jones, submitter of this proposal and current chairman of the NFPA 70E Technical Committee submitted IEEE paper entitled Staged Tests increase Awareness of Arc-Flash Hazards in Electrical Equipment (Paper number PCIC 97-34), which was published in the IEEE Transactions on Industry Applications in 1998, as substantiation for this proposal. In Table I on page 3 of this paper, Test # 4 clearly indicates that Size 1 combination starter protected by a 640 amp power circuit breaker did not open when a load side phase to ground fault was created. Furthermore, the results indicated in Tables III and IV on page 5 clearly indicate that the resulting flash and blast from this test on a 640 amp device with a relatively modest 22,000 amps available was quite extensive. Clearly, equipment much smaller than 6 feet and 1200 amps can be extremely dangerous and would warrant the protection of 110.26 (C)(2).We propose two alternatives to comply with 110.26(C)(2). The balance of 110.26 is not included in the following alternatives:
110.26(C)(2) Equipment. For equipment rated 600 amperes or more that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the required working space not less than 610 mm (24 in.) wide and 2.0 m (6 1/ 2 ft) high at each end of the working space. Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
110.26(C)(2) Equipment. For equipment with the energy capacity of at least 5000 ampere-seconds that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the required working space not less than 610 mm (24 in.) wide and 2.0 m (6 1/ 2 ft) high at each end of the working space. Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
Comment on Affirmative:
BARRIOS, JR., L.: While I agree with the submitter that the number of entrances to a working space should not be based purely on a 1200A equipment rating (refer to my negative ballot comment on Comment 1-247 of the 2005 NEC ROC Report), the submitter's proposal has gaps that should be addressed. What "available short-circuit current" should be used in the energy calculation – three-phase, single-phase, symmetrical, asymmetrical? At what point should this "available short-circuit current" be calculated – line side of the main breaker or first disconnecting means, load side of the main breaker or first disconnecting means? Are the requirements less if arc-resistance switchgear or similar means to limit incident energy exposure are used?

1-126 Log #2881 NEC-P01 **Final Action: Reject**
(110.26(C)(2))

Submitter: James J. Rogers, Bay State Inspectional Agency
Recommendation: After the word "permitted" and prior to the word "where" insert the following:
"only in existing buildings when the addition of a second entrance is structurally impracticable and..."
Substantiation: I have examined several electrical rooms that have experienced catastrophic failures. Should one of these failures occur in a section of switchgear that is between the worker and the door there would no way of existing without suffering severe injury even if there was unobstructed travel or double working space.
Panel Meeting Action: Reject
Panel Statement: The proposed requirement is overly restrictive. The words "structurally impracticable" are vague and unenforceable. See the NEC Style Manual, Section 3.3.4.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action. Our explanation is as follows:
This proposal should have been accepted in principle. We agree with the concept of the submitter whereby the relief offered by the alternatives for a single entrance should only be permitted for existing buildings when the addition of a second entrance is structurally impracticable.

1-127 Log #3487 NEC-P01 **Final Action: Accept**
(110.26(C)(2))

Submitter: Alan Manche, Square D Co.
Recommendation: Reinstate110.26(C)2 as found in the 2002 NEC. Revise NEC 110.26(C)2 with the additions (underlined) and deletions (strike through) as shown. The entire text of 110.26(C)2 is shown for clarity, but only those changes shown underlined or with a strike through are part of this proposal.
NEC 110.26(C) Entrance to Working Space.
(2) Large Equipment. For equipment rated 1200 amperes or more <u>and over 1.8 m (6 ft) wide</u> that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the required working space not less than 610 mm (24 in.) wide and 2.0 m (6 1/2 ft) high at each end of the working space.
Substantiation: The removal of the 6 ft limitation has a significant impact on equipment installation and the required working space. The panel accepted the substantiation from two comments supporting that the issue is related to arc-flash which in turn is driven from the size / rating of the equipment. The rating of the equipment is NOT the driving factor if the panel is using arc-flash to justify this change. NFPA 70E addresses arc-flash protection and no where in that document will you find that the rating of the equipment plays such a role. Mr. Barrios accurately provided an explanation in his negative vote in the 2005 ROC.
"BARRIOS: The panel action should have been to "reject" rather than "accept". During the proposal stage, CMP1 rejected Proposal 1-217 by an 11 to 1 vote, and yet reversed its decision during the comment stage based on no additional technical substantiation. Physical size of the equipment should continue to be criteria used to determine the amount of entrances needed for safe egress from an electrical equipment room or building. It is the physical size and placement of the equipment inside a room which creates barriers and obstructions for safe egress, not the equipments continuous current rating alone.
In his substantiation, the submitter indicated that the size of the arc blast is directly related to the electrical rating of the equipment. This is not necessarily true. The arc blast, or available incident energy at a location, is based on the voltage, available short circuit current, separation between the electrodes (phases), the distance a worker's body parts are from the arcing fault, and the duration of the fault. The continuous current rating of the equipment is not a direct factor in determining the available incident energy or level of the arc blast. Equipment and systems with 1200A or larger continuous current ratings can be designed to expose workers to less arc blast than lower-rated equipment. Likewise, equipment with smaller than 1200A continuous current ratings can pose a more severe arc blast hazard than equipment rated 1200A and above.
Therefore, this is not solely an arc blast issue. The issue is providing an unobstructed path for persons to exit the area not only under equipment fault conditions, but also including fire and other events requiring emergency egress. The 6-foot wide equipment criteria has been in the NEC since 1978 (increased from 4-foot prior to that). Providing unobstructed paths is based on the physical size and location of the equipment and the size of the area in which the equipment is installed. It should not be based solely on the continuous current rating of the equipment."
This area of the NEC addresses an egress issue and equipment width does plays a role but how wide is necessary? Did the committee intend to impose the additional provision on a 36 inch panelboard rated 1200A with a single 800A main? How about a 24 inch wide circuit breaker enclosure rated for a range of 600 to 1200A circuit breakers which has an 800A breaker? The present requirement does impose these additional working space restrictions unnecessarily on such an installation. When you consider disconnects, that are rate 1000A or more, they are required in NEC 230 and NEC 225 to be protected by GFPE which enhances the protection of the system from an arcing fault to ground.
I would encourage the panel to reconsider Mr. Barrios comments as I support the fact that egress from the working space is important and the width of the equipment does plays a role. A comment also shared a concerned that designers are going to avoid the requirements due to the 6ft limit. If the designer is driven by this requirement, he simply drops below the 1200A rating and places two enclosures on the wall making the travel distance further for the egress. Did the reduction in amperage compensate for the additional egress travel distance? Did the energy level for arc-flash change? I urge the committee to reinstate the 6ft width as found in the 2002 NEC as it has a long standing history and absolutely no documentation was presented during the 2005 NEC development process that the existence of the 6ft rule had a safety impact.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action. Our explanation is as follows:
This proposal should have been rejected to maintain the direction the panel took on this issue last cycle. Not only should we not reinstate 6' back into the requirement, we feel that the 1200 amp value should be deleted as recommended in proposals 1-122 and 1-125. Substantiation submitted by Mr. Ray Jones, current chairman of the NFPA 70E Technical Committee clearly substantiates the continued elimination of 6' from this requirement. The submitted IEEE paper entitled Staged Tests increase Awareness of Arc-Flash Hazards in Electrical Equipment (Paper number PCIC 97-34), which was published in the IEEE Transactions on Industry Applications in 1998, is substantiation for proposal 1-125. Test # 4 of Table I on page 3 of this paper shows a Size 1 combination starter with a 30 amp fused switch and protected by a 640 amp power circuit breaker that did not open when a load side phase to ground fault was created. Clearly, a Size 1 starter is smaller than 6'. Furthermore, the results indicated in Tables III and IV on page 5 clearly indicate that the resulting flash and blast from this test on a 640 amp device with a relatively modest 22,000 amps available was quite extensive in spite of being smaller than 6'. Clearly, equipment much smaller than 6 feet can be extremely dangerous and would warrant the protection afforded by the requirements of 110.26 (C)(2).
MCMAHILL, L.: The removal of the 6-foot requirement was made for several reasons. Foremost, the concern for the work person and potential arc flash hazards. Providing sufficient working space for the work person is of utmost importance. Unfortunately, for enforcement purposes it is perhaps the most difficult to attain minimum code compliance. Another reason for the removal of the 6-foot rule is that the size of equipment has changed. Fifteen or twenty years ago, the 6-foot requirement made sense. Equipment enclosures were larger and typically required that a bigger working space area be provided to access and work on the equipment. The bigger space naturally made for a safer work environment. In addition, the hazards were not as great years ago. Available fault current values at the line terminals of the equipment were substantially less and the equipment interior was much larger. Today, available fault current values exceeding 100K are common at the equipment line terminals and interior space is much smaller. Additionally, more equipment and components are being packed into these interior spaces. Monitoring devices, sensors, filters and control devices are the norm today. Switchboard sections that contained only one or two switches several years ago now contain three, four or more. The physical size of the switching devices, such as fusible switches and circuit breakers, have been reduced substantially yet they contain more features and functions. Another consideration for the removal of the 6-foot requirement was how it is being interpreted and enforced. Does the rule apply to individual sections or to a complete assembly? It is easy to circumvent the rule by installing individual sections. Individual sections when placed end to end can easily exceed 6-foot. In addition, sections and assemblies that are less than 6-foot are installed on housekeeping pads with space provided for future sections to be added. Does the 6-foot rule apply to the future sections or only to what is installed? There are other reasons for removal of the 6-foot requirement, but foremost it was made for consideration and safety of the work person. Naturally, from a code enforcement standpoint the 6-foot rule is a difficult call to make - especially when the design of a project is complete and the size of the equipment is bigger than what was shown on the plans. Although it may be selfish on this author's part, removal of the 6-foot rule eliminates headaches for enforcement persons and provides for consistency and safety! I encourage the panel to reconsider the action on this proposal.

1-128 Log #398 NEC-P01 **Final Action: Reject**
(110.26(D))

Submitter: Charles Polson, Linwood, NC
Recommendation: Existing Text:
110.26 Spaces About Electrical Equipment
(D) Illumination. Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, or motor control centers installed indoors. Additional lighting outlets shall not be required where the work space is illuminated by an adjacent light source or permitted by 210.70(A)(1), Exception No. 1, for switched receptacles. In electrical equipment rooms, the illumination shall not be controlled by automatic means only.
210.70(A)(1)Exception No. 1: In other than kitchens and bathrooms, one or more receptacles controlled by a wall switch shall be permitted in lieu of lighting outlets.
(G) Disconnecting Means. In indoor locations, other than dwellings and associated accessory structures, fluorescent luminaires (fixtures) that utilize double-ended lamps and contain ballast(s) that can be serviced in place or ballasted luminaires that are supplied from multiwire branch circuits and contain ballast(s) that can be serviced in place shall have a disconnecting means either internal or external to each luminaire (fixture), to disconnect simultaneously from the source of supply all conductors of the ballast, including the grounded conductor if any. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. This requirement shall become effective January 1, 2008.

Add text to read as follows:

110.26 Spaces About Electrical Equipment.

(D) Illumination. Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, or motor control centers installed indoors. Additional lighting outlets shall not be required where the work space is illuminated by an adjacent light source in other than kitchens and bathrooms, one or more receptacles controlled by a wall switch shall be permitted in lieu of lighting outlets. In electrical equipment rooms, the illumination shall not be controlled by automatic means only.

Substantiation: NEC Manual of Style states: 2.6 Exceptions, 2.6.1 Placement and Order. Exceptions shall immediately follow the main rule to which they apply. Where exceptions are made to items within a numbered list, the exception shall clearly indicate the items within the list to which it applies.

410.30 Cord-Connected Lampholders and Luminaires (Fixtures). (C) Electric-Discharge Luminaires (Fixtures). (1) A listed luminaire (fixture) or a listed assembly shall be permitted to be cord connected if the following conditions apply: (1) The luminaire (fixture) is located directly below the outlet or busway. (2) The flexible cord meets all the following: (a) Is visible for its entire length outside the luminare (fixture) (b) Is not subject to strain or physical damage (c) Is terminated in a grounding-type attachment lug cap or busway plug, or is a part of a listed assembly incorporating a manufactured wiring system connector in accordance with 604.6(C), or has a luminaire (fixture) assembly with a strain relief and canopy.

The NEC is clear in 410.30 that a fixture can be cord and plug connected. The problem arises when a cord and plug fixture is being switched at a panel. This seems to be noncompliant by 110.26 referring to the exception in 210.70(A)(1) for dwelling units.

Panel Meeting Action: Reject

Panel Statement: The substantiation does not support the reason for the proposal. There is no exception to the requirement for illumination in 110.26(D). There is also an inappropriate proposal to 410.30 included. Section 210.70(A)(1), Exception No., applies only to dwelling units. Disconnecting means for fluorescent luminaires are not related to the subject of illumination for working spaces about electrical equipment.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-129 Log #656 NEC-P01 **Final Action: Reject**
(110.26(D))

Submitter: Leon Przybyla, Southern Arizona Chapter IAEI

Recommendation: Revise text to read as follows:

Illuminations shall be provided for all working spaces about service equipment, switchboards, panelboards, or motor control centers installed ~~indoors.~~

Substantiation: On outdoor equipment being serviced at night sometimes the only light source is a flashlight.

Panel Meeting Action: Reject

Panel Statement: CMP-1 sees no technical substantiation to remove the word “indoors”, and as proposed the sentence appears to be incomplete. See the NFPA Regulations Governing Committee Projects, Section 4.3.3(d). The panel concludes that it is too restrictive to assume that all outdoor equipment needs to be serviced at night.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

HICKMAN, P.: While we agree that adequate technical substantiation has not been provided, we feel that the submitter has raised an issue that warrants attention and encourages the submitter to present substantiation in a Comment in the ROC. We join the submitter in wondering why equipment only requires illumination when installed indoors.

1-130 Log #694 NEC-P01 **Final Action: Reject**
(110.26(D))

Submitter: Rick Hollander, City of Tucson-Development Services

Recommendation: Revise as follows:

Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, or motor control centers installed ~~indoors~~ .

Substantiation: On outdoor equipment being serviced at night, sometimes the only light source is a flashlight.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 1-129.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

HICKMAN, P.: While we agree that adequate technical substantiation has not been provided, we feel that the submitter has raised an issue that warrants attention and encourages the submitter to present substantiation in a Comment in the ROC. We join the submitter in wondering why equipment only requires illumination when installed indoors.

1-131 Log #3478 NEC-P01 **Final Action: Reject**
(110.26(D))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read:

110.26(D) Illumination. Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, HVAC equipment, or motor control centers installed indoors or outdoors on roofs .

Substantiation: This article needs rewording because lighting source is needed in these areas. Similar proposals were submitted for 210.70(C) and 110.34(D).

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 1-129. In addition, no substantiation has been provided to extend the coverage of 110.26(D) to HVAC equipment.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

HICKMAN, P.: While we agree that adequate technical substantiation has not been provided, we feel that the submitter has raised an issue that warrants attention and encourages the submitter to present substantiation in a Comment in the ROC. We join the submitter in wondering why equipment only requires illumination when installed indoors.

1-132 Log #2195 NEC-P01 **Final Action: Reject**
(110.26(D)(1) (New))

Submitter: David Williams, Lansing, MI

Recommendation: Add new text to read:

110.26(D)(1) Illumination Emergency Power. In the event of power supply failure, an emergency system shall automatically illuminate the electrical equipment room. The emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or an onsite generator. This requirement is for buildings that are required to have emergency egress illumination by the building code.

Substantiation: The safety of the electrician has been overlooked in the past. Emergency lighting needs to be installed in the areas where electrical panels are located for egress of someone that may have been injured from an electrocution. The building code has not addressed this location and I think this is an area that needs to be addressed.

Panel Meeting Action: Reject

Panel Statement: See panel action and substantiation on Proposal 1-101.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-133 Log #393 NEC-P01 **Final Action: Reject**
(110.26(E))

Submitter: Eric Jason Ginn, Davidson County Community College

Recommendation: Revise text to read as follows:

110.26(E) Headroom. The minimum headroom of working spaces about service equipment, switchboards, panelboards, or motor control centers shall be 2.0 m (6 1/2 ft). Where the electrical equipment exceeds 2.0 m (6 1/2 ft) in height, the minimum headroom shall not be less than the height of the equipment.

Exception: In existing dwelling units, existing or replacement service equipment or panelboards that do not exceed 200 amperes shall be permitted in spaces where the headroom is less than 2.0 m (6 1/2 ft).

Substantiation: As written 110.26(E) exception could and has been thought to mean that any existing dwelling no matter how old or new could have a service change and the new panel not have to comply to the six foot six in. rule as outlined in 110.26(E).

As worded, a new house the day after receiving a Certificate of Occupancy could have the service panel moved to a place such as a crawl space or under a deck.

There needs to be a more concise meaning as to the intent of the exception.

Panel Meeting Action: Reject

Panel Statement: The submitter’s substantiation does not include evidence that non complying equipment has been or is likely to be installed in existing residences.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-134 Log #2140 NEC-P01 **Final Action: Reject**
(110.26(E) Exception)

Submitter: Tom Pernal, Tom Pernal Electrical Seminars LLC

Recommendation: Revise text to read:

Existing text from 70-2005:

Exception: In existing dwelling units, service equipment or panelboards that do not exceed 200 amperes shall be permitted in spaces where the headroom is less than 2.0 m (6 1/2 ft).

(X) Proposal of additional text:

Exception: In existing dwelling units, service equipment or panelboards that do not exceed 200 amperes shall be permitted in spaces where the headroom is less than 2.0 m (6 1/2 ft) <u>, but not less than 1.2 m (4 ft)</u> .

Substantiation: In many years of experience in the electrical field, I have been faced with the aforementioned situation a number of times. I have had to work on service equipment in locations that required a sitting position at best. Under arc-blast conditions it would be difficult, if not impossible, to get out of harms way. Personally, I would opt out of locating a service panel in such a location, but anything below 48 in. is not only difficult to work on, but extremely hazardous for service personnel. In addition, in the event of an emergency, service equipment in a location such as this would be inaccessible to many occupants, especially those with disabilities.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The substantiation suggests that it may be necessary to work on dwelling unit service equipment or panelboards while energized. No justification has been presented to further limit the headroom in existing installations. A dimension as suggested by the submitter was never used as a minimum benchmark for safety.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-135 Log #873 NEC-P01 **Final Action: Accept**

(110.26(F))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 9 and 19 for comment.

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Delete the term "distribution boards" to read as follows:

"All switchboards, panelboards, ~~distribution boards~~ , and motor control centers...".

Substantiation: Switchboards, panel boards, and motor control centers are defined terms. Distribution board is not. The NEMA publication titled "Panelboards and Distribution Boards" makes no distinction. A distribution board is simply a type of panelboard, so "distribution board" is redundant and possibly misleading.

Panel Meeting Action: Accept

Panel Statement: The panel recommends that the TCC forward this Proposal to CMP-9 and CMP-19 for comment.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-136 Log #2141 NEC-P01 **Final Action: Reject**

(110.26(F)(1)(c))

Submitter: David Sroka, Turner Falls, MA

Recommendation: Add a third sentence to this paragraph to read:

A floor drain sized for the sprinkler head(s) shall be installed.

Substantiation: Standing water is a safety hazard to personnel. Also, the chances of wiring being shorted out (floor mounted equipment and boxes) with standing water are greater.

Panel Meeting Action: Reject

Panel Statement: The proposal is outside the scope of the NEC.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

1-137 Log #657 NEC-P01 **Final Action: Reject**

(110.26(F)(2))

Submitter: Leon Przybyla, Southern Arizona Chapter IAEI

Recommendation: Add a new subsection 110.26(F)(2)(a).

110.26(F)(2)(a) Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 1.8 m (6 ft) above the equipment, shall be dedicated to the electrical installation. No piping, or other equipment foreign to the electrical installation shall be located in this zone.

Substantiation: Some of the same conditions that apply to an indoor installation in regard to piping and other equipment (Ex: Water piping, Gas Piping, Hose Bibs, Phone and Cable boxes) pose the same problems outdoors. Access may be impeded by these foreign objects in the area.

Note: Supporting Material is available for review at NFPA headquarters.

Panel Meeting Action: Reject

Panel Statement: The substantiation is inadequate to require the specified dedicated space for outdoor equipment installations. Access is required, and any impediment is not in conformance with Section 110.26(F).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

HICKMAN, P.: While we agree that adequate technical substantiation has not been provided, we feel that the submitter has raised an issue that warrants attention and encourages the submitter to present substantiation in a Comment in the ROC. We join the submitter in wondering why equipment only requires dedicated space when installed indoors.

1-138 Log #663 NEC-P01 **Final Action: Reject**

(110.26(F)(2))

Submitter: Rick Hollander, City of Tucson-Development Services

Recommendation: Add a new subsection 110.26(F)(2)(a).

110.26(F)(2)(a) Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 1.8 m (6 ft) above the equipment, shall be dedicated to the electrical installation. No piping, or other equipment foreign to the electrical installation shall be located in this zone.

Substantiation: Some of the same conditions that apply to an indoor installation in regard to piping and other equipment (Ex: Water piping, Gas Piping, Hose Bibs, Phone and Cable boxes) pose the same problems outdoors. Access may be impeded by these foreign objects in the area.

Note: Supporting Material is available for review at NFPA headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 1-137.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

HICKMAN, P.: While we agree that adequate technical substantiation has not been provided, we feel that the submitter has raised an issue that warrants attention and encourages the submitter to present substantiation in a Comment in the ROC. We join the submitter in wondering why equipment only requires dedicated space when installed indoors.

1-139 Log #2678 NEC-P01 **Final Action: Reject**

(110.27)

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Revise text to read:

110.27 Guarding of Live Parts

(A) Live Parts Guarded Against Accidental Contact <u>by Unqualified Persons.</u> Except as elsewhere required or permitted by this Code, live parts of electrical equipment operating at 50 volts or more shall be guarded against accidental contact by approved enclosures or by any of the following means:

(1) By location in a room, vault, or similar enclosure that is accessible only to qualified persons.

(2) By suitable permanent, substantial partitions or screens arranged so that only qualified persons have access to the space within reach of the live parts. Any openings in such partitions or screens shall be sized and located so that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them.

(3) By location on a suitable balcony, gallery, or platform elevated and arranged so as to exclude unqualified persons.

(4) By elevation of 2.5 m (8 ft) or more above the floor or other working surface.

<u>(B) Live Parts Guarded Against Accidental Contact by Qualified Persons. Electrical equipment and devices operating at 50 volts or more that are likely to require examination, adjustment, servicing, or maintenance by qualified persons while energized, shall be guarded to prevent accidental contact from live parts or constructed so that openings to live parts of the devices and equipment will not permit the entry of a 12.5 mm (0.5 in.) diameter rod.</u>

Substantiation: 110.27(A) covers protecting unqualified persons from accidental contact from live parts. It does not cover protecting qualified persons from accidental contact on equipment that requires adjustment, servicing, or maintenance while energized. The proposed additional wording requires this equipment to be suitably guarded against accidental contact or requires construction that limits the exposure size to exposed live parts. The 12.5 mm (0.5 in.) diameter dimension is based on IP 20 "touch safe terminals". Precedence on the use of the 12.5 mm diameter openings without using the term "touch safe terminals" was established in section 12.5.1.1 Exception No. 4, NFPA 79-2002.

Panel Meeting Action: Reject

Panel Statement: The current NEC language provides sufficient guarding of live parts from accidental contact regardless of the qualification status of the person. The panel does not accept the addition of the new item (B) because it would require that all electrical equipment be provided significant additional guarding inside of the equipment, which is both impractical and unreasonable. Given the type of work that occurs inside of a piece of equipment, the definition of what constitutes "accidental contact" is extremely broad and unclear. The panel notes that the only positive way to ensure that accidental contact with live parts does not occur is to deenergize the equipment prior to working on it.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BARRIOS, JR., L.: The panel action should have been "accept" rather than "reject". The provisions in the current text of 110.27 do not address exposed live parts contained inside enclosures such as control cabinets, junction boxes, uninterruptible power supplies, and adjustable frequency drives.

Troubleshooting this equipment is often required to be carried out by qualified persons while the equipment is energized. The intent of the submitter's proposal is to provide suitable guarding to prevent accidental contact or to utilize finger-safe terminals as is common outside of the US to protect qualified persons when working in these enclosures.

FLOYD, II, H.: As submitted, the proposal was seen as too restrictive. For example, it wold require touch safe terminals on residential switch and receptacle outlet devices. Although the proposal is overly restrictive in requiring touch safe IP20 design on all equipment, the panel could have accepted this in principle in part by identifying this an acceptable option, rather than a mandatory requirement. IP20 designs provide an inherently safer design that reduces the risk of inadvertent contact having the risk of electric shock or initiation of an arc flash. The NEC should acknowledge that the application of touch safe IP20 shrouded terminals provide a safer work environment for both qualified as well as unqualified personnel. These types of designs are widely used outside of the US and significantly reduce the risk of inadvertent personnel contact in industrial control panels and other equipment. The requirement for touch safe IP20 designs has proven both acceptable and reasonable in installations outside the U.S. I would encourage the submitter to resubmit a proposal that is somewhat less restrictive, describes this as an optional method, and perhaps provide examples of how other standards development organizations have successfully implemented this concept.

1-140 Log #3589 NEC-P01 **Final Action: Reject**
(110.27)

Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise as follows:

Entrance to rooms and other locations that contains live parts shall be marked with conspicuous signs ~~forbidding~~ restricting unqualified ~~person~~ persons ' movement i nside the limited approach boundary ~~to enter~~ .

FPN No. 1: NFPA 70E. Standard for Electrical Safety in the Work Place, provides assistance in determining Limited Approach Boundary .

Substantiation: NFPA 70E allows unqualified person to enter limited approach boundary under specific controls, supervision and instruction, from a qualified person.
Panel Meeting Action: Reject
Panel Statement: The proposal would permit unqualified persons access to locations having live parts without supervision, expecting them to know concepts such as "limited approach boundary".
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-141 Log #260 NEC-P01 **Final Action: Reject**
(110.27(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

(B) Prevent ~~Physical~~ Damage. In locations where electric equipment is likely to be exposed to ~~physical~~ damage, enclosures or guards shall be so arranged and of such strength as to prevent such damage.

Substantiation: The word is superfluous. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: "Physical damage" is a common term used in industry. Generally, it is damage caused to property from external events, such as accidents, vandalism, destruction, and other potential hazards. CMP-1 notes to the submitter that an enclosure does not protect equipment from internal events, such as caused by short-circuit and ground-fault conditions or computer and data errors. In addition, this proposal is in violation of 3.2.5.5 of the NEC Style Manual, as the term "physical damage" is a special term identified in that section.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-142 Log #406 NEC-P01 **Final Action: Accept**
(110.31(A))

Submitter: Sam Marcovici, NY City Buildings Dept.
Recommendation: Revise text to read as follows:

110.31 Enclosure for Electrical Installations.

(A) Fire ~~Resistivity~~ Resistance of Electrical Vaults. The walls, roof, floors, and doorways of vaults containing conductors and equipment over 600 volts, nominal, shall be constructed of materials that have adequate structural strength for the conditions, with a minimum fire rating of 3 hours. The floors of vaults in contact with the earth shall be of concrete that is not less than 4 in. (102 mm) thick, but where the vault is constructed with a vacant space or other stories below it, the floor shall have adequate structural strength for the load imposed on it and a minimum fire resistance of 3 hours. For the purpose of this section, studs and wallboards shall not be considered acceptable.

Substantiation: "Resistivity" is strictly an electrical term. The correct term to describe the fire ratings of materials is "Resistance", used by most building codes.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-143 Log #1436 NEC-P01 **Final Action: Reject**
(110.31(A))

Submitter: Wayne H. Robinson, Prince George County Government
Recommendation: Revise text to read as follows:

Where fire resistant vaults are required by 450.21(C), 450.26 and 460.2(A), the walls, roof, floors and doorways of vaults containing conductors and equipment over 600 volts, nominal, shall be constructed of materials that have adequate structural strength for conditions, with a minimum fire rating of 3 hours.

Substantiation: The present language leaves one to interpret that equipment rated over 600 volts; nominal should be installed in a vault. In determining whether a fire resistant vault is required depends on dry-type transformers rated over 35,000 volts, liquid filled transformers and capacitors, not if the equipment is rated over 600 volts.
Panel Meeting Action: Reject
Panel Statement: The requirements of 110.31(A) are general and do not supersede the requirements for the cited transformer and capacitor installations. There is no requirement that all equipment over 600 volts be installed in a vault. The panel concludes that all vaults in which over 600 volt equipment is installed shall have at least a 3 hour fire rating, not just required vaults.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-144 Log #2392 NEC-P01 **Final Action: Reject**
(110.31(A), FPN (New))

Submitter: James Troske, URS Corp.
Recommendation: Add a new FPN to read:

FPN: Vault as used here implies an enclosure of electrical equipment containing more than 1 US gallon of combustible fluid.

Substantiation: "Vault" is not defined in Article 100 and is used in 110.31 as an equal to room or closet. Without a definition of "vault" a strict reading of 110.31(A) requires a 3 hour fire rated enclosure around electrical equipment over 600V.
Panel Meeting Action: Reject
Panel Statement: The proposed FPN contains a requirement not permitted by Section 3.1.3 of the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-145 Log #3181 NEC-P01 **Final Action: Accept**
(110.31(C)(1), FPN)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete this FPN completely.
Substantiation: A review of 90.2 (A) and (B), the Article 100 definition of service point, the complete NEC text and specifically the text in Articles 225, and 230 leads one to believe that electrical wiring and equipment located on the load side of the service point is under the scope of the NEC. This FPN, which based on the text in 90.5(C) is not enforceable, provides no value to the NEC user.

If industry believes information in the NESC is necessary for installations on the load side of the service point, that information should included as requirements of the NEC, not as a FPN. As an FPN, it only adds to the confusion of designers, installers, and AHJ's working on installations working on premises wiring.

The FPN also appears to include a requirement, which is not permitted to be located in a FPN.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
LABRAKE, JR., N.: This proposal should be rejected. The FPN provides the user of the Code an applicable resource that also is adopted by governmental bodies to cover industrial substations or multi-building complexes. Although the submitter recognizes these rules are not covered fully in the Code, ANSI C2 provides the specific information for those installations under engineering supervision.

1-146 Log #3076 NEC-P01 **Final Action: Accept**
(110.32)

TCC Action: The Technical Correlating Committee directs the panel to reconsider their action relative to the necessity of a soft conversion. This action will be considered by the panel as a public comment.
Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise as follows:
914 ~~900~~ mm (3 ft)
Substantiation: This conversion is consistent with other NFPA standards.
Panel Meeting Action: Accept
Panel Statement: The panel concludes that the submitter's soft conversion is appropriate in accordance with 90.9(C)(4).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-147 Log #3223 NEC-P01 **Final Action: Accept in Principle**
(110.33, and 110.33(A) & (B))

Submitter: Robert Carbone, Fischback & Moore Electric Inc.
Recommendation: Revise text to read:
110.33 Entrance <u>to Enclosures Containing Electrical Equipment</u> and Access to Work <u>ing</u> Space.
(A) Entrance <u>to Enclosures</u> . At least one entrance not less than 610 mm (24 in.) wide and 2.0 m (6 1/2 ft) high shall be provided to give access to the <u>enclosures containing</u> ~~working space about~~ electric <u>al</u> equipment. Where the entrance <u>to the enclosure</u> has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
(B) Access <u>to Working Space</u> . Permanent ladders or stairways shall be provided to give safe access to the working space around electric equipment installed on platforms, balconies, or mezzanine floors or in attic or roof rooms or spaces.
Substantiation: This is essentially the same statement of problem and substantiation for the proposal I sent in for 110.26 & 110.26(C). Again, I have found Square D's website to be an extremely helpful resource for information associated with these hazards and am providing copies of some of that information as evidence of the hazard. This is the same information in my proposal for 110.26 and 110.26(C) and is submitted for consideration in its entirety as support of this change.
As Safety Director for a large NECA contractor, I have had a number of inspectors express concern that the intent of the existing language is not necessarily clear even though the inspectors that I have spoken with agree that the present language in the 2005 NEC clearly requires panic hardware on doors of electrical rooms to allow workers to quickly exit the room by leaning against the panic hardware rather than fumbling for a door knob. There seems to be some question as to how far away the doors need to be from the equipment before the doors would not need panic hardware.
Discussions with inspectors and fellow safety professionals agreed that the distance where doors that open out and have panic hardware is definitely more that the working distance required by the code. How far away would the doors need to be before they would not need to open out and have panic hardware? Agreement was reached that it would not be reasonable to expect doors 1,000 feet away to have panic hardware. So the distance is somewhere between greater than code required working distance and 1,000 feet.
Presentations given at IAEI meetings and in articles in their magazine, articles by Square D in various trade publications, and at seminars that I have attended make it clear that the hazard workers face extends well beyond the code required working distance. As a matter of fact, testing done by IEEE shows a dark cloud containing massive amounts of toxic vapors that would make it unlikely that a worker could find a doorknob, let alone operate it. The arc ball and toxic cloud clearly extend well beyond code required working distance and would necessitate a door to have panic hardware wherever that door is located. In addition Dupont's Nomex safety wheel requires workers to wear a switching hood to do voltage testing in 480 volt equipment. It would be extremely difficult for a worker to find and operate a doorknob. It makes perfect sense why you wrote the code requiring panic hardware on doors and for them to open out.
Presenters at seminars I attended also indicated that reported electrical injury to workers has occurred well beyond 10 feet. I am sure that people writing these rules have seen this testing and work for companies that have done this testing and could support my position as I know their companies have been part of this testing and have written about and use this information in their training.
Although I have a great deal of experience and have attended a number of seminars and presentations on the electrical hazards workers are exposed to, I know you cannot take my word for it. I know you need proof. I have found Square D's website to be an extremely helpful resource for information associated with these hazards and am providing copies of some of that information as evidence of the hazard. Although I am submitting these publications in their entirety, I will try to point you to a number of quotes. All submitted information is submitted for consideration in its entirety as support of this change.
In the "Arc Flash Overview" paper, it is reported that "five to ten arc flash explosions occur in electrical equipment every day in the United States...". In the section "An Arc Flash Defined" in the provided June 2003 EC&M article by George Gregory of Square D (document number 0613NA0301) titled "Preventing Arc Flash Incidents in the Workplace", Mr. Gregory states that "... an enormous amount of concentrated radiant energy explodes outward from electrical equipment...that can damage their eyesight, and a superheated ball of gas that can severely burn a worker's body...". An example of an explosion and worker wearing protection including a flash hood is shown in Square D's publication "Engineering Services, Power Systems Engineering, Arc Flash Analysys" (order number 0180HO0302). In the publication "Arc Flash: Understanding The Need For Increased Electrical Safety" (order number 0613BR0301) it is reported that "arc flash incidents typically occur in applications above 120V...". Also note the "side view" of an equipment rack during an arc flash explosion" shown in this same publication. Under the "Potential Equipment Damage" heading, note that "...temperatures of the arcing event can typically range form 5,000 degrees Fahrenheit and up...vaporizing the copper and steel components." In the Data Bulletin (0100DB0402) provided, it is reported that "...an "arc flash"...can result in significant damage to equipment or worse, injury or death to workers exposed to the fault." Again, all submitted information is submitted for consideration in its entirety.
I do not necessarily consider myself a code expert. The changes I offer above are the result of discussions, help, and advice from a number of coworkers who were extremely helpful in trying to get the code wording right. I was advised that the concept for panic hardware in this section was based on the concept for doors for transformer vaults. That is the basis for the change of wording. At first it did not make sense to talk about the enclosure. I, perhaps like most, thought of a box when I thought of an enclosure. When I was reminded to look at the definition of enclosure it made sense. Then, mirroring the words for the transformer vault doors to make them work in this section.
In summary, it is clear that the present language in the code requires doors to open out and have panic hardware. Because of that, it is clear that people involved in writing this rule already clearly understand the reasons why this rule is important to protect workers in electric rooms. Therefore, it is not my intent to change the rule to have electrical room doors open out and have panic hardware. It is important in my position as a safety professional for a large NECA contractor to support rules that will help improve worker safety. Having rules that are clear to inspectors, engineers, and contractors can only further that goal.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the title and first sentence of 110.33(A) as follows:
110.33 Entrance <u>to Enclosures</u> and Access to ~~Work~~ <u>Working</u> Space.
(A) Entrance. At least one entrance <u>to enclosures for electrical installations as described in 110.31</u> not less than 610 mm (24 in.) wide and 2.0 m (6½ ft) high shall be provided to give access to the working space about electric equipment.
Panel Statement: The panel does not necessarily agree with all of the submitter's substantiation. The panel concludes that the changes to 110.33 satisfy the concern of the submitter. The submitter's proposed changes to (B) have been incorporated into the panel action on the title of 110.33.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
MCMAHILL, L.: The additional text proposed to this section is unnecessary, overly restrictive and does nothing for safety. Section 110.31 addresses enclosure requirements and Section 110.33 is specific to access and entrance to the work space. Enclosure requirements are separate and distinct from work space requirements. The additional text will now unnecessarily require that an entrance be provided to the enclosure. The enclosure could be a wall, screen, or fence. Is the wall, screen, or fence is required to contain at least one entrance not less than 24 inches wide and 6-1/2 feet high? In addition, if the entrance has a personnel door(s), is it the intent that the door(s) must open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that open under simple pressure? Keep in mind that the enclosure could be on a platform or in a vault too. A platform may have a ladder and hatch for access and a vault may have a larger roll up door for access. Are they required to have an additional entrance? As worded, this requirement will likely be an enforcement quagmire and do nothing for personnel safety. If anything, it will make it easier for unqualified persons to attain access to the enclosure. Is this the intent of the change? Generally, the enclosure should have as few openings as possible. It should also be noted that in most instances the enclosure is a considerable distance from the work space. Keep in mind that the purpose of the enclosure is to deter access by other than qualified persons. Again, Section 110.31 addresses the enclosure and Section 110.33 addresses the working space. The enclosure is separate and distinct from the working space! For public safety, it is correct to keep it that way! CMP-1 should reject this change.

1-148 Log #1197 NEC-P01 **Final Action: Accept**
(110.33(A))

Submitter: Lanny G. McMahill, Phoenix, AZ
Recommendation: Revise second sentence:
Where the entrance has a personnel door(s) that is less than 3.7 m (12 ft) from the working space, the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
Substantiation: The new language clarifies that the personnel door(s) requirement applies to the working space. The 3.7 m (12 ft) distance is reasonable and provides for safe egress from the area. Currently, some are applying the requirement where the doors are a considerable distance from the working space.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
HICKMAN, P.: While we agree with the action of the panel, we do not necessarily agree with all of the substantiation of the submitter.

1-149 Log #2000 NEC-P01 **Final Action: Reject**
(110.33(C) (New))

Submitter: David Sroka, Turner Falls, MA
Recommendation: Add a new paragraph to read:
(C) Fire Extinguishers. A suitable listed, approved, portable fire extinguisher shall be located inside the work space near each entrance.
Substantiation: Safety improvement. This idea comes from the National Electrical Safety Code and the IEEE Guide for Substation Fire Protection.
Panel Meeting Action: Reject
Panel Statement: Requirements for fire extinguishers are outside the scope of the NEC.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-150 Log #186 NEC-P01 **Final Action: Reject**
(110.34(A))

NOTE: The following proposal consists of Comment 1-252 on Proposal 1-231 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-231 was:
Revise NEC 110.34 with the additions (underlined) and deletions (strike through) as shown. The entire text of 110.34(A) is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
110.34(A) Working Space. Except as elsewhere required or permitted in this Code, equipment likely to require examination, adjustment, servicing, or maintenance while energized shall have ~~the minimum~~ clear working space in the direction of access to live parts of the electrical equipment and shall not be less than specified in Table 110.34(A). Distances shall be measured from the live parts, if such are exposed, or from the enclosure front or opening if such are enclosed.
Submitter: Michael I. Callanan, IBEW
Recommendation: This proposal should be rejected.
Substantiation: The Submitter did not provide adequate technical substantiation to support the proposed recommendation. Section 110.26(A) is for equipment with 600 volts or less. Section 110.34(A) is for equipment with 601 volts or more. Section 110.32 states the minimum requirements for the height and width of working space. Section 110.32 also refers the user to 110.34(A) for the required depth of working space in the direction of access to live parts. Therefore, the Authority Having Jurisdiction (AHJ) would be correct in interpreting the provisions of Section 110.34(A). The present text is clear and addresses the concerns of the submitter. The term "likely" as per Section 3.2.1. and Table 3.2.1 of the NEC Style Manual is vague and unenforceable.
We agree with Mr. Hickman's negative vote that states that Section 110.34(A) is a stand-alone provision addressing clear working space in the direction to live parts. CMP-1 has strongly moved in the right direction over the past few Code cycles in regards to improvements about defining and maintaining working space. Acceptance of this proposal would be a step backwards.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
Panel Meeting Action: Reject
Panel Statement: The panel rejects Comment 1-252 and maintains the acceptance of the original Proposal 1-231 in the 2005 NEC Report on Proposals for the following reasons:
- That access to energized parts by qualified persons is common practice in over 600 volt applications;
- To provide for parallel text structure as in 110.26(A) for Code usability; and
- The term "likely to require" in Comment 1-252 in the 2005 NEC Report on Proposals is acceptable according to the NEC Style Manual.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-150. There still is no technical substantiation to warrant this change. It is not unusual to have unique or different rules for equipment operating at different voltages. We feel that this Panel Action is in violation of Section 3.3.5 of the Style Manual and cannot be considered an editorial change as suggested in the Panel Statement.

1-151 Log #3077 NEC-P01 **Final Action: Accept**
(110.34(A))

TCC Action: The Technical Correlating Committee directs the panel to reconsider their action relative to the necessity of a soft conversion. This action will be considered by the panel as a public comment.
Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise as follows:
762 ~~750~~ min (30 in.)
Substantiation: This conversion is consistent with other NFPA standards.
Panel Meeting Action: Accept
Panel Statement: The panel concludes that the submitter's soft conversion is appropriate in accordance with 90.9(C)(4).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-152 Log #1097 NEC-P01 **Final Action: Reject**
(110.34(B) and (C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: In (B) change "exposed wiring" to "exposed conductors."
Revise (C):
LOCKED ROOMS OR ENCLOSURES . The entrance to all building ~~s~~ areas , vaults, rooms, or similar enclosures containing live parts or exposed conductors operating at over 600 volts, nominal, shall be kept locked unless such entrances are under the observation of a qualified person or one empowered to forbid entry , at all times.
Substantiation: Edit. In (B), exposed wiring can be construed as including suitable raceways or cable assemblies which normally don't require separation. In (C) "exposed conductors" is used. Present literal wording of (C), appears to apply to the entrance of a high rise building which contains a dedicated area in the basement. A person doesn't have to be "qualified" (see definition) to forbid entry, security personnel for instance. Prevention of unauthorized entry is inferred but not specific. In comment 1-253 of the 2004 ROC, the panel states the presence of other than a qualified person cannot be guaranteed; that also applies to a qualified person. The word "similar" is proposed to exclude enclosures such as metal-enclosed switchgear for which 490.35(A) does not permit an alternate to locking.
Panel Meeting Action: Reject
Panel Statement: The panel concludes the proposed changes do not add clarity to the existing Code language. Wiring is not a specific term defined in the Code and is defined as a system of electrical distribution in the dictionary. The panel disagrees that parallel text structure of the term wiring relates to 110.34(C). A qualified person can forbid entry to unauthorized persons.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-153 Log #3081 NEC-P01 **Final Action: Reject**
(110.34(D))

Submitter: Michael A. Anthony, University of Michigan Business & Finance / Rep. Association of Higher Education Facilities Officers
Recommendation: Add text to read as follows:
110.34(D) (NEW) Emergency Illumination. All working spaces about electrical equipment shall be automatically illuminated upon loss of power. For a period of 90 minutes illumination levels shall be
(1) One footcandle (1-fc) along the floor to the established building emergency egress path.
(2) Two footcandles (2-fc) at all vertical surfaces where surface switchgear, permanent service directory, emergency transfer switches, or standby power switches are located.
Substantiation: During a forced outage this proposal will provide an illuminated egress path for the electrician who is working in the service equipment area without a flashlight. Electric service panels are not always installed along the 1-footcandle egress path required by the Life Safety Code

for everyone else in the building. The 2 footcandle requirement matches the illumination levels required by the NESC for substations and will provide sufficient illumination of emergency and/or standby power apparatus that may be needed to be operated to start up the emergency and/or standby power systems. Emergency illumination for electricians should be intuitively understandable and should not be left to the building codes. Emergency illumination for electricians should be considered a general requirement for an electrical installation and not a special condition addressable in Article 700. The per-unit cost to provide such illumination with surface mounted emergency lighting units is on the order of $1000 or less for both labor and materials in most parts of the US and is a relatively minor part of the capital cost to install switchgear over 600V.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that emergency illumination requirements are a function of the building codes and NFPA Life Safety Code and presents a design issue where 90.1(C) intends that the NEC is not to be a design specification. There is no justification presented to require emergency illumination for all electrical equipment over 600 volts. Emergency illumination requirements are covered in 700.16 and are not under the purview of CMP-1.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Abstain: 1
Explanation of Abstention:
ANTHONY, M.: This proposal should have limited the application of emergency lighting to only <u>service</u> equipment over 600V. See comment on negative for proposal 1-101.

1-154 Log #3479 NEC-P01 **Final Action: Reject**
(110.34(D))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
110.34(D) Illumination. Illumination shall be provided for all working spaces about electrical equipment <u>indoors or outdoors on roofs</u> .
Substantiation: This article needs rewording because lighting source is needed in these areas. Similar proposals were submitted for 210.70(C) and 110.26(D).
Panel Meeting Action: Reject
Panel Statement: The panel concludes that illumination is required for all working spaces for equipment operating at over 600 volts.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-155 Log #1106 NEC-P01 **Final Action: Accept**
(110.51(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete last sentence.
Substantiation: Edit. This requirement is unenforceable, and doesn't conform to Style manual. Attention should be paid to all applicable articles.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-156 Log #259 NEC-P01 **Final Action: Reject**
(110.51(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(C) Protection Against ~~Physical~~ Damage. Conductors and cables in tunnels shall be located above the tunnel floor and so placed or guarded to protect them from ~~physical~~ damage.
Substantiation: The word is superfluous. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is a common term used in industry. Generally, it is damage caused to property from external events, such as accidents, vandalism, destruction, and other potential hazards. CMP-1 notes to the submitter that an enclosure does not protect equipment from internal events, such as caused by short-circuit and ground-fault conditions or computer and data errors. In addition, this proposal is in violation of 3.2.5.5 of the NEC Style Manual, as the term "physical damage" is a special term identified in that section.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-157 Log #1539 NEC-P01 **Final Action: Accept**
(110.54(A))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 110 and revise text as shown for the affected NEC sections.
110.54(A): (A) Grounded and Bonded. All non-current-carrying metal parts of electric equipment and all metal raceways and cable sheaths shall be ~~effectively~~ <u>solidly</u> grounded and bonded to all metal pipes and rails at the portal and at intervals not exceeding 300 m (1000 ft) throughout the tunnel.
Substantiation: 110.54(A): The definition is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.
The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."
The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.
This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.
The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-158 Log #1445 NEC-P01 **Final Action: Reject**
(110.75(D))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
(D) Covers. Covers shall be over 45 kg (100 lb) or otherwise designed to require the use of tools to open. They shall be designed or restrained so they cannot fall into the manhole or protrude sufficiently to contact electrical conductors or equipment within the manhole. <u>Metal covers and other exposed conductive surfaces shall be bonded in accordance with 250.96(A).</u>
Substantiation: The intent of this section is to provide an effective ground fault current path for manhole covers, as required by 250.4(A)(3) and 250.4(A)(5). This language already exists in 314.30(D) for handhole enclosures, and should also be present here. I urge Panel 1 to consider the safety ramifications of not accepting this proposal.
Panel Meeting Action: Reject
Panel Statement: The construction requirements of manholes, unlike handholes, virtually exclude the covers from contacting energized parts. There

is no technical justification presented to require bonding of manhole covers. By 90.1(C), the NEC is not intended to be a design specification.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-159 Log #2351 NEC-P01 **Final Action: Reject**
(110.80 (New))

Submitter: John S. Whitney, Newton Sq., PA
Recommendation: Add new section:
Racking Cables and Conductors. Cables and conductors installed within manholes and other electric enclosures intended for personnel entry shall be racked to maintain raedy and safe access/egress. Cables and conductors shall not obstruct the standing area of the enclosure floor or the enclosure entrance. Cables and conductors shall be effectively secured to racks to safely withstand magnetic forces when subjected to short circuit current. Clamps or cable ties securing cables and conductors to racks shall be suitable to withstand the environment in which they are installed.
Substantiation: Hazards associated with manholes and other electric enclosures intended for personnel entry are directly related to the confined nature of the space and the limited access/egress. Cables and conductors shall be racked to provide physical protection for the cables and to maintain safe access/egress and working space within the enclosure. Cables that are not secured to racks often end up on the floor of the enclosure where they present a hazard to entrants and may be damaged by ladders, pumps, personnel, and tools lowered into the enclosures from above. Cables and conductors that are not effectively secured to racks to withstand magnetic forces may sustain damage or damage adjacent cables or conductors as a result of movement due to magnetic forces from fault current. Materials applied within underground enclosures are subject to moisture, condensation, and repeated or continuous submersion and shall be suitable for the environment.
Panel Meeting Action: Reject
Panel Statement: The concerns of the submitter are addressed in 110.74. By 90.1(C), the NEC is not intended to be a design specification.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-160 Log #2353 NEC-P01 **Final Action: Reject**
(110.81 (New))

Submitter: John S. Whitney, Newton Sq., PA
Recommendation: Revise text:
Unused openings shall be effectively closed.
Substantiation: Unused conduit openings shall be effectively closed to minimize ingress of fluids, gasses, moisture, and wildlife. Subsurface utility failures and ground water often result in accumulations of fluids, gases, mud, etc. within enclosures located below grade and within enclosures with conduits entering form below grade. Effectively closing unused conduits will miinimize ingress. Additionally, rodent and other wildlife activity will be minimized.
Panel Meeting Action: Reject
Panel Statement: CMP-1 concludes that the proposal does not contain a clear statement of the problem or substantiation for the change. See the Regulations Governing Committee Projects sections 4.3.3(b) and (d).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-161 Log #2354 NEC-P01 **Final Action: Reject**
(110.82 (New))

Submitter: John S. Whitney, Newton Sq., PA
Recommendation: Add new section:
Protection Against Corrosion and Deterioration. Equipment, cable racks, cable rack arms, other apurtenances and all supporting hardware shall be corrosion resistant and of materials suitable for the envoronment in which they are to be installed.
Substantiation: Materials installed in Underground enclosures are subject to repeated or continuous submersion and quickly deteriorate if not resistant to corrosion.
Panel Meeting Action: Reject
Panel Statement: CMP-1 concludes that the proposal does not contain a clear statement of the problem or substantiation for the change. See the Regulations Governing Committee Projects, sections 4.3.3(b) and (d).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-162 Log #2355 NEC-P01 **Final Action: Reject**
(110.83 (New))

Submitter: John S. Whitney, Newton Sq., PA
Recommendation: Add new section:
Cable Seals. All cables and conductors entering underground enclosures shall be effectively sealed.
Substantiation: Subsurface utility failures and ground water often result in accumulations of of fluids, gases, mud, etc. within enclosures located underground. Effectively sealing cable entries will minimize ingress.
Panel Meeting Action: Reject
Panel Statement: There is insufficient safety justification presented to require sealing of all cable entries. By 90.1(C), the NEC is not intended to be a design specification.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-163 Log #2356 NEC-P01 **Final Action: Reject**
(110.84 (New))

Submitter: John S. Whitney, Newton Sq., PA
Recommendation: Add new section:
Non Electrical Facilities. Non electric conduits, pipes, hoses, etc. transmitting or containing fluids or gases shall not be installed within or throuigh electric duct banks, manholes and other electric enclosures intended for personnel entry.
Substantiation: Duct systyems and manholes are valuable realestate for facility operators considering pathways for expansion or renovation of existing facilities. Existing spare duct space is a very attractive alternative when faced with the cost of underground construction. Comingling of systems introduces hazards outside the qualification of electrical workers. Prescriptive Code prohibiting comingling of facilities provides designers and installers with regulations to prevent such installation.
Panel Meeting Action: Reject
Panel Statement: The submitter's proposal is overly restrictive. For example, it could prohibit piping for a sump pump or the installation of optical fiber cables. Section 90.8(A) addresses wiring planning. CMP-1 concludes that the proposal does not contain a clear statement of the problem or substantiation for the change. See the Regulations Governing Committee Projects, sections 4.3.3(b) and (d).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
STAUFFER, H.: NECA supports accepting a new section 110.84. We believe the proposed new wording is similar to existing 300.8 and will contribute to safety for the same reasons. Fluids should not be deliberately introduced into electrical manholes and other electrical spaces intended for personnel entry. This is particularly true of gases, which may be flammable or pose an inhalation hazard for personnel working in such spaces.
We do not agree with the panel statement that Proposal 1-163 could prohibit the installation of optical fiber cables in these spaces. Optical fiber cables covered by Article 770 are a communications system within the scope of this Code. NECA intends to submit a public comment on this proposal, recommending the following language for new section 110.84:
110.84 Other Systems Not Permitted. Electric duct banks, manholes, and other electric enclosures intended for personnel entry shall not contain any pipe, tube, or equal for steam, water, air, gas, or any service other than electrical. This prohibition shall not preclude the installation of a sump pump with associated piping to drain a manhole or other electric enclosure intended for personnel entry.

1-164 Log #2357 NEC-P01 **Final Action: Reject**
(110.85)

Submitter: John S. Whitney, Newton Sq., PA
Recommendation: Add new section:
Identification of Cables and Conductors. Cables and conductors within enclosures intended for personnel entry shall be permanently and legibly tagged or labeled to indicate the owner, application, and the line or circuit number such as "METRO Electric Co. Circuit #123 15KV". Tags, labels and their attachments shall be durable and of materials suitable to withstand the environment in which they are installed.
Substantiation: Manholes and interconnecting duct systems are often shared by facility owners, serving utilities, and Municipal entities. Manholes may contain assortments of fiber optic and copper cables including communications, power, and data cables. Cables and conductors may be provided with physical protection such as inner duct or arc proofing. It is often difficult to determin the cable or conductor type or application through visual inspection of the jacket or insulation. To perform a hazard assessment of facilities installed within enclosures intended for personnel entry requires information regarding the facilities installed. When cables and conductiors are identified with legible tags or labels, the process of determining the application and owner is much simpler than searching through outdated records stored at a remote location. On site cable identification through field applied tags and labels expedites owner notification and the hazard assessment process when quick repair is a consideration.
Panel Meeting Action: Reject
Panel Statement: The proposal is too restrictive in that it requires identification of all cables and conductors in all enclosures intended for personnel entry. The subject matter of this proposal may be more appropriately addressed in Article 300.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

HICKMAN, P.: We are voting negative to the panel action to reject proposal 1-164. Our explanation is as follows:

This proposal should have been accepted. The submitter has identified a reasonable solution to a serious safety hazard. My notes indicate that there was a good deal of discussion surrounding this proposal with a number of organizations speaking in favor of it. We disagree that the proposal is too restrictive. While cutting an incorrect communication cable may not appear to have the same immediate consequences as cutting the wrong energized cable or conductor, these cables are often a vital link in both safety and commerce. This proposal is a reasonable and relatively cost effective way to improve safety. While Article 300 may be another place this proposal could have been submitted, as the Panel Statement suggests, we should not wait 3 years to consider this concept.

HITTINGER, D.: This proposal should be accepted. Identification of cables and conductors within enclosures would benefit personnel that must perform maintenance duties within the enclosure. In the process of determining cable application, conductor type and ownership, permanent marking should be done at the initial installation for future reference. Proper identification of cables would facilitate repairs and provide a level of safety to the worker engaged in the course of action.

1-165 Log #2994 NEC-P01 **Final Action: Reject**
(110, Part VI -(New))

Submitter: James J. Rogers, Bay State Inspectional Agency
Recommendation: Add new text as follows:

Insert in its entirety Part 1 of the 2002 National Electrical Safety Code pages 27 through 58 inclusive.

Substantiation: In submitting this proposal the submitter understands that it most likely will not be accepted in this fashion. However, due to changes in procedures by utility companies across the country many of the these installations are now privately owned and AHJs have nothing to enforce, this needs public review.
Panel Meeting Action: Reject
Panel Statement: No technical substantiation has been provided in accordance with the Regulations Governing Committee Projects, Sections 4.3.3(b) and (d). The referenced document part is not suitable for direct inclusion in the NEC without considerable modification.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

(Note: Sequence 1-166 was not used).

ARTICLE 200 — USE AND IDENTIFICATION OF GROUNDED CONDUCTORS

4-2 Log #2255a NEC-P04 **Final Action: Reject**
(Chapter 2)

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Reorganize Chapter 2 as follows: 200 –, 210 – Branch-Circuits and Feeders, 215 –Outside Branch-Circuits and Feeders, 220 – Branch-Circuit, Feeder, and Service Calculations, 230 – Ovecurrent Protection, 240 – Use and Identification of Grounded Conductors 250 –Grounding, 260 – Bonding, 280 – Surge Arrestors, 285 – Transient Voltage Surge Suppressors.
Substantiation: This change provides a more linear arrangement for Chapter 2 and places alike articles next to each other. Branch circuits and feeders can be combined into the same article as they are when installed outdoors. The separation of grounding and bonding requirements will provide clarity that each is a separate fundamental and both serve a separate function.
Panel Meeting Action: Reject
Panel Statement: There are special rules and requirements for outside branch circuits and feeders in Article 225 and these special considerations should not be mixed into the general requirements for branch circuits and feeders since this would make the NEC more difficult to use. There has been a concentrated effort for the past three or four Code cycles to make the NEC more user friendly and combining general branch circuit and feeder requirements with these special applications for outside of a building or structure is not user friendly. This proposal is not in conformance with 4-3.3(c) of the NFPA Regualations Governing Committee Projects in that it does not contain recommended text.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

10-3 Log #2255b NEC-P10 **Final Action: Reject**
(Chapter 2)

TCC Action: The Technical Correlating Committee advises that Chapter layout and numbering are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

The Technical Correlating Committee is forwarding this recommendation to the Usability Task Group for review.
Submitter: Bryan P. Holland, Holland Electric
Recommendation: Reorganize Chapter 2 as follows: 200 –, 210 – Branch-Circuits and Feeders, 215 –Outside Branch-Circuits and Feeders, 220 – Branch-Circuit, Feeder, and Service Calculations, 230 – Ovecurrent Protection, 240 – Use and Identification of Grounded Conductors 250 –Grounding, 260 – Bonding, 280 – Surge Arrestors, 285 – Transient Voltage Surge Suppressors.
Substantiation: This change provides a more linear arrangement for Chapter 2 and places alike articles next to each other. Branch circuits and feeders can be combined into the same article as they are when installed outdoors. The separation of grounding and bonding requirements will provide clarity that each is a separate fundamental and both serve a separate function.
Panel Meeting Action: Reject
Panel Statement: The organization and many of these articles of the NEC fall outside the scope of Code-Making Panel 10. This is a major change for which there is insufficient supporting substantiation. The panel requests that this proposal be reviewed by the Technical Correlating Committee for usability consideration.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

5-39 Log #2255 NEC-P05 **Final Action: Reject**
(Chapter 2)

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Reorganize Chapter 2 as follows: 200 –, 210 – Branch-Circuits and Feeders, 215 –Outside Branch-Circuits and Feeders, 220 – Branch-Circuit, Feeder, and Service Calculations, 230 – Ovecurrent Protection, 240 – Use and Identification of Grounded Conductors 250 –Grounding, 260 – Bonding, 280 – Surge Arrestors, 285 – Transient Voltage Surge Suppressors.
Substantiation: This change provides a more linear arrangement for Chapter 2 and places alike articles next to each other. Branch circuits and feeders can be combined into the same article as they are when installed outdoors. The separation of grounding and bonding requirements will provide clarity that each is a separate fundamental and both serve a separate function.
Panel Meeting Action: Reject
Panel Statement: No specific text was proposed to revise Article 250. No specific text was proposed to add new Article 260. The proposal does not meet the requirements of Section 4.3.3 of the NFPA Regulations Governing Committee Projects.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-40 Log #414 NEC-P05 **Final Action: Reject**
(200.2 Exception)

Submitter: Robert J. Walsh, City of Hayward
Recommendation: Exception: Circuits not requiring the use of a grounded conductor.
Substantiation: The section mandates the installation of the grounded conductor for all premise wiring systems. By definition, the premise wiring system is all of the circuitry between the service point and the furthest outlet. 210.10 and 215.7 permit ungrounded conductors to be tapped from ungrounded conductors of circuits that have a grounded conductor.

However, tapped circuits conductors do not reflect the connections of overcurrent devices to a panelboard supplying a feeder or branch circuit.

The addition of the exception would clarify the conventional practice of installing ungrounded and grounding circuit conductor without a grounded conductor.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that the grounded conductor is not always required to be run with every circuit. The proposed text may lead to a conflict with other requirements in the Code. The exception does not add clarity to the code.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

DOBROWSKY, P.: The concept of the proposal should be accepted. The existing language is not clear and including the panel statement material in the NEC is helpful.

5-41 Log #2063 NEC-P05 **Final Action: Accept in Principle**
(200.3)

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add the following new Exception.

Exception: Listed and labeled utility-interactive inverters used in distributed resource generation systems such as photovoltaic and fuel cell power systems may be connected to premises wiring line-to-line without a grounded conductor when the connected premises wiring or utility system supplies the ground reference.

Substantiation: In utility-interactive PV systems, the utility grid and its grounded neutral, and the grounded neutral at the service entrance provide the ground reference and meet the requirement in 200.3 so that all premises wiring stays referenced to the same ground as the utility.

The 240-volt inverters used in photovoltaic power systems and fuel cell power systems do not have an output or internal signal point that would be referenced to the grounded ac neutral. They do, of course, have a grounded chassis (via the ac equipment-grounding conductor). Since most use an internal or external transformer, the dc side of the system is also ground referenced with the negative or positive output conductor of the source connected to ground. The output ac currents from these inverters are injected directly at 240 volts into the premises wiring and into the utility power system without reference to ground.

All of these inverters have been evaluated for safety against UL Standard 1741 and all are being installed in compliance with the instructions and labels provided with the product (NEC 110.3(B)) which include the instructions to connect many of them line to line without a grounded conductor reference. These devices have been operated for more than 20 years without any safety problems associated with the lack of a grounded conductor reference.

The exception is needed to clarify the situation where safe, listed devices without a ground reference may safely be connected to premises wiring under specific conditions.

Panel Meeting Action: Accept in Principle

Revise the proposed text to read as follows:

Exception: Listed ~~and labeled~~ utility-interactive inverters identified for use ~~d~~ in distributed resource generation systems such as photovoltaic and fuel cell power systems ~~may~~ shall be permitted to be connected to premises wiring ~~line-to-line~~ without a grounded conductor where the connected premises wiring or utility system includes a grounded conductor. ~~supplies the ground reference~~ .

Panel Statement: The panel accepts the concept proposed by the submitter. Changes made to the original recommendation bring the proposed text in line with the NEC Style Manual.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-42 Log #2146 NEC-P05 **Final Action: Reject**
(200.6)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be referred to Code-Making Panel 6 for information.

Submitter: Roger Hewitt, Puget Sound Electrical Apprenticeship / Rep. IBEW LU #46

Recommendation: Delete existing text from 200.6 and replace with:

Insulated grounded conductors shall be identified in accordance with 310.12(A).

Substantiation: Multiple sections of the NEC must now be consulted to ensure proper conductor identification. Combining all conductor identification requirements in one section in Article 310 is logical.

Panel Meeting Action: Reject

Panel Statement: The scope of Article 200 states "Identification of grounded conductors" as to what is covered in Article 200. Section 200.6 is the appropriate location for this requirement. CMP-5 requests that this proposal be sent to CMP-6 for Information.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-43 Log #433 NEC-P05 **Final Action: Reject**
(200.6(A) & (E))

Submitter: Richard Angelin, McKee Foods Corporation

Recommendation: Strike all references to "three continuous white stripes".

Substantiation: Conductors are not finished like this, and rarely if ever have been used. This is not a common method of identification and causes confusion.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any technical substantiation or practical reason to support such a change. Conductors are manufactured in accordance with what is permitted by this section as a means of identification for grounded conductors. Manufacturers utilize this method in equipment such as manufacturer's wiring systems, office furniture, Tele-power-poles etc. This method also allows installers and manufacturers a means by which to meet the branch circuit identification requirements of 210.5(C). The conductors mentioned in the recommendation are manufacturered and available.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-44 Log #1464 NEC-P05 **Final Action: Reject**
(200.6(A)(3))

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

200.6 Means of identifying Grounded Conductors.

(A) Sizes 6 AWG or Smaller. An insulated grounded conductor of 6 AWG or smaller shall be identified by a continuous white or gray outer finish or by three continuous white stripes on other than green insulation along its entire length. Wires that have their outer covering finished to show a white or gray color but have colored tracer threads in the braid identifying the source of manufacture shall be considered as meeting the provisions of this section. Insulated grounded conductors shall also be permitted to be identified as follows:

(3) ~~Fixture~~ Luminaire wire shall comply with the requirements for grounded conductor identification as specified in 402.8.

Substantiation: With the changing of the term "fixture" to "luminaire", it only makes sense that the term "fixture wires" be changed to "luminaire wires".

For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.

Panel Meeting Action: Reject

Panel Statement: While the term "fixture" as relating to lighting fixtures has been changed to luminaires, the term for fixture wires applies to conductors that serve appliances or other devices and not just luminaires. The change in terminology will impose changes on the wire industry and those associated with no increase in safety or apparent benefit to users of the Code.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-45 Log #2545 NEC-P05 **Final Action: Accept**
(200.6(B))

Submitter: Timothy D. Curry, Curry Electric, Inc.

Recommendation: Add this language after the section:

Exception: Conductors larger than 6 AWG shall not be required to be marked or identified in conduit bodies that contain no splices or unused hubs.

Substantiation: The definition of "accessible" would include these conduit bodies. It is nearly impossible to install the markings, nor does it serve a purpose to require them in a conduit body where there is no realistic chance that anyone is going to try to splice or tap into the circuit. 250.119(A)(1) Exception uses same logic.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-46 Log #1699 NEC-P05 **Final Action: Reject**
(200.9 Exception)

Submitter: Charles M. Trout, Maron Electric Company

Recommendation: Delete the 200.9 Exception in its entirety.

Substantiation: The body of the text in 200.9 satisfactorily contains the necessary requirements of the safe termination of grounded conductors regarding means of identification of terminals. The exception permits a lesser degree of safety based on an undocumented qualified person hypothetically servicing the installation. No requirements are present to ensure that the conditions of maintenance and supervision to ensure that only qualified persons service the installation actually exist.

Panel Meeting Action: Reject

Panel Statement: The alternative in the exception to 200.9 continues to have occasional limited use within many electrical installations. CMP-5 addressed this issue in their actions to Proposals 5-31 and 5-32 (Log Nos. 3448 and 3449) in the 2005 NEC cycle. In addition, no safety incidents or evidence has been provided to the panel.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-47 Log #964 NEC-P05 **Final Action: Reject**
(200.11)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise:

~~POLARITY OF~~ CONNECTIONS . No grounded conductor shall be attached to any terminal or lead intended for connection to an ungrounded conductor . ~~So as to reverse the designated polarity.~~

Substantiation: Edit. Polarity is associated with direct-current circuits. Alternating-current conductors are not assigned polarities.

Panel Meeting Action: Reject

Panel Statement: Polarity in general means the relationship between two opposite attributes. Looking at other places where this word is used in the NEC, that is the idea that applies. The submitter has provided no technical substantiation to support narrowing the view of this term to apply only to dc.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

ARTICLE 210 — BRANCH CIRCUITS

2-7 Log #1449 NEC-P02 **Final Action: Reject**
(Table 210.2)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Add "Appliances" to the table, with a reference to Article 422. Delete "Central heating equipment other than fixed electric space-heating equipment" and its reference from the table.
Substantiation: Article 422 contains many instances that in theory permit deviation from Article 210. For example, storage type water heaters (422.13 and its fine print note). In this example, the fine print note clearly refers me to Article 422 for branch circuit requirements, not 210.19/210.20.
Panel Meeting Action: Reject
Panel Statement: The reference to 422.12 is to specifically provide information on the special purpose branch circuit required by Article 422. The more specific reference is more useful to the user.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-9 Log #1317 NEC-P02 **Final Action: Reject**
(210.4)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
210.4 Multiwire Branch Circuits.
(A) General. Branch circuits recognized by this article shall be permitted as multiwire circuits. A multiwire circuit shall be permitted ~~to be considered as~~ to supply multiple circuits. All conductors shall originate from the same panelboard or similar distribution equipment.
Substantiation: Article 100 clearly indicates that a multiwire Branch Circuit is to be considered a single circuit. Even if this single circuit supplies multiple loads, as is the case with a 3 wire branch circuit supplying two lighting loads.
Panel Meeting Action: Reject
Panel Statement: The submitters recommendation creates an inaccurate sentence. A multiwire branch circuit cannot supply "multiple circuits". The purpose of the statement in the present code is to allow a multiwire branch circuit to be considered as multiple circuits when applying the rules of Article 210.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-10 Log #2679 NEC-P02 **Final Action: Accept in Principle**
(210.4)

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:
210.4 Multiwire Branch Circuits.
(A) General. Branch circuits recognized by this article shall be permitted as multiwire circuits. A multiwire circuit shall be permitted to be considered as multiple circuits. All conductors shall originate from the same panelboard and shall be provided with a means to disconnect simultaneously all ungrounded conductors.
FPN: A 3-phase, 4-wire, wye-connected power system used to supply power to nonlinear loads may necessitate that the power system design allow for the possibility of high harmonic neutral currents.
~~(B) Devices or Equipment. Where a multiwire branch circuit supplies more than one device or equipment on the same yoke, a means shall be provided to disconnect simultaneously all ungrounded conductors supplying those devices or equipment at the point where the branch circuit originates.~~
(B) Line-to-Neutral Loads. Multiwire branch circuits supply only line-to-neutral loads.
Exception No. 1: A multiwire branch circuit that supplies only one utilization equipment.
Exception No. 2: Where all ungrounded conductors of the multiwire branch circuit are opened simultaneously by the branch-circuit overcurrent device.
FPN: See 300.13(B) for continuity of grounded conductor on multiwire circuits.
Substantiation: Multiwire branch circuits employing shared neutrals can offer unexpected shock hazards to electricians unless all ungrounded conductors from the multiwire branch circuit are disconnected simultaneously. The safety concern associated with unintentional voltage being present on multiwire branch circuits during maintenance is not always fully appreciated. An electrician may not know that a circuit is a multiwire branch circuit when work begins. Even if aware of a multiwire branch circuit, there is presently no requirement to identify and disconnect all ungrounded conductors of that multiwire branch circuit. The present NEC correctly recognized this as a safety issue in 210.4(B) for the limited situation of "more than one device or component on the same yoke". While the use of multiwire branch circuits is a valid use, it should be permitted only where a means is provided to disconnect simultaneously all ungrounded conductors of that circuit.
Panel Meeting Action: Accept in Principle
Revise the last sentence of 210.4(A) in the present code to read: "All conductors of a multiwire branch circuit shall originate from the same panelboard or similar distribution equipment."
Revise 210.4(B) in the present code to read: "Disconnecting Means. Each multiwire branch circuit shall be provided with a means that will simultaneously disconnect all ungrounded conductors at the point where the branch circuit originates."
Panel Statement: The panel has accepted the submitter's recommendation, but has revised the text in 210.4(A) and (B) to accomplish the intent of the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: The new requirement in 410.73(G) of the 2005 code requiring a disconnect for luminaries that are supplied from a multiwire branch circuit helps deal with the concerns of the submitter. Also, switches could be installed in "warehouse situations". For maintenance on the "circuit", at other locations a "qualified" person should be able to deal with the Multiwire issues in the circuit making it unnecessary to simultaneously disconnect all ungrounded conductors at the point where the branch circuit originates. By rejecting this proposal, the common practice of using SWD breakers on multiwire lighting circuits would be more practical rather than having to turn off all the lights with a 3 pole breaker.
Comment on Affirmative:
KING, D.: The revised text resulting from the panel meeting action on this proposal has significantly increased the level of safety for qualified persons working on multiwire branch circuits. I commend Panel 2 on their commitment to providing safer working conditions for persons working in the electrical industry.

2-11 Log #1555 NEC-P02 **Final Action: Accept**
(210.4(A), FPN)

Submitter: Technical Correlating Committee on National Electrical Code,
Recommendation: Make the following change in 210.4(A) FPN:
Change "neutral" to "neutral-conductor."
The revised text would appear as follows:
FPN: A 3-phase, 4-wire, wye-connected power system used to supply power to nonlinear loads may necessitate that the power system design allow for the possibility of high harmonic neutral- conductor currents.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: This proposal should have been rejected. Supporting documentation from the Technical Correlating Committee that was included with this proposal indicates that there could be confusion with what constitutes a "neutral conductor" as it is defined in the Technical Correlating Committee Task Group recommended definition. While reading the proposed Technical Correlating Committee definition of "neutral conductor", it should be noted that this definition could also apply to the equipment grounding conductor of the circuit. This would only add confusion for the code user in determining which conductor is the neutral conductor of the circuit. This proposal should be referred back to the Technical Correlating Committee for further consideration.
Comment on Affirmative:
BROWN, L.: The text at the end of the FPN should be changed from "high harmonic neutral-conductor currents" to high harmonic currents on the neutral conductor" to reflect the correct use of terms related to this situation.

2-12 Log #3071 NEC-P02 **Final Action: Accept in Principle**
(210.4(B))

Submitter: Michael Kovacic, TMK and Associates, Inc.
Recommendation: Revise text to read as follows:
210.4(B) Devices or Equipment. Where a multiwire branch circuit supplies more than one device or equipment ~~on the same yoke~~ , a means shall be provided to disconnect simultaneously all ungrounded conductors supplying those devices or equipment at the point where the branch circuit originates.
Substantiation: Problem: Electrocution of qualified persons working on multiwire branch circuits.
There is a fatality case currently in litigation by OSHA where an experienced veteran electrician was wiring a lighting circuit and was electrocuted. Although the circuit the electrician was working on was shut off at the circuit breaker, the lighting was part of a multiwire branch circuit where the other phase was on. When the electrician opened the neutrals, backfeed through the energized leg energized the opened neutrals the electrician was electrocuted. There have been a number of similar cases in recent years with this same situation and which have resulted in an electrocution. The proposed change would result in both legs of the multiwire branch circuit being deenergized when either leg was shut off and being worked, eliminating possible backfeed and electrocution. As the case is currently in litigation, further details are not yet available but the continuing hazard is clear.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action on Proposal 2-10. The revisions in Proposal 2-10 accomplish the intent of the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See reason on Explanation of Negative for Proposal 2-10.

2-13 Log #3377 NEC-P02 **Final Action: Reject**
(210.4(B))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete this paragraph.
Substantiation: Effective with the 2005 NEC, this rule is completely subsumed by 210.7(B). The revised wording in 210.7(B) covers both multiwire and multiple two- (or three-) circuit applications. It is unwise code administration to place different versions of the same rule in two different locations, particularly when the wording isn't quite the same.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree with the submitter's substantiation that the text is redundant with 210.7(B). Section 210.4 applies to all multi-wire branch circuits. 210.7(B) applies where two separate circuits may supply the equipment. See the panel action on Proposal 2-10.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-14 Log #3567 NEC-P02 **Final Action: Accept in Principle**
(210.4(B))

Submitter: John Grzywacz, U.S. Department of Labor Occupations Safety and Health Administration
Recommendation: Revise as follows:
210.4(B) Devices or Equipment. Where a multiwire branch circuit supplies more than one device or equipment ~~on the same yoke~~ , a means shall be provided to disconnect simultaneously all ungrounded conductors supplying those devices or equipment at the point where the branch circuit originates.
Substantiation: Problem: Electrocution of electricians working on multiwire branch circuits.
Substantiation: There is a current fatality case in litigation by OSHA where an experienced veteran electrician was wiring a lighting circuit and was electrocuted. Although the circuit the electrician was working on was shut off at the breaker, the circuit was part of a multiwire branch circuit where the other leg was on. When the electrician opened the neutrals, backfeed through the energized leg energized the neutrals which were opened and the electrician was electrocuted. There have been several similar cases in recent years where this same situation occurred and resulted in an electrocution. The proposed change requirements would result in both legs of the multiwire branch circuit being deenergized when either leg was shut off and being worked whereby eliminating possible backfeed and electrocution. Since the case is currently in litigation, the file is not yet available from OSHA, however, upon conclusion of the case the case file would be made available.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action on Proposal 2-10. The revisions in Proposal 2-10 accomplish the intent of the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See my Explanation of Negative for Proposal 2-10.

2-15 Log #3660 NEC-P02 **Final Action: Reject**
(210.4(B))

Submitter: James O'Driscoll, IBEW Local #98 / Rep. Eastern Code Advisory Group
Recommendation: Add to bottom of text - This means shall also disconnect all ungrounded conductors on an overcurrent condition.
Substantiation: If a fused safety disconnect switch is employed as the branch circuit overcurrent device, in the event of a ground fault, only one fuse could open, possibly leaving other energized ungrounded conductors present on this device. This would be a safety hazard. A circuit breaker sized with the proper number of poles would simultaneously open and de-energize all conductors upon a fault condition.
Panel Meeting Action: Reject
Panel Statement: The requirement only deals with disconnection requirements and not overcurrent requirements. Requirements for overcurrent protection are under the purview of CMP-10 in Article 240.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-16 Log #2251 NEC-P02 **Final Action: Accept in Principle in Part**
(210.4(D) (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.
Submitter: Michael L. Last, Na'alehu, HI
Recommendation: Add new text to read as follows:
(D) Identification of Ungrounded and Associated Grounded Conductors. At each branch circuit panelboard where multiwire branch circuits originated, there shall be means to identify all multiwire branch circuit ungrounded (phase or line) conductors (two or more) and their associated grounded (neutral) conductor. Such identification shall be permanent, by approved means, and prominently displayed. Identification shall also indicate the lines (phases) to which the individual ungrounded conductors are attached. At all other locations where it is possible to interrupt the integrity of the grounded (neutral) conductor of a multiwire branch circuits, similar means shall be made to identify said grounded conductor with its associated ungrounded conductors. At all locations where more than one multiwire branch circuit is present, each separate multiwire branch circuit shall be uniquely identified whereby each grounded conductor is readily identified to the corresponding ungrounded conductors of that particular multiwire branch circuit.
Substantiation: Multiwire branch circuits are unique in that when the integrity of the grounded (neutral) conductor is compromised, a serious voltage imbalance can occur. The effect of such imbalance can place the safety of the individual(s) performing work on said multiwire branch circuit at risk. The possibility exists also for detrimental consequences to the equipment connected to the multiwire branch circuit. Similarly, when an ungrounded conductor of a multiwire branch circuit is disconnected and then reconnected to a different phase (line), there exists the potential for the grounded conductor of this multiwire branch circuit to operate at a current value that exceeds its ampacity. Where all the ungrounded and grounded conductors of a multiwire branch circuit are contained within a cable assembly, it could be readily indicated which are the associated conductors, however, when the conductors of a multiwire branch circuit(s) are not part of a cable assembly - such identification is not readily apparent. The concern for the integrity of the grounded conductor is apparent in 300.12(B). Similar concern should be addressed at all points of a multiwire branch circuit, not just where devices connections are present. To stipulate that only qualified personnel would perform work on multiwire branch circuits, and, therefore, be cognizant of the associated hazards (i.e., voltage imbalance and grounded conductor ampacity) is to rely on a false premise. When an electrical professional encounters a multitude of conductors of varying colors, along with the need to perform the task in a timely manner, safety is not always paramount. This proposal will increase the level of safety by making the worker immediately aware of the multiwire branch circuit characteristics.
Panel Meeting Action: Accept in Principle in Part
Add a new 210.4(E) to read:
(E) Identification. The grounded conductor of each multiwire branch circuit shall be clearly identified by marking tape, tagging or other approved means to indicate which ungrounded conductors it is associated with at the panelboard or other point of origination.
Panel Statement: This action in concert with the action on Proposal 2-17 will enable the grounded conductor of a multiwire branch circuits to be identified at their point of origin to enable service personnel to clearly associate all conductors of a multiwire branch circuit. The panel does not agree that the requirement to identify the grounded conductor should apply to the entire circuit length.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
KING, D.: See my Affirmative with Comment on Proposal 2-10.

2-17 Log #3378 NEC-P02 **Final Action: Accept in Principle**
(210.4(D) (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Create a new 210.4(D) as follows:
(D) Conductors. The ungrounded and grounded conductors of each multiwire branch circuit shall be grouped using wire ties or similar means within the panelboard or other point of origination unless the circuit enters a cable or raceway unique to the circuit that makes the grouping obvious.
Substantiation: One of the problems of multiwire branch circuits is being assured that the neutral is really dead, and the only way to be sure of that is to be sure all the associated ungrounded conductors are disconnected. This comment works toward that end by forcing new installers to take care that they keep track of which white wire belongs with which colored wires and that they arrive at the same location. Although the requirement to originate in the same panelboard has been around for some time, it has been difficult to enforce, since everything connected will "work" if the rule is violated. It is true that occasionally one ungrounded leg of a multiwire circuit must be worked with the other legs still energized, however, it is still important to know which legs of the multiwire belong with which neutral, even if the not all the legs are disconnected.
Panel Meeting Action: Accept in Principle
Add a new 210.4(D) to read as follows:
(D) Grouping. The ungrounded and grounded conductors of each multiwire branch circuit shall be grouped by wire ties or similar means in at least one location within the panelboard or other point of origination.
Exception: The requirement for grouping shall not apply if the circuit enters from a cable or raceway unique to the circuit that makes the grouping obvious.
Panel Statement: The panel has accepted the concept but has added language to make it clear that the grouping is required at some point within the panelboard or other distribution equipment. This is necessary because not all arrangements of equipment would support grouping of the conductors along their entire length.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See my Explanation of Negative for Proposal 2-10.
Comment on Affirmative:
KING, D.: See my Affirmative with Comment on Proposal 2-10.

2-18 Log #2148 NEC-P02 **Final Action: Reject**
(210.5)

Submitter: Roger Hewitt, Puget Sound Electrical Apprenticeship / Rep. IBEW LU #46
Recommendation: Delete existing text from 210.5 and replace with:
<u>Branch circuit conductors shall be identified in accordance with 310.12 (ALL).</u>
Substantiation: Multiple sections of the NEC must now be consulted to ensure proper conductor identification. Combining all conductor identification requirements in one section in Article 310 is logical.
Panel Meeting Action: Reject
Panel Statement: The purpose of the requirement is to outline identification requirements for ungrounded conductors of branch circuits. The most logical place for those requirements is in the article dealing with branch circuits.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-19 Log #670 NEC-P02 **Final Action: Accept**
(210.5(C))

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
210.5 (C) Ungrounded Conductors. Where the premises wiring system has branch circuits supplied from more then one nominal voltage system, each ungrounded conductor of a branch circuit, where accessible, shall be identified by <u>phase and</u> system.
Substantiation: 210.4 in the 2002 NEC required identified by phase and system this identification helps installers and maintenance personnel identify what phase and system they will be services or working on and the hazards encountered.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-19; 2-22; 2-24; 2-290; and 2-292.

2-20 Log #1119 NEC-P02 **Final Action: Reject**
(210.5(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence:
Where the premises wiring system has branch circuits supplied from ~~more than one nominal voltage~~ system <u>s with different characteristics such as voltages, frequencies, or phases, or derived from separate services or separately derived systems,</u> each ungrounded conductor of branch circuits, where accessible, shall be identified by system.
<u>Exception: Conductors for emergency systems.</u>
Substantiation: Different voltages should not be the only criterion for identification. Wiring systems may be supplied from different services, different transformer vaults, on site local transformers, batteries, rectifiers, generators, etc., with voltages no different than other systems, where the potential hazard of misconnection is no less simply because the voltages are the same. The exception is proposed since Article 700 requires identification for emergency systems.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided substantiation to expand the requirement for identification beyond different voltage system. The substantiation submitted to the panel on this issue dealt specifically with different voltages.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-20; and 2-294.

2-21 Log #1444 NEC-P02 **Final Action: Reject**
(210.5(C))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
210.5 Identification for Branch Circuits.
(C) Ungounded Conductors. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit, where accessible, shall be identified by <u>voltage</u> system. The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment.
Substantiation: I applaud panel 2 in acceptance of this change to the 2005 cycle. I do believe, however, that it does need to be relaxed a bit. A very common application for wiring commercial buildings is to "tack" electrical rooms vertically on each floor, with a 480Y/277 volt panel, a transformer and 208Y/120 volt panel in each room. Because of this, each floor creates at least one new "system". With a high rise building, this can mean literally hundreds of different systems. Unfortunately, there are not enough colors of the rainbow to create a color scheme for each system. I urge the panel to consider accepting this change to require identification by "voltage system" as opposed to "system" in an effort to make this code requirement a possibility.
A similar requirement is being made to 200.6(D) for the purposes of correlation.
Panel Meeting Action: Reject
Panel Statement: The current text already states what the submitter is requesting. The "system" required to be identified is the "nominal voltage system" as stated in the first sentence of the current text.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-22 Log #2221 NEC-P02 **Final Action: Accept**
(210.5(C))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
(C) Ungrounded Conductors. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit, where accessible, shall be identified <u>by phase and</u> system. The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment.
Substantiation: In the 2002 code, identification was required by both phase and system for multiwire branch circuits. When the identification rule was expanded to cover other than multiwire branch circuits in the 2005 code, the requirement to identify by phase was deleted without substantiation. The identification by phase is required to help prevent overloading of grounded conductors when changes are made to the wiring system.
Panel Meeting Action: Accept

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-19; 2-22; 2-24; 2-290; and 2-292.

2-23 Log #2681 NEC-P02 **Final Action: Accept in Part**
(210.5(C))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting related to the use of possibly unenforceable and vague terms.
This action will be considered by the Panel as a Public Comment.
Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text of section as follows:
210.5 Identifications for branch Circuits
(C) Ungrounded Conductors. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit ~~, where accessible,~~ shall be identified by system at all termination, connection and splice points . The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means . The means of identification shall be documented in a manner that is readily available or ~~and~~ shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the installation, a cable and conductor numbering system shall be permitted to meet this requirement.
Substantiation: The current wording would require marking of the conductors at every conduit fitting and pull box or any other location where the branch circuit is accessible. The locations where the branch circuit is terminated, connected or spliced are the critical locations where the marking is needed. The revised wording would account for branch circuits installed using cables and branch circuits installed using single conductors in raceways. Many industrial facilities already have rigorous comprehensive cable and conductor labeling/numbering systems. These systems meet already intent of the requirement and should be allowed. Posting of the numbering system on the equipment is impractical and would be confusing to the people in the field in these kinds of establishments. These labeling/numbering systems are documented on drawings. In these facilities, the drawings are used to gain understanding of the installations and how modifications can be made.
Panel Meeting Action: Accept in Part
1. Accept the submitters revision to the first sentence that deletes the words “where accessible” and adds the words “all termination, connection and splice points”.
2. Accept the submitters revision to the second sentence so that the text reads “The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved
means. The means of identification shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment.”
3. Reject the new last sentence proposed by the submitter.
Panel Statement: The panel has accepted the revision to require the identification only at termination, connection and splice points and notes that the acceptance of 2-19, 2-22 and 2-24 will add the words “phase and” into the existing sentence.
The panel agrees that the identification should be permitted to be readily available and has accepted the revision as proposed by the submitter. The panel rejects the new last sentence because the identification proposed would already be permitted by the current text as an “approved means”. It is not the objective of the panel to detail every possible identification scenario.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
KING, D.: Panel 2 should have rejected the proposed text “The means of identification shall be documented in a manner that is readily available or.” This proposed text is vague and unenforceable and will greatly reduce the level of safety that now exists with the text as presently written in the code. Section 210.5(C) applies generally to all types of occupancies. There are no provisions in the proposed text to ensure that the documentation will be updated and available to electrical contractors, maintenance personnel or electrical inspectors after construction is completed. The present code text ensures that proper circuit identification is located at the point where the qualified person servicing the equipment performs the work.
WEBER, R.: I agree with the panel to accept the revision proposed, except for the change that adds the means to identify by allowing “documentation in a manner that is readily available or shall be permanently posted” created a problem. From the inspection community, when the identification of the ungrounded conductors is indicated by phase and system, it needs to be permanently posted at each panel board or distribution equipment. The proposed change could incorporate a file located somewhere to meet the intent of the language, which can be misplaced or lost at a critical time frame when it is most needed. It is our opinion the change to add “phase and” in Proposal 2-24, does make sense but allowing identification by some other manner that is readily available would cause future trouble for the enforcer.
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-23; and 2-291.

2-24 Log #2735 NEC-P02 **Final Action: Accept**
(210.5(C))

Submitter: Jim Pauley, Square D Company
Recommendation: Revise text to read as follows:
(C) Ungrounded Conductors. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit, where accessible, shall be identified by phase and system. The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment.
Substantiation: The objective of this change is for CMP 2 to clarify whether or not the ungrounded conductors are expected to be identified for just the system or whether the expectation is to have the ID provide both phase and system identification. Under the present requirement, all of the ungrounded conductors of one system could carry the same identification provided it is distinguished from the ungrounded conductors of the other system.
If accepted, the new text will clarify that the expectation is to be able to not only distinguish between the different systems, but between the different phases of the system as well.
The previous requirement in 210.4(D) for identification of ungrounded conductors in multi-wire branch circuits applied to both phase and system.
A companion proposal has been made to Article 215 for feeders.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-19; 2-22; 2-24; 2-290; and 2-292.

2-25 Log #2163 NEC-P02 **Final Action: Accept in Principle**
(210.5(C) & 210.4(D))

Submitter: Larry Cross, B.C.I.T. Adult Education
Recommendation: Revise text to read:
Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit, where accessible, shall be identified by phase and system.
Substantiation: The code should state that all ungrounded conductors of a branch circuit, where accessible, shall be identified by phase and system. In the 2005 NEC, the system is the only item that must be identified. This could pose as a potential hazard, dangerous situation and a critical issue that will impact safety due a phase conductors that are not identified properly. This could cause a cross phasing condition and connection between the two separated systems. Also, this Proposal was addressed in the 2005 Report on Proposal 2-30 Log #2788 NEC-P02 and it would appear that perhaps the panel missed the editorial.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel actions on Proposals 2-19, 2-22 and 2-24.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-26 Log #3652 NEC-P02 **Final Action: Accept in Principle**
(210.5(C) & 210.4(D))

Submitter: Larry Cross, Local Union #98 IBEW
Recommendation: Add text to read as follows:
Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit, where accessible, shall be identified by phase and system.
Substantiation: The code should state that all ungrounded conductors of a branch circuit, where accessible, shall be identified by phase and system. In the 2005 NEC, the system is the only item that must be identified. This could pose as a potential hazard, dangerous situations, and a critical issue that will impact safety due to phase conductors that are not identified properly. This could cause a cross phasing condition and connection between the two separated systems. Also, this proposal was addressed in the 2005 Report on Proposals 2-30 (Log #2788) NEC-P02 and it would appear that perhaps the panel missed the editorial.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel actions on Proposals 2-19, 2-22 and 2-24.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-27 Log #938 NEC-P02 **Final Action: Reject**
(210.5(C) and Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Where the premises wiring system has branch circuits supplied from ~~more than one nominal voltage~~ system s with different characteristics, such as voltage, frequencies or phases, or derived from separate services or separately derived systems, each ungrounded conductor of branch circuits, where accessible, shall be identified by system. (Remainder unchanged.)
Exception: Conductors for emergency systems shall not be required to be identified.
Substantiation: Different voltages should not be the only criterion for identification. Wiring systems may be supplied from different services, different transformer vaults, on site local transformers, batteries, rectifiers, generators, etc. with voltages no different from other systems, where the potential hazard of misconnection is no less simple because voltages are the same. The exception is proposed because Article 700 requires identification for emergency systems.
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 2-20.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-28 Log #1076 NEC-P02 **Final Action: Reject**
(210.5(C) and Exceptions 1, 2, and 3 (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
Where the premises wiring system has branch circuits supplied from ~~more than one nominal voltage~~ system s with different characteristics such as voltages, frequencies, phases, or supplied from different services or separately derived systems, each ungrounded conductor of a branch circuit, where accessible, shall be identified by system. Exception No. 1: Conductors for emergency systems.
Exception No. 2: Conductors in busways.
Exception No. 3: Where the Authority Having Jurisdiction determines that a system is sufficiently limited or separated from other systems identification shall not be required.
Substantiation: Different voltages should not be the only criterion for identification. Systems may be supplied from different services, different transformer vaults, local site transformers, batteries, rectifiers, generators, etc., with voltages no different than other systems, where the potential hazard of misconnection is no less. Exception No. 1 is proposed because Article 700 requires identification for emergency systems. It is impractical to identify busway conductors at every plug-in opening and connecting other system conductors to a busway is unlikely. Exception No. 3 provides some relief as, for example, a large industrial plant has multiple services or transformer vault, etc., and those systems supply limited or designated areas of the premises.
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 2-20. It is unnecessary to add an exception for busways since the identification means is typically already in place. Exception No. 3 three is not needed since the authority having jurisdiction has the latitude to determine “other approved means”.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-29 Log #3390 NEC-P02 **Final Action: Reject**
(210.5(C), FPN)

Submitter: Randall Opperman, Jr., O.S.C.Inc.
Recommendation: Add new text to read:
FPN No. 1: 240 volt single phase systems shall be identified by red and black marking.
FPN No. 2: 240 volt 3-phase systems shall be identified by black, orange, and blue mark.
FPN No. 3: 480 volt 3-phase systems shall be identified by brown, orange, and yellow markings.
FPN No. 4: 208 volt 3-phase systems shall be identified by black, red, and blue markings.
Substantiation: 210.5 does not specify how a branch circuit shall be identified, yet it tells us to identify it. An industry standard for electricians who use the NEC should be adopted by adding a FPN to the article.
Panel Meeting Action: Reject
Panel Statement: The requirement is intended to be flexible and allow identification means other than color code. In addition, the submitter”s proposed FPN’s are inappropriate because they contain requirements.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-29; and 2-289.

2-30 Log #2543 NEC-P02 **Final Action: Accept in Principle**
(210.5(C) Exception (New))

Submitter: Timothy D. Curry, Curry Electric, Inc.
Recommendation: Add this language after the section:
Exception: Conductors larger than 6 AWG shall not be required to be marked or identified in conduit bodies that contain no splices or unused hubs.
Substantiation: The definition of “accessible” would include these conduit bodies. It is nearly impossible to install the markings, nor does it serve a purpose to require them in a conduit body where there is no realistic chance that anyone is going to try to splice or tap into the circuit. 250.119(A)(1) Exception uses the same logic.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-23.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-30; and 2-293.

2-31 Log #2997 NEC-P02 **Final Action: Reject**
(210.6(D) Exception No. 3 (New))

Submitter: Robert H. Wills, Intergrid, LLC / Rep. Photovoltaic Industry Forum
Recommendation: Add the following exception at the end of 210.6(D) Branch-Circuit Voltage Limitations, 600 Volts Between Conductors:
Exception No. 3 to (D): For luminaries (fixtures) installed in direct current systems such as photovoltaic systems described in Article 690.
Substantiation: Fluorescent lighting in commercial and industrial buildings can be powered directly with DC power from photovoltaic (PV) systems. This is called Photovoltaic-Assisted Lighting (PAL) and was first demonstrated more than 20 years ago at a supermarket on Long Island, NY. Several test sites have been implemented since then without problem.
PAL systems can use standard electronic ballasts as these contain rectifiers and can work just as well on DC as AC Power.
The main advantages are efficiency and simplicity - no power conditioning is needed between the PV system and the luminaries.
Ballasts installed in these systems are listed for DC use.
AC ballasts operate best on DC if the DC voltage is near the rectified (peak) value of the normal AC supply.
For 277V AC ballasts, this peak voltage is 391V (with maximum of 430V at 110% of nominal AC voltage).
This also keeps currents low and reduces overall system costs.
210.6(D)(2) excludes luminaries for systems over 277V and thus making photovoltaic-assisted lighting systems using 277V AC ballasts impractical.
It is desirable to support this new technology of photovoltaic-assisted lighting in the NEC by making a provision for DC powered lighting systems with operating voltages up to 430V DC.
210.6(A)(1) limits the use of voltages greater than 120V to commercial and industrial sites.
Panel Meeting Action: Reject
Panel Statement: The recommendation proposed would allow a luminaire with up to 430V to be installed in a location where it could be easily accessed for changing lamps, etc. This defeats the intent of the requirement whichis to require luminaires with voltage supplies higher than 277V to be limited to very specific installations as described in 210.6(D)(1). There is no substantiation to allow luminaires supplied from PV systems to be treated any differently than luminaries power by AC line power.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-32 Log #2742 NEC-P02 **Final Action: Reject**
(210.6(D)(3))

Submitter: Wayne Gutschow, Nextek Power Systems, Inc. / Rep. Photovoltaic Industry Forum
Recommendation: Add the following to 210.6(D) Branch-Circuit Voltage Limitations, 600 Volts Between Conductors:
(3) the auxiliary equipment of electric-discharge lamps mounted in permanently installed luminaires (fixtures) when used in direct current systems.
Substantiation: Commercial fluorescent lighting systems can be powered directly with DC from photovoltaic (PV) systems. This is known as Photovoltaic-Assisted Lighting (PAL).
PAL was first demonstrated more than 20 years ago at a supermarket on Long Island, NY.
More recently, in 1992, the University of Massachusetts at Lowell installed a research system on the Bradlees Department Store in Medford, MA, that has been working flawlessly ever since.
The main advantages of PAL systems are:
- Standard electronic ballasts can be used as they contain rectifiers and work just as well on DC as AC power.

- The lamp terminals are provided with the same voltages as on AC systems - only the ballast input is changed.
- Efficiency: no power conversion equipment is needed between the photovoltaic system and the light ballasts. This can save 5% or more of a building's total lighting load.
- Battery backup can easily be added to provide lighting during power outages.
- The DC bus can also be powered directly from other sources of DC power such as fuel cells and micro-turbines.

Ballasts installed in these systems should, of course, be listed for DC use and 410.74 requires that luminaires be marked for dc operation. (For example, the Sylvania QHE/Universal series is UL listed for use on 380V DC).

A grid-powered AC rectifier is used in PAL systems to supply power at night and on cloudy days.

AC ballasts operate optimally on DC if the DC voltage is near the rectified (peak) value of the normal AC supply. For 277V AC ballasts, this peak voltage is 391V (with a maximum of 430V at 110% of nominal AC voltage). This also keeps currents low and reduces overall system costs.

210.6(D)(2) was changed in the 2005 code, excluding luminaires for systems over 277V and thus making photovoltaic-assisted lighting systems using 277V AC ballasts impractical.

It is desirable to support this new technology of photovoltaic-assisted lighting in the NEC by making a provision for DC powered lighting systems with operating voltages up to 430V DC.

The suggested wording limits the application specifically to light ballasts (the auxiliary equipment of electric-discharge lamps), and also to permanently installed luminaires. 210.6(A)(1) limits the use of voltages greater than 120V to commercial and industrial sites.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 2-31.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-33 Log #668 NEC-P02 **Final Action: Accept in Principle**

(210.7)

Submitter: Jamie McNamara, Hastings, MN

Recommendation: Revise as follows:

210.7 Branch Circuit ~~Receptacle~~ Requirements.

Substantiation: Change the heading to read **Branch Circuit Requirements** . 210.7 cover more than receptacles (B) reads **"(B) Multiple Branch Circuits.** Where two or more branch circuits supply device or equipment on the same yoke, a means to simultaneously disconnect the ungrounded conductors supplying those devices shall be provided at the point the branch circuits originate."

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-35.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

(Note: Sequence 2-34 was not used)

2-35 Log #3666 NEC-P02 **Final Action: Accept**

(210.7)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Retitle this section "Branch Circuit Requirements for Device Connections and Locations."

Substantiation: This proposal eliminates the direct conflict between the section title, which only covers receptacles, and (B) which was broadened in the 2005 cycle to include all other equipment that might be fed by multiple circuits, whether multiple two- or three-wire, or multiwire.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-36 Log #87 NEC-P02 **Final Action: Reject**

(210.7(C) (New))

Submitter: Robert A. Kelly, Robert A. Kelly and Associates

Recommendation: Add a new paragraph (C) to Section 210:7:

(C) Receptacle outlets installed in a wet location shall be connected to circuits having ground-fault circuit-interrupter protection.

Substantiation: On two occasions in the past year, I have been called to make repairs to outside duplex receptacles destroyed by arcing.

In the first case, the duplex receptacle was in a flush mounted metal outlet box with a weatherproof cover in an outside wall sided with cedar shakes (a wet location). The outlet was not in use and the cover was shut. The weather was humid (late evening) but it had not been raining. The wiring method was nonmetallic sheathed cable. Moisture was able to enter the duplex receptacle and cause tracking internally, with the resulting arc creating a great deal of smoke. I was told the overcurrent device tripped, opening the circuit.

In the second case, the duplex receptacle was in a flush mounted metal outlet box with a weatherproof cover in an outside wall of brick veneer (a wet location). The outlet was not in use and the cover was shut. The weather was humid (early AM) but it had not been raining. The wiring method was armored cable. Moisture was able to enter the duplex receptacle and cause tracking internally, with the resulting arc creating smoke and fire, destroying the wooden sheathing in the vicinity of the outlet and a portion of the wooden stud to which the sheathing was nailed. I arrived after the firemen put the fire out and found the overcurrent device had tripped, opening the circuit. In addition to destroying the duplex receptacle, about four inches of the armored cable outside the outlet box and inside the wall was destroyed. The armored cable had been secured to the outlet box via a knockout and clamp.

To the best of my knowledge, the installations at both residences met all current Code requirements except for having ground-fault circuit-interrupter protection for personnel per 210.8(A)(3).

As you are aware, moisture and electricity do not mix. Given the materials from which receptacles are made (GFI and conventional), moisture makes them susceptible to tracking and arcing. While GFI receptacles provide protection to personnel, they, like conventional receptacles, with the presence of moisture (from condensation or seepage), can track from the live parts to other grounded parts, creating an arc and causing damage.

Use of a GFI receptacle in a wet location would not be a solution as it does not have the ability to disconnect power from its supply terminals. (I have had to replace GFI receptacles that were damaged by moisture.)

By requiring ground-fault circuit-interrupter protection upstream from a receptacle exposed to moisture, if racking does occur, as soon as the grounding conductor becomes involved, either from tracking or via combustion products and usually quickly, the circuit will be interrupted and damage will be significantly limited.

Use of ground-fault circuit-interrupter protection upstream from places where moisture is present will provide excellent protection to susceptible equipment and would have prevented the fire in the second case described above.

Panel Meeting Action: Reject

Panel Statement: The submitter notes that in both instances cited, GFCI protection was not provided as required by the current edition of the Code. The submitter has not provided sufficient substantiation to change the current requirement.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-37 Log #2663 NEC-P02 **Final Action: Reject**

(210.8)

Submitter: Anthony J. Denami, Nash Lipsey Burch, LLC

Recommendation: (A) Dwelling Units and (3) Other than Dwelling Units.

Add requirement for lighting installed in showers over bath tubs and within 6 feet of shower/tub to be protected by ground fault interrupter.

Substantiation: The receptacle located adjacent to the basin has GFI protection and most have feed through protected feature. It would not cost any more to connect this lighting to the GFI and the protection for personnel is achieved. This would also apply to hotels, motels and similar facilities.

Panel Meeting Action: Reject

Panel Statement: The proposal does not recommend specific code text as is required by Section 4.3.3(c) of the NFPA Regulations Governing Committee Projects.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-38 Log #2415 NEC-P02 **Final Action: Reject**

(210.8(7))

Submitter: Dan Frohberg, Northeast Community College

Recommendation: Add new text to read:

Exception No. 1 to (7): Receptacles that are not readily accessible.

Exception No. 2 to (7): A single receptacle or a duplex receptacle for two appliances located within the dedicated space for each appliance that, in normal use, is not easily moved from one place to another, that is cord and plug connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

Substantiation: The receptacles that would be affected are those within six feet of a laundry sink such as the washer or gas dryer, or a small refrigerator in a built in bar. We are given the same exceptions in other areas of the structure. This will make the exceptions standard throughout.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated the need for exceptions to the GFCI requirement. All of the equipment mentioned in the submitter's substantiation is compatible with GFCI protection.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-39 Log #558 NEC-P02 **Final Action: Reject**

(210.8(A))

Submitter: Tracy Barnett, Dickson, TN

Recommendation: Add additional wording to read:

The GFCI when in the tripped position shall not significantly impede the lighting in that area.

Substantiation: Lighting in these areas when lost due to a tripped GFCI can

introduce a hazard. As an electrical inspector, here are two examples I see: 1) lighting in stairs leading down to garage and garage lighting all on load side of GFCI for garage receptacles; and 2) lighting under floor will be on load side of GFCI service receptacle for HVAC.
Panel Meeting Action: Reject
Panel Statement: The submitter"s recommendation is a design issue. In addition, the words "significantly impede" are vague and unenforceable. The panel notes that there is no prohibition for any general lighting to be supplied by a GFCI and adding such a limitation would be design restrictive.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: From an emergency egress safety standpoint the submitter does address an issue of most
importance - That being the ability to see to safely egress a space. In most commercial
occupancies an emergency lighting is now installed in restrooms. In the case of a power failure the occupant has the ability to egress the restroom, as well as all other parts of the means of egress to the exit discharge. As a GFCI (or an AFCI for that matter) has the potential to disconnect the power to the lighting of an area (either through a fault or unintentional tripping) this could impede the egress from the space. This is of particular concern to those with disabilities. The installation of lighting on a GFCI protected circuit where there is no emergency lighting raises the potential for this problem and possible harm to the occupants. I would encourage the Submitter to submit a Public Comment on this change, using text that is written in enforceable code language. I also encourage the Panel to consider this concern, not from a design standpoint of receptacle protection, but the potential of physical harm to the occupants, especially those with disabilities when the lighting is connected to a GFCI protected circuit.

2-40 Log #3601 NEC-P02 **Final Action: Accept in Principle**
(210.8(A))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal adds the additional new sentence after the existing sentence in 210.8(A)(5).
The Technical Correlating Committee understands that the Panel Action on Proposal 2-41 modifies the Panel Action on this Proposal and reidentifies the existing Exception No. 3 as Exception.
Submitter: Douglas Hansen, Code Check
Recommendation: Eliminate exception number 2 to (2) and eliminate exception number 2 to (5).
Substantiation: The change in 210.8(A)(7) in the 2005 edition has created a contradiction. If a laundry or utility sink is present in a garage or basement, and a clothes washer receptacle is within 6 feet of that sink, it now requires GFCI protection. The existing exceptions are no longer necessary. The present generation of GFCI devices do not have the problems of "nuisance tripping" that plagued the earlier devices.
Panel Meeting Action: Accept in Principle
In addition to deleting the exceptions the following text is to be deleted from 210.8(A)(2) and.
~~"Receptacles installed under the exceptions to 210.8(A)(2) shall not be considered as meeting the requirements of 210.52(G)."~~
Revise the current code text in the last paragraph of 210.8(A)(5) to read:
"Receptacles installed under the exception ~~s~~ to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G)."
Panel Statement: The meeting action taken by the panel correlates with the accepted recommendation to delete the exceptions.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
BROWN, L.: I sincerely hope, from the discussion by the "experts" on the Panel, that the "problem" of "nuisance tripping" no longer exists. These two Exception were developed to address certain and clear needs. The Submitter's Substantiation related the need to delete these Exceptions to the installation of a utility sink and clothes washer. Using Exception #2, it is a refrigerator or freezer located on a GFCI protected circuit in a garage or basement loosing power and spoiling its consumable contents that is still of concern.
PURVIS, R.: The Submitter has not provided sufficient substantiation ("The existing exceptions are no longer necessary") to expand the requirements for GFCIs in dwellings.

2-41 Log #3602 NEC-P02 **Final Action: Accept**
(210.8(A))

Submitter: Douglas Hansen, Code Check
Recommendation: Eliminate exception #1 to (2) and exception #1 to (5).
Substantiation: Being "readily accessible" is too vague a standard. A garage door opener might not be readily accessible to a person who is 5 feet tall, and it could be accessible to a person who is 6 feet tall. There is no longer a need for these exceptions. The current generation of GFCI devices do not have the problems of nuisance tripping that were common with older GFCIs.
Panel Meeting Action: Accept
Panel Statement: See the panel action on Proposal 2-40.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See my Explanation of Negative for Proposal 2-40.

2-42 Log #3553 NEC-P02 **Final Action: Reject**
(210.8(A) & (B))

Submitter: Wayne Clevenger, Durham City/ County Inspections
Recommendation: Revise as follows:
210.8(A)(9) and 210.8(B)(6):
All 125 V receptacles located within 6 ft of sink, tub, or other body of water shall be GFCI protected.
Substantiation: Outlets in dwellings are often located within 6 ft of kitchen sink or utility sink not GFCI protection (most appliance cords 6 in. in length)
Outlets in commercial break rooms with sink not GFCI protected.
Isn't this what the code should require since GFIs are made for.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided substantiation to expand the GFCI requirement in such a general manner.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: I disagree with the panel action to reject this proposal. Panel 2 has accepted this proposal in part with the panel meeting action on proposal 2-81. The panel action on proposal 2-81 requires GFCI protection for all receptacles installed within 6 feet of a sink in other than dwelling units. In proposal 2-81, the submitter substantiated that the same electrical hazard exists in the area of a sink regardless of the type of occupancy where the sink is installed and that the same requirements for GFCI protection should be applied consistently to all receptacles installed in close proximity of a sink. Panel 2 has recognized the need for GFCI protection within 6 feet of sinks in dwelling units for many years. The present code text would allow for the installation of a receptacle within 6 feet of a kitchen sink without GFCI protection if the receptacle were to be installed more than 12 inches below the surface of the countertop. The submitters proposed text would require this receptacle to have GFCI protection and make
the requirements for GFCI protection within 6 feet of a sink in dwelling units the same as they are for installations in other than dwelling units.
Comment on Affirmative:
BROWN, L.: The term "other body of water" is too vague and would include water in a bucket or portable tub, and a puddle of water on the floor.

2-43 Log #1620 NEC-P02 **Final Action: Reject**
(210.8(A), Exception to (7))

Submitter: John Powell, Independence, OR
Recommendation: Add new text as follows:
<u>Exception to (7): A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and -plug connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).</u>
Substantiation: Currently, 210.8(A)(7) would not allow a 125-volt washing machine to be located within 6 ft of a laundry sink unless the receptacle is GFCI protected. GFCI protection of washing machines are prone to nuisance tripping. This exception will mirror exceptions granted to 210.8(A)(2) for garages.
Panel Meeting Action: Reject
Panel Statement: The objective of the current requirement is to include the washing machine receptacle if it is installed within 6 feet of the sink. The panel disagrees with the submitter in the statement that "washing machines
are prone to nuisance tripping". A GFCI trips when the ground fault current exceeds 4-6mA. Washing machines are limited to leakage currents well below this threshold. If the washing machine has leakage current that exceeds the trip limits, the washing machine should be examined and repaired.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-44 Log #126 NEC-P02 **Final Action: Reject**
(210.8(A) Exception No. 3)

Submitter: Louis Roselle, Louis Roselle Electrical Cont. Inc.
Recommendation: Revise as follows:
Exception No. 3: A <u>single</u> receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground fault circuit-interrupter protection.
Substantiation: Exception No. 2 states a single receptacle or a duplex receptacle for the twoappliances.
Life Safety Equipment, I feel, are not appliances as listed in Article 100. The word "single" would leave no doubt.
Panel Meeting Action: Reject
Panel Statement: Many power supply units for these systems have a retention screw that holds the power supply in place. Requiring a single receptacle

would defeat the ability to use the center of a duplex receptacle as a means to hold the supply in place. The panel notes that the use of the other receptacle can be limited by removing the tabs from the duplex receptacle. The panel understands that the recommendation is for Section 210.8(A)(5) Exception No. 3.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-45 Log #2152 NEC-P02 **Final Action: Reject**
(210.8(A)(1))

Submitter: Darwin Jones, IBEW
Recommendation: Revise text to read:
210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.
(A) Dwelling Units. All 125-volt, single phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (8) shall have ground-fault circuit-interrupter protection for personnel.
(1) Bathrooms. <u>The ground fault circuit interrupter receptacle or device, protecting a bathroom shall be located in the bathroom being protected.</u>
Substantiation: 210.11(C)(3) requires an individual branch circuit to serve bathroom receptacle outlet(s). Such circuits shall have no other outlets. It states in the exception that if that branch circuit supplies a single bathroom that it may also serve other loads in that bathroom. This statement then obivously allows a single branch circuit to serve multiple bathrooms providing that it serves only the receptacle outlets.
As an Electrical Inspector for the State of South Dakota, I see many residences with multiple bathrooms on different levels being served by one individual branch circuit serving only the receptacle outlets. The electricians are placing the GFCI device in the bathroom located closest to the panel and protecting the other bathrooms which contain a standard duplex receptacle. When and if the GFCI device trips, it requires the homeowner to go to the location of the GFCI device to reset it. This trip could require going up or down two flights of stairs. The homeowner may have bare feet, slippers, loose fitting clothing or other encumbrances that are dangerous for climbing stairs. It is also very inconvenient for the homeowner. While the present code protects the individual from an electrical injury, it does in fact, invite the possibility of other injuries caused by the process of resetting the very device designed to protect them.
Panel Meeting Action: Reject
Panel Statement: This is a design issue and may be an inconvenience, but it is not an unsafe application.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
KING, D.: I agree with the panel action based on the substantiation that was provided. I disagree with the panel statement that this is a design issue and that it is not an unsafe application. The submitter of this proposal has raised a valid safety concern that should be considered further by panel 2.

2-46 Log #2349 NEC-P02 **Final Action: Reject**
(210.8(A)(1))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Add Exceptions No. 1 and No. 2 that are in 210.8(A)(2).
Substantiation: This change will provide NEC and enforcement logic. There was a debate on the laundry in the bathroom a couple of Code cycles ago, the concern was that people could hop out of the shower and get clothes out of the laundry equipment. There is no relief from ground fault protection.
Presently, relief is granted for basements and garages even though basements and garages typically have concrete floors. In the summer, it is common for homeowners to be barefoot.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree that equipment in bathrooms should be exempt from the GFCI protection requirements. The change recommended by the submitter reduces the protection provided without substantiation. See the panel action on Proposals 2-40 and 2-41.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-47 Log #1853 NEC-P02 **Final Action: Reject**
(210.8(A)(2))

Submitter: Rand Veerman, Town of Normal
Recommendation: Receptacles installed under the exceptions to 210.8(A)(2) shall not be considered as meeting the requirements of 210.52(G) <u>and shall be marked "Warning: No GFCI Protection."</u>
Substantiation: People who own newer homes assume that basement and garage receptacles are GFCI protected. When the original owner moves out taking his appliances, the second homeowner is left with unmarked and unprotected receptacles. This poses an obvious danger.
Panel Meeting Action: Reject
Panel Statement: The panel has deleted the exceptions. See panel action on Proposals 2-40 and 2-41.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-48 Log #3138 NEC-P02 **Final Action: Reject**
(210.8(A)(2))

Submitter: Dale Rooney, Municipality of Anchorage
Recommendation: Add new sentence after exception no. 2 (not part of ex. No. 2) to read:
Exceptions nos. 1 and 2 shall only be permitted after incompatible equipment has been identified and investigated for leakage current.
Substantiation: Despite improvements in the product standards for appliances and GFCI devices, there is a longstanding assumption that certain appliances should not be used on GFCI protected circuits. This new requirement will force electricians to test not only the equipment but their own assumptions as well.
Panel Meeting Action: Reject
Panel Statement: The panel has deleted the exceptions. See panel action on Proposals 2-40 and 2-41.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-49 Log #2118 NEC-P02 **Final Action: Reject**
(210.8(A)(2)(5), Exception No. 2)

Submitter: Jennifer Eigenberger, Lakeshore Technical College
Recommendation: Revise as follows:
A single receptacle <u>for one appliance</u> or a duplex receptacle for two appliances...
Substantiation: As an instructor, I often see difficulties interpreting this section. Many students believe the wording means that an installer has a choice of a single or a duplex receptacle. I believe the confusion would cease by adding three words, "for one appliance."
Panel Meeting Action: Reject
Panel Statement: The panel has deleted the exceptions. See panel action on Proposals 2-40 and 2-41.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-50 Log #3180 NEC-P02 **Final Action: Accept**
(210.8(A)(2) Exception No. 1 to (2))

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete this exception completely.
Substantiation: The protection afforded by GFCI is not related to the location of the receptacle. If cord and plug connected utilization equipment is powered from this receptacle and has leakage current at a level that will trip the GFCI, protection should be provided. The permitted leakage current for typical cord and plug connected equipment is.5 ma. The trip range for GFCI protective devices is 4-6 ma. For this utilization equipment to trip the GFCI device, it would have 8 to 12 times the leakage current permitted by the product standard. The fact that the receptacle is not readily accessible will have no impact on the shock hazard to a person touching the utilization equipment.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See my Explanation of Negative for Proposal 2-40.

2-51 Log #3182 NEC-P02 **Final Action: Accept**
(210.8(A)(2) Exception No. 2)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete this exception completely.
Substantiation: The protection afforded by GFCI is not related to the location of the appliance or how easy the appliance is to move. If cord and plug connected utilization equipment is powered from this receptacle and has leakage current at a level that will trip the GFCI, protection should be provided. The permitted leakage current for typical cord and plug connected equipment is.5 ma. The trip range for GFCI protective devices is 4-6 ma. For this utilization equipment to trip the GFCI device, it would have 8 to 12 times the leakage current permitted by the product standard. The fact that the appliance is in a dedicated space and not easy to move will have no impact on the shock hazard to a person touching the utilization equipment.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-40 (Log #3601).
PURVIS, R.: See my Explanation of Negative for Proposal 2-40.

2-52 Log #2125 NEC-P02 **Final Action: Reject**
(210.8(A)(3))

Submitter: Lynn P. Swathwood, Electrical Contracting, Inc.
Recommendation: Add paragraph (3) to read:
Dwelling unit garages may be attached or separate buildings on one premises and used primarily for either parking or storage or both.
Substantiation: Many times dwelling unit garage(s) is defined as a commercial garage and some inspectors require that the wiring meet 511.3. This proposal will make it clear there is a difference.
Panel Meeting Action: Reject
Panel Statement: The additional language does not add any clarity. The definition of a garage in Article 100 already states that it is a "building or a portion of a building". The issue of defining the structure as a commercial garage is a building code issue and not an NEC issue.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-53 Log #3440 NEC-P02 **Final Action: Accept in Principle**
(210.8(A)(3))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as Accept in Principle because the text relocation was done editorially in later editions of the 2005 Code and the requested text was modified by the Panel Action on Proposal 2-40.
Submitter: Donald Dekker, N. Muskegon, MI
Recommendation: Delete the following text:
~~Receptacles installed under the exceptions to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).~~
Relocate the following text to section 210.8(A)(5):
<u>Receptacles installed under the exceptions to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).</u>
Substantiation: This paragraph is located in a section where it does not apply. It creates confusion not being near the section to which it does apply. My recommendation is to move it to the beginning of the exceptions under 210.8(A)(5).
Panel Meeting Action: Reject
Panel Statement: The recommendation has been addressed as an error in the 1st printing 2005 NEC and has been corrected in subsequent printings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-54 Log #2900a NEC-P02 **Final Action: Reject**
(210.8(A)(3))

Submitter: Eugene Lucas, American Electronic Components
Recommendation: None.
Substantiation: I believe that in this article that GFCI should be used for dwelling units that are snow and ice melting devices. If the dwelling unit has a metal roof.
Panel Meeting Action: Reject
Panel Statement: The proposal does not recommend specific code text as is required by Section 4.3.3(c) of the NFPA Regulations Governing Committee Projects.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-55 Log #1852 NEC-P02 **Final Action: Reject**
(210.8(A)(5))

Submitter: Rand Veerman, Town of Normal
Recommendation: Revise to read as follows:
Receptacles installed under the exceptions to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G) and shall be marked " <u>Warning: No GFCI Protection."</u>
Substantiation: People who own newer homes assume that basement and garage receptacles are GFCI protected. When the original owner moves out taking his appliances, the second homeowner is left with unmarked and unprotected receptacles. This poses an obvious danger.
Panel Meeting Action: Reject
Panel Statement: The panel has deleted Exceptions No. 1 and 2 to 210.8(A)(5). See the panel action on Proposals 2-40 and 2-41. The remaining exception (current Exception No. 3) is for a specific piece of equipment and the marking is not necessary.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-56 Log #3183 NEC-P02 **Final Action: Accept**
(210.8(A)(5) Exception No. 1 to 5)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete this exception completely.
Substantiation: The protection afforded by GFCI is not related to the location of the receptacle. If cord and plug connected utilization equipment is powered from this receptacle and has leakage current at a level that will trip the GFCI, protection should be provided. The permitted leakage current for typical cord and plug connected equipment is.5 ma. The trip range for GFCI protective devices is 4-6 ma. For this utilization equipment to trip the GFCI device, it would have 8 to 12 times the leakage current permitted by the product standard. The fact that the receptacle is not readily accessible will have no impact on the shock hazard to a person touching the utilization equipment.
Panel Meeting Action: Accept
Panel Statement: See the panel action on Proposals 2-40 and 2-41.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See my Explanation of Negative for Proposal 2-40.

2-57 Log #3185 NEC-P02 **Final Action: Accept**
(210.8(A)(5) Exception No. 2 to 5)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete this exception completely.
Substantiation: The protection afforded by GFCI is not related to the location of the appliance or how easy the appliance is to move. If cord and plug connected utilization equipment is powered from this receptacle and has leakage current at a level that will trip the GFCI, protection should be provided. The permitted leakage current for typical cord and plug connected equipment is.5 ma. The trip range for GFCI protective devices is 4-6 ma. For this utilization equipment to trip the GFCI device, it would have 8 to 12 times the leakage current permitted by the product standard. The fact that the appliance is in a dedicated space and not easy to move will have no impact on the shock hazard to a person touching the utilization equipment.
Panel Meeting Action: Accept
Panel Statement: See the panel action on Proposals 2-40 and 2-41.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-40 (Log #3601).
PURVIS, R.: See my Explanation of Negative for Proposal 2-40.

2-58 Log #561 NEC-P02 **Final Action: Reject**
(210.8(A)(5) Exception No. 3 to (5), FPN (New))

Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Add a new FPN to read:
Exception No. 3 to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.
<u>FPN: See 760.21 and 760.41. Power sources for fire alarms systems shall not be supplied through ground-fault circuit-interrupters.</u>
Substantiation: Both 760.21 and 760.41 make it clear that power sources for fire alarm circuits are not to be supplied through circuits protected by ground-fault circuit-interrupters or arc-fault circuit interrupters; this was a change in the 2005 NEC.
As presently written, 210.8(A)(5), Exception No. 3, simply states that fire alarm systems in unfinished basements are not required to have ground-fault circuit-interrupter protection; this Fine Print Note will alert installers that fire alarm systems are not permitted to be supplied by circuits that have ground-fault circuit-interrupter protection.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree with adding the cross reference. If a fire alarm system is being installed, all applicable requirements of Article 760, including 760.21 and 760.41 have to be complied with.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: It may be advisable to include this cross-reference FPN in Chapter 2 as most electricians who wire one- and two-family dwellings and low-rise multifamily buildings very rarely use the provisions of Chapter 7. In addition, NAHB would like to make sure this important information is included in the electrical provisions of the ICC International Residential Code (IRC). These provision are extracts from NFPA 70.

2-59 Log #579 NEC-P02 **Final Action: Reject**
(210.8(A)(5) Exception No. 4 (New))

Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Add new Exception No. 4 to 210.8(A)(5):
<u>Exception No. 4 to (5): A single receptacle supplying a permanently installed sump pump.</u>
Substantiation: Permanently installed sump pumps were excluded from ground-fault circuit-interrupting protection in the 1990 and 1993 versions of the NEC as Exception No. 3.
The proposal to delete the sump pump exception was submitted by Robert H. Heis (Log #3398, Proposal 2-139, 1995 ROP). His intent was to include sump

pumps under, what was then, new Exception No.1: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

Sump pumps do fit within the loose definition of appliances in Article 422, but are not specifically mentioned by name. I've had numerous reports from wireman and electrical contractors that many AHJs are requiring GFCI protection for sump pumps; the end result is occasional nuisance tripping and flooding. It was apparently not the intent of this Code-Making Panel, in accepting Robert H. Heis's proposal, to require GFCI protection for sump pumps. Restoration of this exception will eliminate, what appears to be, fairly common misinterpretation of this section.

Panel Meeting Action: Reject

Panel Statement: Sump pumps are not incompatible with GFCI protection. There is no technical basis to exempt them from GFCI protection.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Though the discussion during the meeting set out that the old problems with GFIA nuisance tripping has been solved, I hope the new technology has solved all reasons for the nuisance tripping. The committee may want to reconsider this Proposal and all a sump pump to be non-GFCI protected.

As with fire pumps during an emergency fire situation (where the intent of not having overload
protection or GFCI protection is to ensure the pump motor can run until it burns up), there are
situations where the assurance of the availability of the sump pump needs to be maintained during flooding situations. The fire pump overload and GFCI provisions are located in Section 430.31 FPN, and Section 695.6 (D) and (H).

2-60 Log #1893 NEC-P02 **Final Action: Reject**
(210.8(A)(6))

Submitter: Norman Ellis, Stellar Inspections, Inc.

Recommendation: Revise as follows:

(6) Kitchens - Where the receptacles are installed to serve the counter top surfaces <u>or installed within 1.8 m (6 ft) of the outside edge of the sink.</u>

<u>Exception No. 1 to (6): Receptacles that are not readily accessible.</u>

<u>Exception No. 2 to (6): A single or a duplex receptacle for two appliances located...".</u>

Substantiation: Homes with kitchens where a knee wall or adjacent wall often have duplex receptacles where crockpots, decorations, phone charger, etc., rendering a safety hazard. Please provide provision for safety as this is often overlooked or argued over during construction inspection.

Panel Meeting Action: Reject

Panel Statement: If the receptacle is being used to supply the countertop, it must be provided with GFCI protection regardless of its location. The submitter has not presented any evidence that receptacles that do not serve the countertop are creating a specific hazard. In addition, the submitter has not provided any substantiation to add the exceptions to the kitchen requirements.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: This proposal should have been accepted in part. I agree with the panel that the submitter has not provided any substantiation to add exceptions to the required GFCI protection for receptacles serving countertops in residential kitchens, but disagree with the panel's position on GFCI protection of receptacles within 6 feet of a kitchen sink. See my explanation of negative for proposal 2-42.

Comment on Affirmative:

BROWN, L.: The 1990 NFPA 70 (NEC) (210-8(a)(5) (dwelling units) only required: "receptacles installed within 6 feet of a kitchen sink" to have GFCI protection.

This changed in the 1993 NEC (210-8(a)(5) (dwelling units) as the provision was changed to:
"receptacles to serve counter top surfaces, installed with 6 feet of a wet bar sink or kitchen sink."
In the 1996 NEC (210-8(a)(6) (dwelling units - kitchens) it was changed to apply only: "Where the receptacles are installed to serve the countertop surfaces." Any reference to the kitchen sink was removed from this provision. Though, provision (210-8(a)(7) (dwelling units - wet bar sinks) for GFCI protect for: "receptacles where installed to serve counter top surfaces and are located within 6 feet of the outside of the wet bar sink" was separated out into a new provision.
No change was made in the 1999 (210-8(a)(7) or 2002 (210.8(A)(7) editions of the NEC related to the GFCI locations for kitchens or wet bar sinks.

The 2005 NEC expanded Section (210-8(A)(7) to include "laundry, utility, and wet bar sinks", and the
GFCI locations changed to: "where the receptacles are installed within 6 feet of the outside of the sink." The relationship to serving a counter top was removed. The provisions for kitchen GFCI's (210-8(A)(6) did not change.

So the question is raised - does a receptacle on a wall in a kitchen, not serving the counter top surface, but within 6 feet of the sink, required to have GFCI protection? It would appear the NEC would not require GFCI protection for the wall outlet within 6 feet of a kitchen sink. Though, it would for any other type of sink. In addition, please refer to the Panel Statement on Proposal 2-64.

2-61 Log #3528 NEC-P02 **Final Action: Reject**
(210.8(A)(6) Exception No. 1 (New))

Submitter: Timothy McCord, Washington, PA

Recommendation: Add an exception to read as follows:

(6) Kitchens. Where the receptacles are installed to serve the countertop surfaces.

<u>Exception No. 1: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved and that is cord-and-plug connected in accordance with 400.7(A)(6), 400.7(A)(7) or 400.7(A)(8).</u>

Substantiation: This will eliminate tripping of the GFCI due to motor loads.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated that "motor loads" are tripping the GFCI. Motor operated appliances are compatible with GFCI protection.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-62 Log #2348 NEC-P02 **Final Action: Reject**
(210.8(A)(7))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Add new text to read:

210(8)(A) Exceptions No. 1 and No. 2 should be included with (7).

Substantiation: This will provide equal NEC provisions for equal installations. I can't see the logic of a washing machine being a hazard based on the installation of a laundry tub.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated adding new exceptions to the rule. Expansion of the exceptions to other areas is counter to increased safety, particularly since the equipment in question is compatible with a GFCI. See the panel action on Proposals 2-40 and 2-41.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-63 Log #2878 NEC-P02 **Final Action: Reject**
(210.8(A)(7))

Submitter: James J. Rogers, Bay State Inspectional Agency

Recommendation: Add a second paragraph to read as follows: This requirement for receptacles that are within this area and are solely for supplying power to permanently installed laundry appliances or sump pumps.

Substantiation: This requirement to provide additional protection to general purpose receptacles adjacent to laundry sinks is a good one. However, in reviewing the Panel Statement for 2-38 in the 05 code cycle it appears to me that the Panel was seeking to protect the general use receptacles in these areas not the appliance receptacle.

Panel Meeting Action: Reject

Panel Statement: It is the intent of the rule to cover all receptacles that are installed within 6 feet of the laundry sink, regardless of what they supply.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-64 Log #3120 NEC-P02 **Final Action: Reject**
(210.8(A)(7))

Submitter: Jonathan R. Althouse, Michigan State University

Recommendation: Revise the section as follows to allow for a receptacle in dedicated space to have GFCI protection omitted.

(7) Laundry, utility, and wet bar sinks - where the receptacles are installed <u>to serve a countertop or are readily accessible</u> , and are within 1.8 m (6 ft) of the outside edge of the sink.

Substantiation: The rule, as it is presently written, requires receptacles that are not readily accessible and are installed in dedicated space to serve not easily moved appliances to also be GFCI protected if located within 1.8 m of the edge of the sink. Sometimes this requires the receptacle to be located so it is not behind the appliance just to get it more than 1.8 m from the sink.

Panel Meeting Action: Reject

Panel Statement: It is the intent of the rule to cover all receptacles that are installed within 6 feet of the laundry sink, regardless of what they supply. The submitter has not provided any technical substantiation as to why all receptacles within 6 feet of the sink should not be included.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-65 Log #2009 NEC-P02 **Final Action: Reject**
(210.8(A)(7), Exceptions 1 & 2 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered since the acceptance of two other proposals is not a technical reason for rejecting this proposal in accordance with the 4.3.5.1 of the NFPA Regulations Governing Committee Projects.

This action will be considered by the Panel as a Public Comment.

Submitter: Larry Logan, Township of Princeton, New Jersey
Recommendation: Insert after 210.8(A)(7)

Exception No. 1: Receptacles that are not readily accessible.

Exception No. 2: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and is cord and plug connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

Substantiation: The present code fails to recognize the long standing practice of allowing fixed equipment with dedicated outlets to be exempt from the GFCI protection requirements. Other sections of this code that represent areas that would have as much greater chance of contact with grounded surfaces allow this practice, (i.e. Garages etc. 210.8(A)(2) and Unfinished basements, 210.8(A)(5)). It is unreasonable to expect that finished areas of a dwelling unit would be more hazardous than an unfinished area.
Panel Meeting Action: Reject
Panel Statement: See the panel action on Proposals 2-40, 2-41, and 2-62.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-66 Log #1431 NEC-P02 **Final Action: Reject**
(210.8(A)(7) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered since the acceptance of two other proposals is not a technical reason for rejecting this proposal in accordance with the 4.3.5.1 of the NFPA Regulations Governing Committee Projects.

This action will be considered by the Panel as a Public Comment.

Submitter: Greg Chontow, Hopatcong, NJ
Recommendation: Add new text as follows:

Exception: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

Substantiation: This new exception would be similar in installation to 210.8(A)(5) ex. no. 2 in that a washer/dryer would conform to a fixed appliance.
Panel Meeting Action: Reject
Panel Statement: See the panel action on Proposals 2-40, 2-41, and 2-62.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-67 Log #3121 NEC-P02 **Final Action: Reject**
(210.8(A)(7) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered since the acceptance of two other proposals is not a technical reason for rejecting this proposal in accordance with the 4.3.5.1 of the NFPA Regulations Governing Committee Projects.

This action will be considered by the Panel as a Public Comment.

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new exception to this section with the same language as Exception 2 of 210.8(A)(5) to read as follows:

Exception: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug connected in accordance with 400.7(A), (A)(7), or (A)(8).

Substantiation: If laundry equipment is located in dwellings other than in the basement, the receptacle in this dedicated space is required to be GFCI protected if within 1.8 m (6 ft) of a sink. Generally, the washer is located next to a nonmetallic sink and the receptacle must be installed behind the dryer rather than the washer to keep it far enough away from the sink. Most of these sinks are nonmetallic. Even the plumbing supplying the sink is generally nonmetallic.
Panel Meeting Action: Reject
Panel Statement: See the panel action on Proposals 2-40, 2-41, and 2-62.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-68 Log #578 NEC-P02 **Final Action: Reject**
(210.8(A)(9) and 210.8(C))

Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Delete Section 210.8(C) and add new item (9) to Section 210.8(A)

~~210.8(C) Boat Hoists Ground-fault circuit-interrupter protection for personnel shall be provided for outlets that supply boat hoists installed in dwelling unit locations and supplied by 125-volt, 15- and 20-ampere branch circuits.~~

210.8(A)

(9) Boat Hoists - where 125 volt, 15 and 20-ampere receptacles are installed to serve boat hoists.

Substantiation: Traditionally 210.8(A) has contained the requirements for dwelling units; 210.8(B) has been reserved for other than dwelling units. The 2005 NEC broke with convention by adding 210.8(C) for boat hoists in dwelling unit locations. There seems to be little justification for this. While it is true that boat docks are not attached to the dwelling unit, neither are boat houses, accessory buildings, or for that matter detached garages.

It's much easier to explain to students of the Code that 210.8(A) is for dwelling units, and 210.8(B) is for other than dwelling units; for the sake of clarity and their understanding, we should try to keep it that way.
Panel Meeting Action: Reject
Panel Statement: The submitter has not substantiated changing the requirement to apply to only to cord- and plug-connected boat hoists. The requirement in the present code applies to "outlets" which could be receptacle or hard wired.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-69 Log #428 NEC-P02 **Final Action: Reject**
(210.8(B))

Submitter: Kenneth Wilee, Wilee Electric Inc.
Recommendation: Add new text as follows:

(6) Commercial Garages - see Article 511
(7) Temporary Wiring - see Article 590
(8) Elevator Rooms - see Article 620
(9) Fountains - see Article 680
And so on.

Substantiation: Incorporate ALL GFCI protection into 210.8 to avoid confusion or omission of requirements. One would clearly see what installations require GFCI protection and would know to go to that article for instructions.
Panel Meeting Action: Reject
Panel Statement: The requirements outlined by the submitter are application and occupancy specific and are not appropriate for the general article on branch circuits.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-70 Log #1443 NEC-P02 **Final Action: Accept in Principle in Part**
(210.8(B))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal retained "(3) Rooftops"; revised (4) to read "(4) Outdoors", deleted the existing text in (4), changed the existing "Exception to (3) and (4)" to "Exception No. 1 to (3) and (4)", and added the proposed "Exception to (3)" as "Exception No. 2 to (4)"; and deleted (5).

The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with 4.1.1 of the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:

(B) Other Than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (5) shall have ground-fault circuit-interrupter protection for personnel:

(1) Bathrooms

(2) Commercial and institutional kitchens - for the purposes of this section, a kitchen is an area with a sink and permanent facilities for food preparation and cooking.

~~(3) Rooftops~~

~~(4) Outdoors in public spaces for the purpose of this section a public space is defined as any space that is for use by, or is accessible to, the public.~~

~~Exception to (3) and (4): Receptacles that are not readily accessible and are supplied from a dedicated branch circuit for electric snow-melting or deicing equipment shall be permitted to be installed in accordance with the applicable provisions of Article 426.~~

~~(5) Outdoors, where installed to comply with 210.63~~

(3) Outdoors

Exception to (3): Receptacles that are not readily accessible and are supplied from a dedicated branch circuit for electric snow-melting or deicing equipment shall be permitted to be installed in accordance with the applicable provisions of Article 426.

Substantiation: The existing code language in parenthetical four nearly requires all applicable outdoor receptacles to be protected, by the "accessible to the public" clause. The term "accessible" is defined in Article 100 in two areas: Accessible as it pertains to wiring methods, and Accessible as it pertains to equipment. The more accurate definition would be Accessible as it pertains to equipment. The definition is: "Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means". Considering the broad scope of this definition, nearly all exterior 125V 15 or 20A receptacles all required to be GFCI protected. I could have a high rise building with a receptacle located 250 feet in the air and have it meet this definition. The argument then becomes "what is the intent?" The problem with that argument is, we are dealing with life safety equipment...my attorney isn't going to care what the intent is...he/she wants to know what the law is. Right now, the law is requiring such receptacles to be protected. It is time for the Code to stop beating around the bush on on this issue. Panel 2 did a great service to the public at large by accepting this in the 2005 cycle, it is time to take it a step further. If nothing else, this proposal should be accepted in an effort to create uniform interpretation.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the recommendation to expand the requirement for outdoor GFCI protection. The panel rejects the recommendation to delete the requirement for GFCI protection of rooftop receptacles. Because the requirement for rooftop receptacles has been retained, the proposed revision to the exception and section renumbering is not accepted.

Add a new Exception No. 2 to read:

"In industrial establishments only, where the conditions of maintanance and supervision ensure that only qualified personnel are involved, GFCI protection shall not be required on receptacles that are limited to use with equipment qualified under an assured equipment grounding conductor program as specified in 590.6(B)(2)."

Panel Statement: The panel accepts the recommendation to expand the GFCI protection requirement to all outdoor 15- and 20-ampere, 125 volt receptacles. The panel rejects the proposed deletion of the term "rooftops" based on concerns that the outdoor GFCI requirement may not cover all rooftop applications. The addition of the new Exception No. 2 provides for a limited alternative to GFCI protection.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

KING, D.: I agree with the panel action to accept in part the recommendation to expand the requirement for GFCI protection for all 125 volt, 15-and-20 ampere receptacles installed outdoors and to reject the recommendation to delete the requirement for GFCI protection for receptacles installed on rooftops. I disagree with the panel's addition of a new exception for industrial establishments that permits an assured equipment-grounding program in lieu of GFCI Protection. This proposed exception would greatly reduce the level of safety that would be provided if GFCI protection were to be required. Existing language in section 590.6(A) of the NEC limits the use of an assured equipment-grounding program to installations only where a greater hazard would exist if GFCI protection were to be used. Panel 2 was not provided with any technical data that would indicate that an assured equipment grounding program would provide the same level of safety as a GFCI protected receptacle and therefore should not have added this exception.

PURVIS, R.: No substantiation was provided to expand the GFCI protection requirement to all outdoor 15- and 20-ampere, 125 volt receptacles.

WEBER, R.: The enforcement community concurs with the expanded need and use of the GFCI protection for all outdoor receptacles as indicated in the section. We do no support the inclusion of the new Exception No. 2, which basically incorporates the concept found in 590.6(B)(2), for the assured equipment grounding conductor program. From actual in field observations and experience, when this system is evoked only lip service is given and little actual performance requirements are being done.

In previous additions of the code CMP-3, who has purview of Article 590 and former Article 305 - Temporary Installations, received comments indicating lack of meeting all of the requirements in what is now 590.6(B)(2). In its review of the value of the AEGCP (assured equipment grounding conductor program), the Panel was presented with data from OSHA as to the large number of noncompliance violation notices given out regarding that code section. In a number of cases, it was the lack of written documentation of identified responsible individuals and required test being recorded as well as records availability that were cited. We as an industry are approached many times to make special exceptions of the requirements for "In Industrial establishments only", given the theme that they have better trained, more experienced personnel with long term employment history and enhanced safety programs that are not present in commercial or other segments of the electrical industry. This may be true but given the fact that many tasks and projects are out sourced and contracted out, is that belief still viable? All workers should be afforded the best possible electrical safety scheme available with no exceptions to the code's required practice or procedure.

Comment on Affirmative:

PAULEY, J.: This comment is to provide some additional clarity to the panel action text of this proposal. The panel accepted revising the existing item (4) to say "Outdoors". The existing Exception in 210.8(B) should remain as "Exception to (3) and (4)....". The new exception added by the panel should say "Exception No. 2 to (4)...". This will make it clear that the new exception applies to 210.8(B)(4) only.

2-71 Log #2554 NEC-P02 **Final Action: Accept in Principle in Part (210.8(B))**

Submitter: Paul S. Hamer, Chevron Texaco Energy Research and Technology Company

Recommendation: Change the following in the introductory clause of this Section:

210.8(B) Other Than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (~~5~~ 6) shall have ground-fault circuit-interrupter protection for personnel:

The following item (6) is proposed to be added at the end of the existing wording in 210.8(B):

(6) Commercial, educational, institutional, or industrial laboratory facilities that have sinks or metallic countertops - where the receptacles are installed within 3 m (10 ft) of the outside edge of the sink or the metallic countertop.

Substantiation: An incident occurred recently in a new main industrial laboratory. This new lab has modern equipment, and had been built to the latest codes and provides more efficient ventilation, lighting, and work space for the employees.

The employee involved in this incident was following an ASTM standard that called for the use of a thin stainless steel tube about six feet long to clean a long glass tube. The employee was wearing Personal Protective Equipment (PPE), including a flame-resistant coat. Cleaning of these tubes can be done at a couple of different locations in the lab. This particular work station contains a sink and is under a ventilation hood with a sliding glass door that can be lowered to contain fugitive vapors. At the time of this incident, vapors were not a concern and the hood was raised.

Also located at this work station was a small electrical mixer. The cord for the mixer had been stretched behind the sink, around the side of the sink, and plugged into the outlet in front of the work station and outside of the hood. At some point the plug in the 120 volt receptacle for the mixer had been slightly jarred loose, leaving a gap of less than 1/4 in. between the rubber insulation of the plug and the receptacle on the wall. The receptacles in this work area were not protected by a GFCI (Ground Fault Circuit Interrupter). GFCIs are not presently required in this type of installation. GFCIs are required in residential installations for receptacles within 1.8 m (6 ft) of a laundry or utility sink.

After the cleaning of the tube was completed, the employee leaned into the hood to turn off the water at the back of the sink. During this movement, the stainless tubing coiled around and touched one of the electrical connectors on a nearby plug attachment. The employee was shocked and burned as the tubing contacted the stainless steel countertop.

This incident demonstrates that laboratory facilities that have sinks or grounded (e.g., through the sink's plumbing) metallic countertops represent a shock hazard if there are nearby receptacles. Requirements should be similar to those for a laundry or utility sink area, except that receptacles a farther distance from the sink or metallic countertop edge should be required to have GFCI protection to accommodate experiences such as described above. A distance of 3 m (10 ft) from the edge of a laboratory sink or metallic countertop is a reasonable distance to require installation of receptacles protected by GFCIs. This requirement will better protect personnel from the hazards of an electrical shock in a laboratory environment.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the recommendation to provide GFCI protection in the proximity of sinks. The panel rejects the recommendation to require GFCI protection for receptacles in the proximity of metallic countertops.

Panel Statement: See the panel action on Proposal 2-81 for the GFCI requirements in the vicinity of all nonresidential sinks. The panel rejects the recommendation to require GFCI protection for receptacles in the proximity of all metallic countertops because there are instances where such countertops may not be grounded or in the vicinity of a wet or damp location.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

KING, D.: I agree with the panel action on proposal 2-81 that extends GFCI protection for all 125-volt 15-and-20 ampere receptacles installed within 6 feet of any sink. I disagree with the panel action to reject the submitter's recommendation that receptacles installed to serve countertops that have a metal surface should not have GFCI protection. The submitter has illustrated in his substantiation that a hazard does exist where a grounded metal countertop is installed and accidental contact of live electrical components and the grounded metal surface of the countertop occur. The submitter has further demonstrated that this situation can result in serious injury to persons utilizing electrical appliances with these types of applications.

NENNINGER, B.: The panel should amend its action by rejecting the text "industrial laboratories." The reference to industrial lab facilities is of concern due to a potential loss of power to hood fans. Loss of power to such equipment either from a nuisance or intentional GFCI trip may result in a significant hazard depending on the characteristics of the gases requiring evacuation. These hazards include fire for those hood installations classified as division 2.

PURVIS, R.: Insufficient evidence to expand the use of GFCIs to commercial, educational, institutional or industrial laboratory facilities that have sinks.

2-72 Log #1318 NEC-P02 **Final Action: Accept**
(210.8(B)(2))

TCC Action: The Technical Correlating Committee directs that the Panel reconsider the proposal and correlate with the Panel Action on Proposal 1-36.

This action will be considered by the Panel as a Public Comment.

The Technical Correlating Committee understands that the Panel Action on Proposal 2-73 modifies the Panel Action on this Proposal.

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Edit for clarification

Commercial and institutional kitchens—for the purposes of this ~~section~~ requirement , a kitchen is defined as an area with a sink and permanent facilities for food preparation and cooking.

Substantiation: According to the style manual, the use of the word "section," as written, makes this definition applicable to all of section 210.8, not just 210.8(B)(2). Furthermore, the existing *Code* language is written in a manner inconsistent with other provisions of the *Code* . If the intent of this rule is to create a defined term, it should be written as such.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-73 Log #1724 NEC-P02 **Final Action: Accept**
(210.8(B)(2))

TCC Action: The Technical Correlating Committee directs that the Panel reconsider the proposal and correlate with the Panel Action on Proposal 1-36.

This action will be considered by the Panel as a Public Comment.
Submitter: Richard P. Owen, City Of St. Paul Electrical Inspection
Recommendation: Revise as follows:

(2) Commercial, ~~and~~ institutional, and other nonresidential kitchens - for the purposes of this section, a kitchen is an area with a sink and permanent facilities for food preparation and cooking.

Substantiation: An office "break area" with a sink and permanent facilities for food preparation and cooking does not really qualify as either commercial or institutional, but the break area or room with a sink and permanent cooking facilities has the same shock hazard potential. This change should, hopefully, clarify that these break rooms or areas do fall under the requirements of this section for ground-fault protection.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

PURVIS, R.: Insufficient evidence to expand the use of GFCIs to other nonresidential kitchens just by reference to other similar kitchens.

2-74 Log #457 NEC-P02 **Final Action: Reject**
(210.8(B)(2) Exception (New))

Submitter: Amos D. Lowrance, Jr., City of Chattanooga, TN
Recommendation: Add a new exception to read as follows:

Exception: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

Substantiation: This change would eliminate the nuisance tripping caused by commercial mixers, refrigerators and freezers that plug in a commercial kitchen. We have had several instances of these appliances causing the GFCI to trip due to motor loading at startup.
Panel Meeting Action: Reject
Panel Statement: The addition of the exception would lessen the requirements and would be counter to the substantiation submitted to the panel that added the requirement. The panel notes that the product standards for such equipment has leakage current limits that are compatible with GFCI protection. If the equipment was tripping the GFCI in question, it likely has leakage current that exceeds the permissible levels in the product standard.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

BROWN, L.: As I noted in my Ballot Comment Proposal 2-40: I sincerely hope, from the discussion by the
"experts" on the Panel, that the "problem" of "nuisance tripping" no longer exists. It appears from the Proposals submitted this cycle the problem still exists. If the Panel needs to have additional information on which to base a rational change, I suggest a Task Group be formed to research this problem prior to the next edition of the NEC.

2-75 Log #1430 NEC-P02 **Final Action: Reject**
(210.8(B)(2) Exception)

Submitter: Greg Chontow, Hopatcong, NJ
Recommendation: Add new text as follows:

Exception: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

Substantiation: This exception would allow non GFCI protected outlets for cord connected refrigeration equipment in commercial kitchens, therefore, reducing the possibility of lost food due to nuisance tripping.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-74.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

BROWN, L.: Please see my Ballot Comment on Proposals 2-40 and 2-74.

2-76 Log #122 NEC-P02 **Final Action: Reject**
(210.8(B)(2) Exception No. 2 (New))

Submitter: Arthur J. Carlson, Chubbuck, ID
Recommendation: Add a new exception to read as follows:

Exception to (2): A single receptacle or a duplex receptacle for two appliances located within a dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug connected in accordance with 400.7(A)(6); (A)(7) or (A)(8).

Substantiation: Refrigeration equipment references something in the controls to ground when going into defrost, and will cause tripping of a Class A GFCI.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-74. The submitter has not substantiated the statement relative to the tripping of a Class A GFCI.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

BROWN, L.: Please see my Ballot Comment on Proposals 2-40 and 2-74.

2-77 Log #2017 NEC-P02 **Final Action: Accept in Principle**
(210.8(B)(3))

Submitter: Mark Smythe, Smythe Electric Inc.
Recommendation: Revise text to read as follows:

210.8(B) Other Than Dwelling Units. All 125-volt, single-phase, 15 and 20 amp receptacles installed in the locations specified in (1) through ~~(5)~~ (6) shall have ground fault circuit-interuupter protection for personnel:

(3) Food preparation/Serving areas - where the receptacles are installed within 1.8 m (6 ft) of the outside edge of the sink and serve the countertop surface ~~(3)~~ (4) ~~(5)~~ (6)

Substantiation: A. Statement of Problem

1. Food serving areas located in fast food, deli, and coffee house type establishments often have a serving/food preparation area consisting of a stainless steel counter top with one or more sinks along its length. Employee lunch rooms will also typically have a sink installed in the countertop surface, adjacent to where employees warm up and prepare their meals.

2. These countertop locations will often have various electric appliances, (toasters, microwaves, blenders, coffee makers, toaster ovens...) located adjacent to the sink.

3. The 2005 NEC only requires GFCI protection of these receptacles if the area includes permanent facilities for food preparation and cooking.

4. A shock hazard potential exists for the personnel when operating, and cleaning around these appliances.

B. Substantiation for proposal to change 210.8(B)(3)

1. The employees and personal of these type of establishments deserve the same degree of protection from shock as is provided for homeowners in 210.8(A)(6) and (7).

Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-81.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

PURVIS, R.: See my Explanation of Negative for Proposal 2-81.

2-78 Log #2584 NEC-P02 **Final Action: Reject**
(210.8(B)(3), FPN (New))

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Add text to read as follows:

FPN: Examples of permanent facilities are range-tops, stoves and ovens. Counter mounted microwaves, toasters, coffee-makers would not constitute permanent facilities.

Substantiation: The 2005 NEC made a good move in adopting the definition in the 2005 NEC, but it did not go far enough. By adding some clarification of what is intended in a FPN a lot of confusion will be alleviated in both installations and enforcement.
Panel Meeting Action: Reject
Panel Statement: The FPN is not appropriate because it contains a requirement. The term "permanent facilities" is sufficiently detailed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-79 Log #3373 NEC-P02 **Final Action: Reject**
(210.8(B)(4))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered since the acceptance of two other proposals is not a technical reason for rejecting this proposal in accordance with the 4.3.5.1 of the NFPA Regulations Governing Committee Projects.
This action will be considered by the Panel as a Public Comment.
Submitter: Tom Braeutigam, Nuechterlein Electric
Recommendation: Revise text to read:
Outdoors in Public Spaces. For the purpose of this section a public space is defined as any space that is [lower than 3 meters (10 ft)], for use by, or is accessible to the public.
Substantiation: Receptacles located higher than 3 meters (10 ft), are not accessible to the general public. In municipalities, receptacles, located above this height, on light poles are generally used for decoration.
Panel Meeting Action: Reject
Panel Statement: The reference to "outdoors in public spaces" has been deleted by the panel action on Proposal 2-70.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-80 Log #3381 NEC-P02 **Final Action: Reject**
(210.8(B)(4))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered since the acceptance of two other proposals is not a technical reason for rejecting this proposal in accordance with the 4.3.5.1 of the NFPA Regulations Governing Committee Projects.
This action will be considered by the Panel as a Public Comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
(4) Outdoors in spaces intended for use by the public or for which public access is expected to be routine.
Substantiation: The substantiation for the 2005 NEC wording did not support such a broad expansion of the requirements. With one exception, every electrocution involved a vending machine. This issue is now fully addressed in 422.51, which requires integral GFCI protection in new and remanufactured vending machines, (or double insulation) and protection for outlets for others. This means that for a single substantiated incident that would be otherwise unaddressed in the NEC, we are dealing with an extraordinary expansion of requirements.
Nevertheless, some expansion of coverage may be warranted. However, the applicability of such a requirement should be apparent to the user. Public access may be defined in some jurisdictions as every place not fenced, in others as any place not prohibited by a trespass sign, and still others as any place not within the lot lines of private as opposed to public property. Good code is in part code that will be consistently understood and applied in a uniform manner. Experience has already shown that this isl not, and the language needs to better signal the intent. This proposal addresses the spaces where the real loss exposure seems to lie, as covered in the substantiation for the 2005 change. It is also more simply worded.
Panel Meeting Action: Reject
Panel Statement: The reference to "outdoors in public spaces" has been deleted by the panel action on Proposal 2-70.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-81 Log #81 NEC-P02 **Final Action: Accept in Principle**
(210.8(B)(5) (New))

TCC Action: The Technical Correlating Committee understands that the Panel Action on Proposal 2-70 deleted the existing (5) and the Panel Action on this Proposal adds a new (5).
Submitter: Joe Riley, City of Arlington
Recommendation: Add:
(5) Laundry, utility, and wet bar sinks - where the receptacles are installed within 1.8 m (6 ft) of the outside edge of the sink.
Substantiation: GFCI protection for these areas should not be limited to just dwelling units. The hazard of electrical shock in and around water exists regardless of whether it is dwelling units or other than dwelling units.
Panel Meeting Action: Accept in Principle
(5) Sinks - where receptacles are installed within 1.8 m (6 ft) of the outside edge of the sink.
Panel Statement: The panel action is to provide GFCI protection at all sink locations in nonresidential occupancies.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: Insufficient evidence to expand the use of GFCIs to all sink locations just by reference to use in sinks in dwelling units.

2-82 Log #2123 NEC-P02 **Final Action: Accept in Principle**
(210.8(B)(6))

Submitter: Bud Swathwood, Bud Swathwood Consulting
Recommendation: Add paragraph:
(6) Break rooms in commercial and industrial facilities. See No. 1 for definition of kitchens.
Substantiation: Many break room kitchens in commercial and industrial facilities have kitchens that meet the definition in 210.8(B)(2) and should be included in the requirements of 210.8(B).
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-73.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See my Explanation of Negative for Proposal 2-81.

2-83 Log #2743 NEC-P02 **Final Action: Reject**
(210.8(B)(6))

Submitter: Jeff Fitzloff, State of Idaho Division of Building Safety
Recommendation: Revise text to read:
(B) Other Than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (5) shall have ground-fault circuit-interrupter protection for personnel:
(1) Bathrooms
(2) Commercial and institutional kitchens – for the purposes of this section, a kitchen is an area with a sink and permanent facilities for food preparation and cooking
(3) Rooftops
(4) Outdoors in public spaces – for the purpose of this section a public space is defined as any space that is for use by, or is accessible to, the public
Exception to (3) and (4): Receptacles that are not readily accessible and are supplied from a dedicated branch circuit for electric snow-melting or deicing equipment shall be permitted to be installed in accordance with the applicable provisions of Article 426.
(5) Outdoors, where installed to comply with 210.63
<u>(6) Receptacles serving hair cutting and styling stations in barber shops and hair styling establishments</u>
Substantiation: During visits to such establishments I have noted that the cords for hair clippers, hair dryers, and styling blowers are two wire, cords and no equipment grounds and have exposed metal that is put in contact with people's heads. The chairs in these establishments put the customer in contact with grounded metal parts. These cords are normally twisted from the repeated wrapping of the cord around the clipper thus damaging the cord.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided sufficient substantiation to expand the requirements to hair styling establishments. The panel action on Proposal 2-81 has expanded GFCI protection requirements to all sink locations in nonresidential occupancies which provides protection in some of the most vulnerable locations in the type of occupancy covered by this proposal.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: The submitter of this proposal raises an important safety concern that warrants further consideration. Although the panel action on proposal 2-81 adds much needed protection in these types of occupancies in the area of a sink. Further protection is needed for persons who come in contact with electrical hair appliances while their hair is still wet and as the submitter has indicated in his Substantiation grounded through the chair in which he or she is seated. There is no requirement that these appliances be double insulated. Requiring GFCI protection for 125-volt 15-and 20-ampere receptacles in these types of occupancies would reduce the risk of electrical shock or electrocution.

2-84 Log #2919 NEC-P02 **Final Action: Reject**
(210.8(B)(6))

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Revise as follows:
210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.
(B) Other than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (5) (<u>6</u>) shall have ground-fault circuit-interrupter protection for personnel:
<u>(6) Bar countertops</u>

Substantiation: Stainless steel countertops, wet hands, melted ice and wet floors do not mix well with portable electric appliances such as blenders and juicers. The GFCI protection afforded individuals in kitchens should be extended to bartenders, since identical conditions exist.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided substantiation to expand the requirement. The term "bar countertops" is extremely broad and would apply the requirement is a wide variety of applications without substantiation. The panel action on Proposal 2-81 provides GFCI protection where a bar countertop contains a sink.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: This proposal should be given further consideration. The panel's reference to the panel action on proposal 2-81 does not fully address the submitter's concerns. The hazards associated with the use of electricity in locations that are damp or wet is well documented. The risk of electric shock or electrocution is present in the example given in the submitter's substantiation regardless of whether a sink is installed.

2-85 Log #3171 NEC-P02 **Final Action: Accept in Principle**
(210.8(B)(6))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Add new Section as follows:
(6) Janitorial, Service and Utility Closets – for the purpose of this section a janitorial, service or utility closet is a closet which contains a floor level mop basin (slop sink), wall mounted mop basin or any other basin.
Substantiation: The same potential hazards exist at these locations that exist in bathrooms, kitchens, rooftops, and outdoor spaces. Electricity and ground faults do not follow, or take into consideration architectural definitions of building spaces.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-81.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
PURVIS, R.: See my Explanation of Negative for Proposal 2-81.

2-86 Log #2187 NEC-P02 **Final Action: Accept in Principle**
(210.8(C))

Submitter: Dann Strube, Strube Consulting
Recommendation: Revise voltage:
"...supplied by ~~125~~ 120 volt...".
Substantiation: Use of 125 volts in the rule would imply that the requirement is for receptacle outlets only.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-87.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-87 Log #3065 NEC-P02 **Final Action: Accept in Principle**
(210.8(C))

Submitter: Douglas A. Lee, U.S. Consumer Product Safety Commission
Recommendation: Revise 210.8(C) as follows:
(C) Boat Hoists
Ground -fault circuit-interrupter protection for personnel shall be provided for outlets that supply 120/240-volt boat hoists installed in dwelling unit ~~locations and supplied by 125 volt, 15- and 20-ampered~~ branch circuits.
Substantiation: The essential severe shock/electrocution protection provided by 210.8(C) for personnel in contact with a boat hoist or in the water near a boat hoist should not be limited to 120 V installatons.
CPSC In-depth Investigation (IDI) database describes four incidents resulting in five electrocution deaths from 1994 to 2003 from contact with a boat hoist.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise 210.8(C) in the present Code to read:
(C) Boat Hoists. GFCI protection shall be provided for outlets not exceeding 240 volts that supply boat hoists installed in dwelling unit locations.
Panel Statement: The panel has revised the current language to apply to boat hoists not exceeding 240 volts. This will include 120V as well as 240V hoists. In addition, the panel has used the term "GFCI" in accordance with the NEC style manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-88 Log #1728 NEC-P02 **Final Action: Reject**
(210.8(D) (New))

Submitter: Paul S. Hamer, Chevron Texaco Energy Research and Technology Company
Recommendation: Add new text to read as follows:
(D) Three-Phase Ground-Fault Circuit-Interrupter System (GFCIS-3Ph) Protection for Personnel.
(1) Supplying Lighting Circuits. Lighting branch circuits with an operating voltage of more than 150 volts to ground shall be protected by a three-phase ground-fault circuit-interrupter system. Upon detection of a ground fault, the three-phase ground-fault circuit-interrupter system shall initiate disconnection of all three phases of the faulted branch circuit.
FPN: Segregation of the lighting power supply on a separately derived system facilitates application of the three-phase ground-fault circuit-interrupter system on all of the lighting branch circuits.
(2) Supplying Other Than Lighting Loads. Three-phase branch circuits that supply loads other than lighting shall be permitted to be protected by a three-phase ground-fault circuit-interrupter system. Upon detection of a ground fault, the three-phase ground-fault circuit-interrupter system shall initiate disconnection of all three phases of the faulted branch circuit.
Substantiation: There are many electrocutions that occur on three-phase 480 volts systems, particularly 277 volt lighting branch circuits. Ground-fault circuit-interrupters (GFCIs) have saved many lives on 120 volt and 120-240 volt single-phase systems since being introduced to the NEC in 1971. Application of GFCIs at voltages higher than 120 volts has not progressed due to fact that the higher voltages to ground result in higher capacitive charging current of branch circuits, which in turn leads to "nuisance trips." This proposal describes a Three-Phase Ground-Fault Circuit-Interrupter System (GFCIS-3Ph) that overcomes nuisance tripping by a novel approach to sensing and tripping logic. It is initially proposed as a requirement for lighting branch circuits due to the historical risk of these circuits, but the GFCIS-3Ph is also applicable to all 3-phase circuits and this proposal allows its application as an option for all three-phase branch circuits. Application of the proposed GFCIS-3Ph technology has the potential to almost eliminate electrocutions for persons who make direct contact between an energized phase conductor and ground on three-phase systems rated below 1000 volts, phase-to-phase.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel notes that there is no prohibition in the present code to the installation of the system described by the submitter. The panel disagrees with adding a requirement that all greater than 150V to ground lighting circuits be
supplied with a form of GFCI protection. The submitters substantiation notes that the hazard is when unqualified persons work on equipment without taking the appropriate precautions to deenergize the circuit and verify that circuit is disconnected. Adding such a system to compensate for what is improper and ineffective work practices is not appropriate.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
KING, D.: This proposal should be accepted. I disagree with the panel statement that states "The submitters substantiation notes that the hazard is when unqualified persons work on equipment without taking the appropriate precautions to de-energize the circuit and verify that circuit is disconnected" and the statement that "Adding such a system to compensate for what is improper and ineffective work practices is not appropriate." The panel falsely assumes that contact with energized parts of 480 volt 3 phase systems is limited to qualified persons working on these systems. There are many incidences in commercial buildings where construction and maintenance personnel can come in contact with exposed parts of energized circuits, especially with 277 volt lighting above suspended ceilings. Manufactured wiring systems for ceiling suspended luminaries can become partially or completely detached resulting in accidental contact by someone who is attempting to access equipment above the ceiling. In many cases the individual in this case is grounded through the surrounding structural steel or other mechanical piping and duct systems. This can result in a serious shock or electrocution. Qualified persons performing work are a constant victim of poor workmanship that may have been done prior to their working on equipment which may present a dangerous condition. The increased level of safety afforded by this new technology will save many lives and should not be disregarded by panel 2. Further consideration needs to be given to this proposal.
WEBER, R.: In the panel statement to support the reject action taken the statement is made, "there is no prohibition in the present code to the installation of the system" or in fact use of the component. But what are often times the case, if the requirement is not stated in the code or permissive language included in the code text, it falls into the great idea category but most users will not incorporate its use or protective scheme in normal installation. I am aware that all proposals submitted to the code-making panel must be acted upon and direction given to the submitter. If it were possible I would certainly recommend that this concept be "Held for Further Study" as can be done in the

review of comments stage. Given the comments made by the submitter and presentation of data to the panel as to the value and need of the enhanced protection scheme it would promote an additional electrical safety means and should be supported. The code process needs to incorporate some means of providing encouragement to new concepts and ideas that further the safety cause and have future potential life saving value. The electrical industry today has a tremendous amount of capital invested and must show reasonable expectations of use or inclusion of the new component or concept in the code before financial commitments are made beyond the research and development stage with a prototype model then being considered for marketing. I am a firm believer in Beta testing and the results of the product performance and fact-finding reports from National Recognized Testing Laboratories prior to it being included into the code. Thus, on the condition that data can be presented to be evaluated and considered by the panel for its true worth. We need that information before the theory is embraced. But if we stifle that concept, then are we meeting our mission's objectives? I look forward to comment by others in perhaps the IEC community or other code making bodies as to the need or value of the type of protection.

2-89 Log #1700 NEC-P02 **Final Action: Reject**
(210.9 Exception No. 2)

Submitter: Charles M. Trout, Maron Electric Company
Recommendation: Delete the 210.9 Exception No. 2 in its entiriety.
Substantiation: The body of the text in 200.9 satisfactorily contains the necessary requirements for branch circuits derived from autotransformers. The exception permits a lesser degree of safety based on an undocumented qualified person hypothetically servicing the installation. No requirements are present to ensure that the conditions of maintenance and supervision to ensure that only qualified persons service the installation actually exist.
Panel Meeting Action: Reject
Panel Statement: The authority having jurisdiction has the responsibility to evaluate whether persons responsible for the supervision and maintenance are qualified before permitting such installations.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: I agree with the submitter that this exception allows for an installation that is less safe. An exception that permits a reduction in safety to this extent should include clear prescriptive language for proper interpretation by both the electrician and the authority having jurisdiction. The present definition of "qualified person" in the NEC states that the qualified person must have safety training on the hazards involved. There is no requirement for documentation that would provide evidence for the authority having jurisdiction that a qualified person actually exists. This could lead to inconsistent and improper application of this section.

2-90 Log #2299 NEC-P02 **Final Action: Reject**
(210.11)

Submitter: James Shaw, Jim Shaw Electric Co.
Recommendation: Revise text to read as follows:
210.11(C)(4)(a) Smoke Detectors in New Dwelling Units. Dwelling units shall have smoke detectors installed in each bedroom, one on each floor level including basements but excluding stairway landings. All smoke detectors shall be installed as per manufacturer recommendations and shall be connected to an essential lighting circuit, be inter-wired and have battery back-up. The smoke detector circuit shall not be on dedicated branch circuit.
Smoke Detectors may be installed but shall not be required in attic spaces.
210.11(C)(4)(b) Heat Detectors in New Dwelling Units. Dwelling units shall have a heat detector installed in the garage. Heat detectors shall be installed as per manufacturer recommendations and shall be inter-wired with the smoke detector circuit inside the dwelling unit and have battery back-up. Heat Detectors may be used elsewhere including attic spaces inside the dwelling unit but are not required.
210.11(C)(4)(c) Carbon Monoxide Detectors in New Dwelling Units. Dwelling units shall have carbon monoxide detectors installed adjacent to or in all bedrooms. All carbon monoxide detectors shall be installed as per manufacturer recommendations and shall be inter-wired with the smoke detectors and have battery back-up. A combination smoke/carbon monoxide detector may be substituted for the smoke detectors required in 210.11(C)(4)(a).
Carbon Monoxide Detectors may be used elsewhere including attic spaces inside the dwelling unit but are not required.
210.11(C)(4)(d) Smoke, Heat and Carbon Monoxide Detectors installed in existing dwelling units shall not be required to be inter-wired.
Substantiation: I believe that smoke detectors in dwelling units should be addressed and have their own paragraph in the code.
I feel that smoke detectors, heat detectors, and carbon monoxide detectors should be a part of 210.11.
Panel Meeting Action: Reject
Panel Statement: This is a building/life safety code issue rather than an NEC issue. The section proposed for revision deals with branch circuits required rather than equipment to be installed. Proposals dealing with these topics should be submitted to the NFPA 101, Life Safety Code technical committees.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In addition, the NFPA Technical Committee on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) may have responsibility over some of the proposed criteria.

2-91 Log #2103 NEC-P02 **Final Action: Reject**
(210.11(A) and (C))

Submitter: Jon Farren, Farren Engineering, Inc.
Recommendation: Revise text to read as follows:
210.11(A) ~~Number~~ Quantity of Branch Circuits. The minimum ~~number~~ quantity of branch circuits shall be determined from the total calculated load and the size or rating of the circuits used. In all installations, the ~~number~~ quantity of circuits shall be sufficient to supply the load served. In no case shall the load on any circuit exceed the maximum specified by 220.18.
210.11(C)
(1) Small-Appliance Branch Circuits. In addition to the ~~number~~ quantity of branch circuits required by other parts of this section, two or more 20-ampere small-appliance branch circuits shall be provided for all receptacle outlets specified by 210.52(B).
(2) Laundry Branch Circuits. In addition to the ~~number~~ quantity of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s) required by 210.52(F). This circuit shall have no other outlets.
(3) Bathroom Branch Circuits. In addition to the ~~number~~ quantity of branch circuits required by other parts of this section, at least one 20-ampere branch circuit shall be provided to supply bathroom receptacle outlet(s). Such circuits shall have no other outlets.
Substantiation: The term "quantity" refers to "total amount of", which is the intent of this code section.
Although the term "number" is sometimes used to indicate a quantity, it does not always specify the "total" quantity. The word "number" can also be used to designate a specific object, such as: "circuit number 3, in a 42 circuit panelboard", where 3 is the number and 42 is the quantity or "total amount of".
The word "number" has multiple meanings, the word "quantity" is more specifically related to "total amount of", which is the intent of this code section.
*Also refer to proposal for same word change in 220.42 and 230.2.
Panel Meeting Action: Reject
Panel Statement: The present term is clear and the recommended change would be more confusing. Webster's Dictionary has multiple definitions for the term "quantity" the first being "an indefinite number." The panel agrees that the proposed definition would not add any additional clarity to the intent of this section.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-92 Log #84 NEC-P02 **Final Action: Reject**
(210.11(B))

Submitter: Joe Riley, City of Arlington
Recommendation: Revise as follows:
This load shall be evenly proportioned among ~~multioutlet~~ multiwire branch circuits within the panelboard(s).
Substantiation: The word "multioutlet" refers to more than one outlet where in this article the word "multiwire" refers to a branch circuit.
Panel Meeting Action: Reject
Panel Statement: There is no technical substantiation for the change. The term "multi-outlet" is correct as used in this section.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-93 Log #1021 NEC-P02 **Final Action: Reject**
(210.11(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Where the load is calculated on a volt/ampere sq meter or sq ft basis, the wiring system up to and including the branch circuit ~~panelboard~~ overcurrent device(s) shall be provided to serve not less than the calculated load.
This load shall be evenly proportioned ~~among multioutlet branch circuit branch circuits in the panelboards~~ as much as practical between the ungrounded feeder conductors where the feeder consists of two or more ungrounded conductors . ~~Branch circuit overcurrent devices and circuit shall only be required to be installed to serve the connected load.~~
Substantiation: All branch circuits do not originate in panelboards e.g., a fused switch. It appears a 400 sq ft room in a dwelling unit or motel/hotel supplied by two multioutlet circuits requires each circuit to serve 200 sq ft since load is determined by area. This precludes one of the circuits from only supplying two or more outlets in close proximity at one location to serve grouped equipment such as an entertainment center. The provisions of 210.60(B) may preclude evenly proportioned load (sq ft area) for each circuit.

The last sentence is superfluous; it may be construed as utilization equipment but not receptacle outlets for general lighting.
Panel Meeting Action: Reject
Panel Statement: The term "panelboard" is correct because it is only required to install overcurrent devices to serve the connected load. This section refers to branch circuit conductors and the reference in the recommendation to ungrounded feeder conductors is inappropriate.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-94 Log #392 NEC-P02 **Final Action: Reject**
(210.11(C)(2))

Submitter: Anthony King, Linwood, NC
Recommendation: Revise text to read as follows:
210.11(C)(2) Laundry Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry <u>single</u> receptacle outlet required by 210.52(F). This circuit shall have no other outlets.
<u>Exception: A duplex may be installed for the igniters of a gas dryer if within six feet of receptacle.</u>
Substantiation: As written in 210.11(C)(2), there may be a duplex receptacle used in the laundry and only part of it being used for the washing machine. Leaving the second part of the duplex open may tempt a homeowner to use a drop cord across the washing machine for an iron. If there is a shelf above the washing machine, the homeowner may set the iron on the shelf and the homeowner might knock the iron off of the shelf and pull at the cord just as it enters the water.
Panel Meeting Action: Reject
Panel Statement: The laundry branch circuit is intended to supply one or more receptacle outlets for electrical appliances that are typically used for the purpose of laundering clothes. The submitter has not provided sufficient substantiation to support his recommendation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-95 Log #1839 NEC-P02 **Final Action: Reject**
(210.11(C)(2))

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician
Recommendation: Revise as follows:
Laundry Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional <u>20 amp 120 volt circuit or 30 amp 120/240 volt circuit</u> shall be provided to supply the laundry receptacle outlet(s) required by 210.52(F).
Substantiation: Compact laundry units can require 30 amp 120/240 circuits without need of 20 amp 120V circuit. The code needs to follow appliance changes.
Panel Meeting Action: Reject
Panel Statement: The current text provides for minimum installation requirements. An additional circuit may be provided for compact or stacked laundry equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-96 Log #2870 NEC-P02 **Final Action: Reject**
(210.11(C)(2))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Add in the third line, at least one 20 ampere OR LARGER branch circuit shall be provided...
Substantiation: Laundry equipment now commonly requires 240V for the washing machine, which on a stacked washer/dryer is supplied by the 30 amp, 240V dryer circuit.
This change is part of the proposal submitted for 210.52(F) and concerns the installation of laundry equipment.
More substantiation provided in that proposal.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-95.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-97 Log #3259 NEC-P02 **Final Action: Reject**
(210.11(C)(2)(a))

Submitter: Ryan Schank, North Branch, MI
Recommendation: Add text to read as follows:
(a) Additional receptacles in the laundry room provided they are 20 amp rated can be served from adjacent circuits the specific laundry circuit is installed.
Substantiation: The reason for this is that it does not tell you if you can bring in more circuits into the laundry room.
Panel Meeting Action: Reject
Panel Statement: The intent of this section is to require at least one 20-ampere branch-circuit that is dedicated to the laundry area to ensure that the branch circuit is sufficiently sized to supply electrical equipment associated with doing laundry, such as an iron. Receptacles installed in a laundry area intended to serve laundry equipment must comply with 210.11(C)(2) as presently written. The requirements in section 210.11 do not preclude the addition of other branch circuits in the laundry area.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-98 Log #1408 NEC-P02 **Final Action: Reject**
(210.11(C)(2) and Exception (New))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Change the term and add an Exception to read:
(2) Laundry <u>Equipment</u> Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry <u>equipment</u> receptacle(s) required by 210.52(F). This circuit shall have no other outlets.
<u>Exception: General purpose receptacles within the same laundry area shall be permitted on the laundry equipment circuit.</u>
Substantiation: As it is currently written in the 2005 NEC, laundry areas are to be treated in the same method as the areas defined in (C)(1) and (C)(3). It seems to unintentionally elevate the status of an entire laundry room as a special location. This presents conflicts, in that if a washing machine is to be located in a basement, the entire basement could be regarded as a laundry area, requiring all receptacles to be supplied by that circuit.
It is generally assumed that the laundry receptacle is to be used for the washing machine and gas-dryer ignitor receptacles. Changing the terminology to address the equipment to be served will clarify the purpose of the requirements of this section, and allow installers to install general-purpose receptacles from a general purpose branch circuit to serve wall spaces in laundry rooms.
Pertaining to the exception: Given that other cord-and-plug-connected laundry-related appliances such as irons have a high probability to be used in the laundry room, it is reasonable to allow this 20-ampere circuit to supply other receptacles in the same space for such potential uses. It is more desirable to extend the 20-ampere circuit required to encounter this potential load, than to require it to be supplied by a 15-ampere circuit for general lighting and receptacles.
Please note this is submitted with a coordinating proposal to similarly modify 210.52(F) accordingly:
(Change 210.52(F) to read: 210.52(F) Laundry Areas. In dwelling units, at least one receptacle outlet shall be installed for the laundry <u>equipment</u> .)
Panel Meeting Action: Reject
Panel Statement: The addition of term "equipment" as proposed by the submitter adds no further clarity to the present text. The proposed new exception is not necessary. The rule as written does not limit the number of receptacle outlets supplied by the laundry branch circuit. However, that circuit shall not supply outlets that are not covered in 210.52(F).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-99 Log #3358 NEC-P02 **Final Action: Reject**
(210.11(C)(2) Exception (New))

Submitter: Les Tanzer, City of Phoenix
Recommendation: Add new text to read:
<u>Exception: Where a laundry area consists of a closet sized to allow only accommodate a stackable type washer/dryer combination shall be permissible to install a single 30-ampere 240-volt branch circuit in lieu of the 20-ampere branch circuit.</u>
Substantiation: In smaller dwellings where the space/construction considerations will only allow the smallest of stackable washer/dryer combination units the installation of the 20-ampere branch circuit, as well as the needed 30-ampere branch circuit, appears to be redundant and useless. The wording of the original code text appears to have considered this possibility with the words "at least one additional 20-ampere branch circuit". This exception would tend to clarify if the use of a single 30-ampere branch circuit alone would be allowable in these situations.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-95.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-100 Log #150 NEC-P02 **Final Action: Reject**
(210.11(C)(3))

Submitter: Victor Timpanaro, Municipal Electrical Inspectors
Recommendation: Add to words "at least one 20 ampere branch circuit shall be provided to supply bathroom receptacle outlet(s) (<u>where not more than three bathrooms would be on the same 20 ampere circuit</u>).
Substantiation: More and more large dwelling units having more than three bathrooms pose a load greater than the one branch circuit can supply. NEC should then require additional branch circuits where more than 3 bathrooms.
Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 2-102. The submitter has not provided any data to support the limitation on the number of bathrooms permitted to be supplied by the bathroom branch circuit.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: See my explanation of negative on proposal 2-102.

2-101 Log #929 NEC-P02 **Final Action: Reject**
(210.11(C)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
"The ampere rating of the receptacle shall be 20-amperes."
Substantiation: The vast majority of these receptacles will be multiple type (duplex). Table 310.21(B)(2) indicates the maximum load as 12 amperes for a 15 ampere multiple receptacle I believe this section was adopted due to widespread use of hair blowdryers or portable electric space heaters. Most of these dryers are rated 1500 watts or higher which exceeds the maximum permitted load for a multiple 15 ampere rated receptacle.
Panel Meeting Action: Reject
Panel Statement: Section 210.23(A)(1) requires cord and plug connected utilization equipment to not exceed 80% of the branch circuit rating. Equipment with a 15 ampere rated cord cap should not exceed the load shown in Table 210.21(B)(2).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: The submitter may also want to refer to Section 210.24 for additional guidance.

2-102 Log #3149 NEC-P02 **Final Action: Reject**
(210.11(C)(3))

Submitter: Paul Kennedy, Jr., Inspectional Services
Recommendation: Revise the last sentence as follows:
Such circuits shall supply no more than two bathrooms and shall have no other outlets.
Substantiation: It is common to provide five or more bathrooms in today's higher priced residential market and it's unrealistic not to place a limit on the number of bathrooms that may be served by one circuit. Each of these bathrooms may contain three or more receptacles that could be serving appliances simultaneously.
Panel Meeting Action: Reject
Panel Statement: The submitter's recommendation is a design matter exceeding the minimum requirements prescribed by the Code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: Panel 2 has been presented with several proposals regarding the overload conditions that exist with receptacles installed in bathrooms due to the use of readily available appliances that are typically used for hair care today. It has been substantiated that two or more of these appliances used simultaneously in most cases will create an overload condition for the branch-circuit wiring and outlet devices serving these cord and plug connected loads. The submitter's recommendation would limit the loading on these circuits to a safe level which is the intent of section 210.11(C)(3). Panel 2 should give further consideration to this proposal.
Comment on Affirmative:
BROWN, L.: If there is a problem in the field with the overcurrent device tripping due to the simultaneous use of the bathroom receptacles, especially with the larger homes, the home builders would address the situation as they want their customers to be happy with their new home. In addition, this is no different than all of the bedroom receptacles being used at the same time. There is no limit as to the number of receptacles on a residential general lighting branch circuit.

2-103 Log #685 NEC-P02 **Final Action: Reject**
(210.11(C)(3) Exception)

Submitter: Vincent Metallo, Sr., Baltimore County Government / Rep. Baltimore County Electrical Inspection
Recommendation: Delete the following:
~~Exception: Where the 20 ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with 210.23(A)(1) and (A)(2).~~
Substantiation: It has been an ongoing problem in which many bathroom luminaires and fans are listed to be protected at a 15 amp overcurrent protective device. Many times the equipment is provided by an owner and builder at the finish of the job because of custom type houses and change layouts. It has created a time consuming inspection process because of the disassembly required on each piece of equipment and has created a safety issue. The second problem created has been the loading of the circuit based on the unknown use on the receptacles ranging from hair curlers and 1500W hair dryers added to the load of bar type luminaires that can contain numerous light bulbs and other equipment. The problem is that these issues occur after the rough and final inspections are done. It is impossible to resolve this issue many times at this point and creates a burden on the homeowners and inspection authorities.
Panel Meeting Action: Reject
Panel Statement: Equipment must be installed in accordance with it's listing. Adequate substantiation has not been provided by the submitter to delete the exception.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: Panel 2 has been presented with several proposals regarding the overload conditions that exist with receptacles installed in bathrooms due to the use of readily available appliances that are typically used for hair care today. It has been substantiated that two or more of these appliances used simultaneously in most cases will create an overload condition for the branch-circuit wiring and outlet devices serving these cord and plug connected loads. The submitter's recommendation would eliminate additional loading on these circuits and allow for the connection of additional cord and plug connected loads which is the intent of 210.11(C)(3). Panel 2 should give further consideration to this proposal.

2-104 Log #3548 NEC-P02 **Final Action: Reject**
(210.11(C)(4))

Submitter: Ken Dunn, Corning Cable Systems
Recommendation: Add new te xt:
210.11(C)(4) Vital Communications Branch Circuit. In addition to the number of branch circuits required by other parts of this section, at least one 15 amp branch circuit shall be provided to supply non-network powered communications equipment for two way voice communications. The circuit shall have an outlet within 6 feet of the point of entrance of the communications cable and another outlet within 6 feet of communications equipment. The circuit shall have no other outlet(s). The outlet(s) shall be marked "VCO". The circuit shall not be required to have AFI or GFCI protection.
Substantiation: Reliable residential power for the support of two way voice communications during emergencies, such as fire, burglary, or medical emergency is a growing concern, because an increase amount of residential communications equipment is not network-powered. Services such as fiber to the home and IP technology rely on residential power circuits for continued operation.
Vital communications circuits must also be protected from nuisance trips. To this end, outlets on this circuit are limited to the communications point of entry and locations used for communications equipment (as defined in 800.2) In addition, mandatory GFCI and AFI are excluded because faults may not be readily identified and corrected by the elderly or infirm or those unfamiliar with such devices.
Panel Meeting Action: Reject
Panel Statement: The panel agrees there is a need for reliable power source for vital communications equipment when installed in dwelling units. However,the submitter has not provided sufficient substantiation to require this type of branch circuit for all dwelling units.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-105 Log #613 NEC-P02 **Final Action: Accept in Principle in Part**
(210.12)

TCC Action: The Technical Correlating Committee understands that the Panel Actions on Proposals 2-119, 2-137, 2-142, 2-143 and 2-147 modify the Panel Action on this Proposal.
The Technical Correlating Committee understands that the Panel Action on Proposal 2-143 will change the existing FPN to FPN No. 1.
The Technical Correlating Committee understands that the Panel Action did not change the existing "120-volt" to "125-volt".
Submitter: Eddie Phillips, Southern Regional Fire Code Development Committee
Recommendation: Revise NEC 210.12 to read as follows:
210.12 Arc-Fault Circuit-Interrupter Protection.
(A) Definition. An arc-fault circuit interrupter is a device ~~intended~~ designed to provide protection from the effects of arc-faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc-fault is detected.
(B) Dwelling Unit ~~Bedrooms~~ . All 125 volt, single phase, 15 and 20-ampere branch circuits supplying outlets installed in a d welling unit , as defined by the Life Safety Code (NFPA 101), bedrooms, recreational room, living room, dining room, kitchen and bathrooms shall be protected by a listed arc-fault circuit interrupter , ~~combination type~~ as listed in UL 1699, Standard for Arc-Fault Circuit Interrupters, installed to provide protection of the branch circuit.
~~Branch/Feeder AFCI's shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.~~

~~FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, Standard for Arc-Fault Circuit Interrupters.~~

FPN: Closets off of bedrooms with outlets shall be considered part of the bedroom circuitry.

Exception: The location of the arc-fault circuit interrupter ~~combination type~~ shall be permitted to be at other than the origination of the branch circuit in compliance with (1) and (2):

(1) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.

(2) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.

Substantiation: During the last cycle of the NEC CMP 2 acknowledged the increased level of protection provided by branch/feeder AFCIs. This statement in itself affirms the AFCI as a beneficial safety device for saving lives, property and the environment from unwanted electrical arcing conditions that cause fires. The expansion of this proven safety protection device is justifiable. More than 15 million AFCIs are installed and working in new dwellings throughout the America.

The information submitted to the NEC CMP 2 during the last cycle still remains valid. The Consumer Product Safety Task Force, National Association of State Fire Marshals (NASFM), published a comprehensive report on August 1, 2002 on the efficacy and reliability of arc-fault circuit interrupters. Electrical engineering experts for the US CPSC, Underwriters Laboratories, Chair of NASFMÕs Science Advisory Committee, SP Swedish National Testing and Research Institute, and many fire safety professionals reviewed and commented on statistics and data provided by numerous sources which supports the reliability and effectiveness of arc-fault circuit interrupter technology. This has been confirmed by CMP 2 during the last cycle. Studies conducted by the NASFM and the CPSC indicate that expanding the requirement for AFCI protection to all living areas this code cycle would save many lives and save millions of dollars in property loss."

Panel Meeting Action: Accept in Principle in Part

The panel accepts in principle expansion of the AFCI protection requirements. The panel rejects the addition of the word "design," the reference to NFPA 101, the deletion of combination type devices, the reference to UL Standard 1699 in the mandatory text and the deletion of the fine print note. The panel accepts the deletion of the following text: "branch/feeder AFCI's shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008."

Panel Statement: The term "intended" correlates with the terminology in the product standard. Dwelling units are defined in the NEC and the reference to the definition in NFPA 101 is not necessary. The reference to UL 1699 in mandatory code text does not comply with section 4.2 of the NEC Style Manual. The submitter has not provided adequate substantiation to delete the requirement for combination type devices. See the panel action on Proposal 2-142 regarding the expanded requirements for AFCI protection. It should be noted that the action on Proposal 2-142 addresses the concern regarding closets.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 8 Negative: 4

Explanation of Negative:

BECKER, R.: I agree with the comments expressed in Mr. Nenninger's explanation of negative vote.

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

NENNINGER, B.: The proposal should be rejected at this time, and the installation of AFCIs should be limited to bedrooms only. The use of combination type AFCIs will be a requirement in 2008. However, they will not be commercially available until summer of 2006. The requirement to expand an AFCI product beyond bedrooms to all dwelling unit locations in 2008 is premature as the market will not have sufficient experience with the newer combination type AFCI technology. It is more appropriate to leave the current code as written and gain experience with the combination type AFCIs in bedrooms only. Based on the outcome of this experience, further expansion can be considered for the 2011 code.

PURVIS, R.: See my Explanation of Negative for Proposal 2-115.

2-106 Log #614 NEC-P02 **Final Action: Accept in Part**
(210.12)

TCC Action: The Technical Correlating Committee understands that the Panel Action on Proposals 2-105 and 2-147 modify the Panel Action on this Proposal.

Submitter: Eddie Phillips, Southern Regional Fire Code Development Committee

Recommendation: Revise to read:

210.12 Arc-Fault Circuit-Interrupter Protection.

(A) Definition. An arc-fault circuit interrupter is a device ~~intended~~ designed to provide protection from the effects of arc-faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc-fault is detected.

(B) Dwelling Unit Bedrooms. All 125 volt, single phase, 15 and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.

(C) Other Residential Occupancies. All 125 volt, single phase, 15 and 20-ampere branch circuits supplying outlets installed in lodging and rooming houses, dormitories, board and care facilities as defined by the Life Safety Code (NFPA 101) shall be protected by a listed arc-fault circuit interrupter as listed in UL 1699, Standard for Arc-Fault Circuit Interrupters, installed to provide protection of the branch circuit.

~~Branch/Feeder AFCI's shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.~~

~~FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, Standard for Arc-Fault Circuit Interrupters.~~

Exception: The location of the arc-fault circuit interrupter shall be permitted to be at other than the origination of the branch circuit in compliance with (1) and (2):

(1) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.

(2) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.

Substantiation: The code proposal expands the use of arc-fault technology into other occupancies as defined by the Life Safety Code (NFPA 101). Previously CMP 2 rejected this proposal that it was too broad, therefore with the addition of the reference to the Life Safety Code the definition it is now better clarified.

Sufficient data has been submitted previously such as "Fire Loss in the United States During 2001" by Michael J. Karter, Jr., Fire Analysis and Research Division, September 2002 publication clearly indicates the tragic fire losses occurring in residential occupancies with an increase of 4.5 percent. The other occupancies identified in this proposal are used as a home environment must be protected to ensure the residents are provided protection from electrical arcing fires.

Panel Meeting Action: Accept in Part

The panel rejects the addition of the word "design," the reference to NFPA 101, the reference to UL Standard 1699 in the mandatory text and the deletion of the fine print note that references UL 1699. The panel accepts the deletion of the following text: "branch/feeder AFCI's shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008."

Panel Statement: The term "intended" correlates with the terminology in the product standard. Dwelling units are defined in the NEC and the reference to the definition in NFPA 101 is not necessary. The reference to UL 1699 in mandatory code text does not comply with Section 4.2 of the NEC Style Manual. The fine print note provides useful information describing various types of AFCI's. The submitter has not provided adequate substantiation to support the expansion of AFCI devices to the locations described in the proposed new subdivision (C). CMP-2 action supporting the use and expansion of AFCI protection has been based on dwelling unit fire data.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

(Note to the TCC: It appears the Panel Meeting Action does not match the conclusion shown in the Panel Statement. The Panel Statement states, "The submitter has not provided adequate substantiation to support the expansion of ACFI devices to the locations described in the proposed new subdivision (C)." The Panel Meeting Action does not state that it does not accept the change shown in new subdivision (C). If it is the intent of the Panel to not accept new (C) this should be stated in the ROP. In fact, it actually looks as if the Panel Rejected the Proposal except for the one item (deletion of the sentence, "Branch/Feeder AFCI's....") already covered under Panel Meeting Action on Proposal 2-105.)

Comment on Affirmative:

KING, D.: I disagree with the panel action to not accept the expansion of AFCI protection to the occupancies listed in the submitter's recommendation. These occupancies serve as dwelling units for those who occupy them and are subject to the same hazards that arise with the use of electricity as that of a dwelling unit. The excessive use of extension cords in most dormitories is common place creating a greater risk of fire due to arcing faults. The panel should give further consideration to this proposal.

2-107 Log #615 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: Eddie Phillips, Southern Regional Fire Code Development Committee

Recommendation: Revise to read: 210.12 Arc-Fault Circuit-Interrupter Protection.

(A) Definition. An arc-fault circuit interrupter is a device ~~intended~~ designed to provide protection from the effects of arc-faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc-fault is detected.

(B) Dwelling Unit Bedrooms. All 125 volt, single phase, 15 and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.

Branch/Feeder AFCI's shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.

FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, Standard for Arc-Fault Circuit Interrupters.

Exception: The location of the arc-fault circuit interrupter shall be permitted to be at other than the origination of the branch circuit in compliance with (1) and (2):

(1) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.

(2) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.

<u>(C) Educational and Day Care Occupancies. All 125-volt single phase, 15-and 20Ðampere branch circuits supplying outlets installed in educational occupancies K-12 and day care centers for preschool age as defined by the Life Safety Code (NFPA 101) shall be protected by a listed arc-fault circuit interrupter, as listed in UL 1699, Standard for Arc-Fault Circuit Interrupters, installed to provide protection of the branch circuits.</u>

<u>Exception: The location of the arc-fault circuit interrupter combination type shall be permitted to be at other than the origination of the branch circuit in compliance with (1) and (2):</u>

<u>(1) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch Circuit overcurrent device as measured along the branch circuit conductors.</u>

<u>(2) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.</u>

Substantiation: The need to expand the use of AFCI technology is necessary to afford greater safety within these occupancies from the hazards arising from the use of electricity. Educational occupancies as defined by the Life Safety Code include grades K through 12. These facilities are supported by tax dollars as well as private funding and protecting this investment is vital to the educational programs. A school fire disrupts the educational process and disrupts the academia programs. Schools also contain many different hazards such as laboratories, shops etc. These hazardous areas in use by students present an even greater hazard and the installation of AFCI's would reduce one of those hazards. To prevent electrical fires in the educational occupancies is justifiable and vital to the safety of the students. It is not a matter of staffing but practical safeguarding from the hazards arising from the use of electricity.

Day care centers fall into the same category as educational occupancies substantiation except today many are private facilities.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided adequate substantiation to support the expansion of AFCI devices to the locations described in the proposed new subdivision (C). CMP-2 action supporting the use and expansion of AFCI protection has been based on dwelling unit fire data.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: I agree with the submitter that this proven safety technology should be expanded to educational facilities. The use of AFCI devices does reduce the incidence of fires due to arcing faults. The panel action on proposal 2-142 speaks to the confidence that panel 2 has with the reliability of these devices. The National Association of State Fire Marshals has documented that of the majority of the 5,500 fires in educational facilities that are reported on average annually, most occur during the hours when school is in session and the buildings are occupied thus increasing the risk of injury or death to persons occupying these facilities. The orientation of some of these documented fires is electrical in nature. Requiring AFCI protection for branch circuits supplying 125-volt 15-and 20-ampere receptacle outlets would reduce the number if not eliminate the number of fires resulting from electrical arcing on these branch circuits.

Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-108 Log #616 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: Eddie Phillips, Southern Regional Fire Code Development Committee

Recommendation: Add a new Subsection of 210.12 to read as follows:

<u>( ) Existing Occupancies: When the panelboard that contains the overcurrent protection devices for branch circuits is replaced in existing dwellings, apartments, lodging and rooming houses, residential board and care homes and dormitories as defined by the Life Safety Code, (NFPA 101), a listed arc-fault circuit interrupter as listed in UL 1699, Standard for Arc-Fault Circuit Interrupters, shall protect each branch circuit that serves 125-volt, single-phase, 15 and 20-ampere outlets.</u>

<u>E xception: The location of the arc-fault circuit interrupter shall be permitted to be at other than the origination of the branch circuit in compliance with (1) and (2):</u>

<u>(1) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.</u>

<u>(2) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.</u>

Substantiation: Data provided CMP 2 from NFPA regarding lodging and rooming houses, existing dwellings, dormitories, apartments and residential board and care homes provide equivalent environments settings to dwellings (our homes). Previously CMP 2 indicated that apartments are considered dwellings; however, there is no definition of dwelling in the NEC. Therefore, utilizing the Life Safety Code definition provides consistency with NFPA documents. Apartments added to this section may be redundant but necessary to clearly provide intent of the code.

Existing occupancies as identified in this proposal house the largest number of citizens for living in an environment that has the greatest fire losses, human and property that must be provided the latest technology for electrical safety. Data clearly indicates that dwelling fires from electrical arcing conditions cause approximately 400 deaths, 1700 injuries and over a billion dollars in losses. These unnecessary and needless losses can be prevented by the use of arc-fault technology. Providing for the installation of AFCIs during electrical upgrades will greatly enhance the electrical safety in the proposed occupancies.

Wiring in older homes is a problem. Over the years circuits, receptacles and other accessories have been added, in most cases by inexperienced people, to the existing circuits and panel boards. The addition of AFCI's during change out would ensure an increased level of safety in these aging systems.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided sufficient substantiation to expand the requirement for AFCI protection beyond dwellings. CMP-2 action supporting the use and expansion of AFCI protection has been based on dwelling unit fire data. See panel action and statement on Proposal 2-138 regarding the use of AFCI protection in existing dwelling units.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

KING, D.: This proposal should have been accepted in principal with the panel rejecting the reference to the Life Safety Code, NFPA 101 and the addition of the reference to UL Standard 1699 in the main text. With regard to the part of the submitter's recommendation that AFCI protection be required for each 125-volt 15-and 20-ampere circuits installed in dwelling units, CMP-2 has accepted this for new installations with the panel meeting action on proposal 2-142. Panel 2 has been presented with data both in the past and present code cycle that shows evidence that there is an increased risk of fire in homes that are older than 20 years old, with even a more significant increase in fires in homes that are 40 years or older. The installation of these devices in older dwelling units will identify many wiring problems that will need to be corrected by the electrician installing these devices. This will help to mitigate the number of fires due to the improper installation of branch circuit wiring while ensuring that protection in the future from fires associated with arcing faults is afforded to these homeowners. Panel-2 should give further consideration to the submitter's recommendation to expand this requirement to other occupancies that are similar to dwelling units. See my explanation of negative for proposal 2-106.

WEBER, R.: The value and enhanced safety for occupants as well as the general public by the use and incorporation of AFCI protection techniques in not only dwelling unit type occupancies will provide a safer environment. Given the age and lack of good maintenance to the electrical systems in older type structures this proposal has merit and advantages. See my comment and explanation for the negative vote on Proposal 2-138.

Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-109 Log #2300 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: James Shaw, Jim Shaw Electric Co.

Recommendation: Subject 210.12

I am told that I am amongst the fifty percent of the country that oppose smoke detectors on arc-fault circuits. I feel that 210.12(B) should be rewritten once again.

210.12(B) Dwelling unit bedrooms. All 120 volt, single phase 15 and 20 ampere branch circuits supplying <u>receptacle</u> outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection for the branch circuits.

I also believe that the exceptions in this section should be eliminated entirely, and allow AFCI receptacle outlets (similar to GFCI receptacle outlets) to be installed at the first outlet of each bedroom.

Substantiation: In the 1999 code, Arc-fault Circuit interrupters, were introduced. I do not have a copy of the 1999 code book, but as I remember it, it stated that in 2002 all receptacle outlets installed in dwelling unit bedrooms shall be protected by a listed arc fault circuit interrupter.

In the 2002 code book, the wording was changed slightly to include ALL 125 single phase 15 and 20 ampere outlets installed in dwelling unit bedrooms shall be protected by an arc fault circuit interrupter listed to provide protection of the entire branch circuit. The way this was written meant that now smoke detectors installed in bedrooms now had to be installed on the arc-fault protected circuit. This should never have happened? Placing a smoke detector circuit on a sensitive arc-fault circuit is like placing a sump pump on a GFCI circuit or a fire pump on breaker. These items should be on at all times and should be the last to trip or to fail.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any technical substantiation that would indicate that AFCI devices are not compatible with smoke alarms nor has there been any data presented that warrants limiting AFCI protection to only receptacle circuits in dwelling unit bedrooms. The exception provides reasonable alternatives for dwelling unit owners that do not have service panels compatible with currently available AFCI procucts.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-110 Log #2605 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: Thomas Domitrovich, Eaton Electrical

Recommendation: Revise text to read:

210.12 Branch Circuit Arc-Fault Circuit-Interrupter Protection.

(A) Definition. Arc-Fault Circuit-Interrupter. An arc-fault circuit interrupter is a device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing . ~~and by functioning~~ It functions to de-energize the circuit when an arc fault is detected ~~.~~ and in response to ground faults that exceed a setting of no more than 100 mA.

(B) No change.

Substantiation: Article 210 is concerned with Branch Circuits. It is, therefore, appropriate to add the words "Branch Circuit" to the 210.12 heading. With this heading, the definition, 210.12(A), and the requirement, 210.12(B), relate to branch circuit protection. This change is needed because the AFCI standard, UL 1699, covers six different types of AFCI, and many of these types, for example, portable AFCIs, are not suitable for branch circuit protection.

The 210.12(A) definition change reflects the fact that all commercially available AFCIs, designed for branch circuit protection, incorporate ground fault protection that is set to operate at no more than 100 mA. Thus, ground faults that exceed this setting will de-energize the circuit. In addition to exceeding the UL 1699 requirement for responding to arcs down to 5A in typical installation-cable, Type NM-B plus ground, this ground fault protection has important fire protection advantages. First, the AFCI will respond to arcs to ground at any point in the installed wiring and in the branch circuit extension wiring. This response will occur for currents down to 100 mA, or less depending upon the design. Second, there is significant protection against "glowing connections" (1) Thus, loose connections at receptacles can lead to local overheating. The resulting "glowing connections" can create ground currents that can cause the AFCI to operate prior to fire initiation. Third, wiring errors (for example, grounded or shared neutrals) are immediately detected during initial circuit installation and power use.

The value of ground fault was recognized in the 1995 UL landmark study (2) prepared by UL for CPSC entitled "Technology for Detecting and Monitoring Conditions that Could Cause Electrical Wiring System Fires". That report includes in its Summary of Findings the statement: "Ground-fault interruption technology, due to the low-trip current levels that are possible, coupled with a fast response was shown to be very effective in interrupting arcing-fault currents to ground. This suggests that it should be combined with AFD technology, since AFD technology does not require current to ground to operate. As a fire prevention device, as opposed to a device intended to provide protection from electric shock, there is greater flexibility with respect to trip-current levels. The effectiveness of ground-fault technology is enhanced by increasing the probability that a fault will involve ground."

Further, in the 1995 study Recommendations, UL states: "Arc fault detection appears to be a very promising technology [for protecting against electrical fires] especially when added to residential branch circuit breakers and combined with other proven technologies such as ground fault protection."

The proposed definition change will not impact the design of commercially available AFCIs. It will, however, ensure that the additional fire protection benefits of ground fault detection continue to be incorporated in the AFCIs that are applied to branch circuits.

References:

1. UL Special Services Investigation for Cutler-Hammer entitled "Branch/Feeder Arc Fault Circuit Interrupter Incorporating Equipment Ground Fault Protection", File E45310, May 31, 2001.

2. UL report for CPSC entitled "Technology for Detecting and Monitoring Conditions that Could Cause Electrical Wiring System Fires", Contract Number CPSC-C-94-112, September 1995.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Including ground fault detection in an AFCI is a design feature and is not required for all AFCIs to function. The addition of ground fault technology should be addressed in the applicable product standard.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-111 Log #2606 NEC-P02 **Final Action: Accept in Principle in Part**
(210.12)

Submitter: Thomas Domitrovich, Eaton Electrical

Recommendation: Revise text to read:

210.12 Arc-Fault Circuit-Interrupter Protection.

(A) Definition. Arc-Fault Circuit Interrupter. (No change)

(B) Dwelling Unit ~~Bedrooms~~ Living Areas . All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit ~~bedrooms~~ living areas shall be protected by a listed arc-fault circuit interrupter ~~, combination type~~ installed to provide protection of the branch circuit.

~~Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.~~

~~FPN: For information on types of AFCI, see UL 1699-1999, Standard for Arc Fault Circuit Interrupters.~~

Exception: (No change)

Substantiation: The change dealing with the type of AFCI would permit the continued use of listed Branch/feeder AFCIs beyond January 1, 2008. Further, since the proposed code language would not specify any particular type of AFCI for branch circuit protection, the wording would also permit the use of listed Combination Type AFCIs when available. Essentially the code language is similar to the language used in the 2002 code, which did not specify a Type designation. This change is necessary because, as of November 2005, Combination AFCIs have not become commercially available. As a consequence, there is no practical field experience to form a basis for judging whether these devices offer superior fire protection and satisfactory resistance to unwanted tripping. This practical field experience is absolutely essential as pointed out in the recent Eaton Electrical articles that appeared in IAEI News (ref. 1) and the NEC Digest (ref. 2).

What is know is that Branch/feeder AFCIs have proven safety features. They mitigate the effects of high current arcs at any point in the branch circuit wiring, Type NM-B plus ground, and in the two-wire branch circuit extension wiring. They protect against low current arcs in the branch circuit wiring and, since the commercially available devices contain low-level ground fault protection (30-50 mA), they additionally mitigate the effects of arcs to ground and of glowing connections (ref. 3). Branch/feeder AFCIs are practical devices that have been readily available from at least four major manufacturers since 1999. Since that time more than 15 million devices have been installed. Electrical fires have been prevented, wiring errors during initial electrical installation have been corrected, and unwanted tripping has been minimal. In particular, the AFCI support of many organizations including UL, CSA, the National Association of State Fire Marshals, the Consumer Products Safety Commission, and the Electrical Safety Foundation International is based on the experience gained with Branch/feeder AFCIs.

The change dealing with AFCI protection for all living areas represents an increase in AFCI application and fire safety. At the present time, AFCI protection is only required for bedroom circuits. These circuits represent a limited fraction of dwelling unit circuits. Consequently, AFCIs can presently mitigate less than 20 percent (ref. 4) of the electrical fires that could occur in dwellings that are wired according to the 210.12(B) code requirements. The value of expanded AFCI fire protection was certainly appreciated by the National Association of State Fire Marshals who, during the 2005 code cycle, proposed (proposal 2-140) the expansion of AFCI to all branch circuits that supply living areas. The NASFM proposal was subsequently discussed during the comment period, (comment 2-91) where is was defeated. The associated panel statement reads, "The panel appreciates the level of protection provided by branch/feeder AFCIs. However, the panel wants to see the combination protection implemented before expansion beyond the bedrooms. The submitter has provided comprehensive fire data; however, Panel 2 seeks to gain further information on the experience with the devices already in the field". The dissenting statement, supporting expansion, by Ms. Porter of UL reads, "The panel has been provided with data that shows that fires in kitchens, living rooms and other dwelling unit areas may be reduced by the use of AFCI devices. The existing branch/feeder AFCIs have demonstrated their performance in the field. Since these devices will continue to be permitted until January 1, 2008, there is no need to postpone the expansion of AFCI into other circuits." The dissenting statement, supporting expansion, by Jim Pauley of NEMA deals with the fire statistics issue.

The panel is faced with a quandary. (1) With two years left before Branch/feeder AFCIs exclusion, which is the intent of the 2005 Code language, their presumed successor, Combination AFCIs, are not commercially available and their viability has not been proven. (2) Even if Combination AFCIs became available in January 2006, there would be very limited field experience prior to the code-comment-period decisions in December 2006. (3) Following from (1) and (2), if expansion of AFCI application is dependent on Combination AFCI implementation and experience, then expansion is likely to be delayed to the 2012 code cycle. And, during this time period there are likely to be thousands of preventable electrical system fires in dwelling units, with associated deaths, injuries and property loss.

The present proposal offers a solution to the quandary. (1) The installation of Branch/feeder AFCIs, with a level of protection, per the panel statement, that is appreciated, would be permitted beyond January 1, 2008. (2) No type of AFCI is specified in the proposed code language. This means that Combination AFCIs could be introduced to the market place at any time. This should result in a gradual increase in practical experience rather than a possible rush for experience in 2006. (3) Fire statistics show an evident need for electrical-system fire-protection on additional circuits. As expressed by Ms. Porter, "The existing Branch/feeder AFCIs have demonstrated their performance in the field. Since these devices will continue to be permitted until January 1, 2008, there is no need to postpone the expansion of AFCI into other circuits." The proposed code language achieves circuit expansion, and the protection requirement, at least initially, can be expected to be met by Branch/feeder AFCIs. However, the public could choose, alternatively, to fill the requirement using Combination AFCIs, when available. Ultimately, the panel may be in a position to compare the technologies and experiences. But for the moment, the best interests of fire safety are served by a lack of AFCI type specification, and an increase in the number of protected circuits.

References:

1. Arc Fault Circuit Interrupters - A critical NEC 2005 Issue, B. Foley, J. C. Engel, and C. W. Kimblin, IAEI News, pages 78-82, November/December 2003

(Available at web address: www.iaei/org/magazine_03_f.htm)

2. Arc Fault Circuit Interrupters: Branch/feeder and Combination AFCIs, Clive W. Kimblin, NEC Digest, pages 56-63, June 2005.

3. UL Special Services Investigation for Cutler-Hammer entitled "Branch/ Feeder Arc Fault Circuit Interrupter Incorporating Equipment Ground Fault Protection", File E45310, May 31, 2001.

4. Statistical tables on structure fires involving electrical arcing or improper operating electrical equipment in one- or two-family dwellings, prepared by Marty Ahrens, NFPA, Quincy, March 2002.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

The panel rejects the deletion of the reference to combination type devices and the deletion of the existing fine print note referencing UL1699. The panel accepts the deletion of the following text: "branch/feeder AFCI's shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008."

Panel Statement: The submitter has not provided adequate substantiation to delete the requirement for combination type devices.The reference to UL 1699 in the fine print note provides usefull information in describing various different types of AFCI's. See the panel action on Proposal 2-142.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

NENNINGER, B.: See my explanation of negative vote on Proposal 2-105.

2-112 Log #2607 NEC-P02 **Final Action: Accept in Part**
(210.12)

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal is modified by the Panel Action on Proposal 2-142.

Submitter: Thomas Domitrovich, Eaton Electrical

Recommendation: Revise text to read:

210.12 Arc-Fault Circuit-Interrupter Protection.

(A) Definition. Arc-Fault Circuit Interrupter. (No change)

(B) Dwelling Unit Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter ~~, combination type~~ installed to provide protection of the branch circuit.

~~Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.~~

~~FPN: For information on types of arc fault circuit interrupters, see UL 1699-1999, Standard for Arc Fault Circuit Interrupters.~~

Exception: (No change)

Substantiation: This change would permit the continued use of listed Branch/ feeder AFCIs beyond January 1, 2008. Further, since the proposed code language would not specify any particular type of AFCI for branch circuit protection, the wording would also permit the use of listed Combination Type AFCIs when available. Essentially, the code language is similar to the language used in the 2002 code, which did not specify a Type designation.

In the November/December 2003 IAEI News article "AFCIs-A Critical NEC 2005 Issue" (1), Eaton Electrical had suggested that the 2005 code language should not be changed to reference a specific type of AFCI. We stated that the code panel could certainly revisit this subject in future code cycles should Combination AFCIs become commercially available, and if subsequent practical field experience indicated superior fire protection capabilities and satisfactory resistance to unwanted tripping. But, as of November 2005, Combination AFCIs have not become commercially available. As a consequence, there is no practical field experience to form the basis for judging superior fire protection and satisfactory resistance to unwanted tripping. Eaton Electrical has also provided an in-depth discussion of Branch/feeder AFCIs and Combination AFCIs in the June 2005 edition of NEC Digest (2), This article again stresses that, although UL has provided listings for Combination AFCIs, these devices are not readily available in the marketplace.

Further, the article points out that Combination AFCIs could eventually be installed in millions of homes where they would be subjected to all manner of circuit conditions and all manner of appliance types and configurations. But, so far extensive commercial experience with the devices is lacking and their resistance to unwanted tripping under practical field conditions is unknown.

In urging the panel to accept this proposal, Eaton Electrical again references the proven safety features of Branch/feeder AFCIs. They mitigate the effects of high current arcs at any point in the branch circuit wiring, Type NM-B plus ground, and in the branch circuit extension wiring. They protect against low current arcs in the branch circuit wiring and, since the commercially available devices contain low-level ground fault protection (30-50 mA), they additionally mitigate the effects of arcs to ground and of glowing connections (3), Branch/ feeder AFCIs are practical devices that have been readily available from at least four major manufacturers since 1999. Since that time more than 15 million devices have been installed. Electrical fires have been prevented, wiring errors during initial electrical installation have been corrected, and unwanted tripping has been minimal. In particular, their fire-protection value has been recognized by many organizations including UL, CSA, the National Association of State Fire Marshals, the Consumer Products Safety Commission, and the Electrical Safety Foundation International. It must again be emphasized that the proposed language does not exclude Combination AFCIs. Rather, it removes the exclusion of the proven technology, Branch/ feeder AFCIs, and also permits the immediate introduction of Combination AFCIs when available. Eventually the panel should expect to have comparative data from millions of field installations for the two types of devices. But, at this time, there is absolutely no commercial field experience with Combination AFCIs that could justify the exclusion of Branch Feeder AFCIs. The panel should accept this proposal in the interests of continued fire safety.

References:

1. Arc Fault Circuit Interrupters - A critical NEC 2005 Issue, B. Foley, J. C. Engel, and C. W. Kimblin, IAEI News, pages 78-82, November/December 2003.

(Available at web address: www.iaei/org/magazine_03_f.htm)

2. Arc Fault Circuit Interrupters: Branch/feeder and Combination AFCIs, Clive W. Kimblin, NEC Digest, pages 56-63, June 2005.

3. UL Special Services Investigation for Cutler-Hammer entitled "Branch/ Feeder Arc Fault Circuit Interrupter Incorporating Equipment Ground Fault Protection", File E45310, May 31, 2001.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Part

The panel accepts the deletion of "Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008."

The panel rejects the remainder of the recomendation.

Panel Statement: See the Panel action and statement on Proposal 2-111 regarding the rejected portion of the recommendation.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

BECKER, R.: The combination type AFCI should be dropped as proposed by the submitter. In presentation to CMP 2 the submitter raised serious questions regarding the viability of the combination type AFCI, while at the same time also promoted extending the use of the non combination type. The submitter's concerns regarding combination type AFCI availability, the viability of the UL tests, and the existence of a proven track record are valid.

The CPSC 2005 Performance and Accountability Report states that its goal for 2005 was to evaluate field installed AFCIs to make future NEC proposals, but that the devices were not available. Why not wait for results from CPSC? Mandating use of a product that is still in a testing environment unnecessarily risks the financial resources of the public. NASFM fact finding endeavors reveal that series type arc faults are low energy and less likely to cause fires. There is no documentation to support the substantial existence of fires attributable to events that the combination type will sense, and that would not be sensed by the branch/feeder AFCI. It is prudent to wait until the product has a more substantial record and is field proven.

The panel statement asks the submitter to provide substantiation that the combination type is not viable, but clearly this is unreasonable for a product that is not widely, commercially available. CPSC's unfulfilled intent should be enough substantiation. IEEE encourages CPSC and UL to develop testing procedures that reveal significant benefits of the combination type AFCI.

CMP 2 should approach the combination type AFCI as it did with its response to Proposal 2-88, nothing in the code prevents its installation, and if it offers beneficial results they will be proven in the field.

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

NENNINGER, B.: See my explanation of negative vote on Proposal 2-105.

2-113 Log #3620 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: Richard W. Becker, Engineered Electrical Systems, Inc. / Rep. IEEE
Recommendation: Delete this section.
Substantiation: Electrically caused ignition is the result of joule heating when an energized conductor comes in contact with a grounded surface. The heat that is produced can result in the conductor melting and vaporizing which then emits "sparks" and can support "arcing" however ignition results before this phenomenon becomes detectable by the Arc Fault detection circuit. Producing ignition in combustible material using conductors protected by an AFCI device can be accomplished repeatedly without tripping the device. Under these conditions it becomes apparent that this technology is not effective in preventing electrically caused ignition.

The estimated cost of this requirement has been stated in other documentation as an estimated average cost of $ 100 per dwelling. The benefit has not been demonstrated, and the consumer is being given a false sense of security. Substantiation that has been presented previously by Fire Investigators is not specific as to the actual electrical conditions at the time of ignition. Research must continue to accurately define the conditions that result in "electrically caused" fires so that positive measures can be defined that will reduce or eliminate this problem.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any data that would indicate that AFCI devices would not respond to an arcing fault in time to prevent ignition of combustible materials. Contrary to the submitters substantiation, there is documentation at NFPA headquarters that supports the panel's position that AFCI devices do mitigate the effects arcing faults prior to ignition of surrounding combustible materials.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

(Note: Sequence 2-114 was not used)

2-115 Log #3646 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: Lawrence Brown, National Association of Home Builders (NAHB)
Recommendation: Delete Section 210.12.
Substantiation: Data on fire loss has yet to prove that the use of AFCI devices is a cost-effective approach to lessen fires associated with the wiring between the electric distribution panel and the electrical outlet. Also of concern is that these devices are not capable of identifying all of the possible electrical fires that may be related to this same wiring. If, on a national basis, the cost to install these devices greatly exceeds the loss there is no cost-benefit and this provision in the NEC should be removed. Please see the article on House Fire Deaths which I have provided.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The submitters substantiation includes one report on the declining number of residential fires both in the United States and Europe. The report fails to include any data on the contribution of AFCI technology to the decline of electrically oriented fires. Since first discussed during the 1999 NEC cycle, data has been presented that supports the panel's position that AFCI devices do mitigate the number of fires resulting from electrical arcing. The panel is aware that there have been other measures taken to reduce the number of fires in dwelling units and views the use of AFCI protected devices as being one that will play a role in the reduction of these fires.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

PURVIS, R.: Proposal 2-115 (AFCIs) should be accepted. EEI EL&P agrees with the substantiation of the proposal. AFCI requirements should be removed from the NEC for dwelling unit branch circuits and not be expanded to any other location. Problems in the field, manufacturer recalls, nuisance trips, and the numerous jurisdictions that have removed this requirement from local adoption are an indication of the lack of support of AFCIs in electrical systems in residential occupancies. AFCI requirements throughout the dwelling increases housing costs when not justified for new wiring systems. The AFCI does not address all of the problems with the incidents of fire that were submitted in the substantiation of the Consumer Product Safety Commission. The majority of known problems submitted have occurred on old wiring systems in older dwellings and not with the latest wiring requirements found in the NEC. Hazards have occurred when there is a lack of receptacles in an existing dwelling and extension cords are used to supply utilization equipment. These cords have been placed under furniture, under floor coverings or had physical damage. It appears that the intent of the AFCI requirement in the NEC is to create a market for a product where the benefit of the device does not protect against all arcing problems.

2-116 Log #2918 NEC-P02 **Final Action: Reject**
(210.12 Exception No. 1 (New))

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Revise as follows:

210.12 Arc-Fault Circuit-Interrupter Protection.

<u>Exception 1: A single receptacle located within a bedroom closet used exclusively for a lift pump shall not require arc-fault circuit interrupter protection. This receptacle shall be identified as NOT arc-fault protected.</u>

Renumber existing exception as Exception <u>2</u> .
Substantiation: As an essential piece of equipment, lift pumps located within bedroom spaces should not be required to be installed on a circuit that, if tripped, could cause unnecessary damage.
Panel Meeting Action: Reject
Panel Statement: The submitter of this proposal has not provided any technical data to support his position that listed AFCI devices are not compatible with lift pumps.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-117 Log #2920 NEC-P02 **Final Action: Reject**
(210.12 Exception No. 1 (New))

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Add an exception to read as follows:

<u>Exception No. 1: A single receptacle used exclusively for the connection of an essential medical device shall not require arc-fault circuit interrupter protection. This receptacle shall be identified as NOT arc-fault protected.</u>

Renumber existing exception as Exception No. 2.
Substantiation: Specialty home medical devices have electronic components that are incompatible with ground-fault and arc-fault devices.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any technical data to support his substantiation that electronic components contained in medical devices are incompatible with arc-fault devices.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-118 Log #2850 NEC-P02 **Final Action: Reject**
(210.12 Exception No. 2 (New))

Submitter: Lorenzo Adam, City of Mason-Building Department
Recommendation: Add new text as follows:

Exception <u>No. 1</u> : The location...".

<u>Exception No. 2: In dwelling units 120 volt, single phase, 15- and 20-ampere branch circuits supplying smoke alarms shall conform to NFPA 72.</u>
Substantiation: Article 760 covers Fire Alarm Systems. Smoke alarms covered under this article are part of a system and not individually (single and multiple stations) as in the Building Code. The International Building Code and International Residential Code cover single- and multiple-station smoke alarms. Both codes reference NFPA 72. In NFPA 72, Chapter 11 covers single- and multiple-station alarms.

This is a case where NFPA 72 and 70 are in conflict with each other.

(1) NFPA 72 states no smoke detectors under AFCI protection (see ROP already submitted for NFPA 72, 2006 (to be specific 72-530 Log #179 SIG-HOU/11.36.3(5)/72-528 Log #390/72-529 Log #630) which has been accepted to modify and to add "arc fault circuit interrupter" to this paragraph) and;

(2) NFPA 70 states that any "outlets" in the bedrooms must be AFCI protected. The word "outlets" is what makes smoke alarms part of the AFCI protection. Therefore, it would be the discretion of the Authority Having Jurisdiction to interpret which code is more appropriate for the application of the proper code language. In this case, is it the building code that has the jurisdiction over the smoke alarms in residential applications.

Panel Meeting Action: Reject
Panel Statement: See the panel action on Proposal 2-118a (Log# CP 200) which is consistent with the action of the NFPA 72 Technical Correlating Committee to resolve the potential conflict.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-119 Log #3061 NEC-P02 **Final Action: Accept**
(210.12(A).Arc-Fault Circuit Interrupter (AFCI))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal modifies the Panel Action on Proposal 2-105.
The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal to revise the definition to comply with 2.2.2 of the NEC Style Manual by deleting the term within the definition.
This action will be considered by the Panel as a Public Comment.
Submitter: Douglas A. Lee, U.S. Consumer Product Safety Commission
Recommendation: Revise section 210.12(A) to read as follows:
(A) Definition: Arc-Fault Circuit Interrupter (<u>AFCI</u>). An arc-fault circuit interrupter is a device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.
Substantiation: The acronym "AFCI" is used in 210.12(B) but is not previously defined. Appropriately the acronym "GFCI" is in the definition of Ground-Fault Circuit Interrupter (GFCI) in Article 100.
Some people are still confused by arc-fault circuit interrupters, which are used to protect against arcing faults to prevent fires, and ground-fault circuit interrupters which are used for personnel protection against electrical shock. This addition will help users to relate arc-fault circuit interrupter to AFCI.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-118a Log #CP200 NEC-P02 **Final Action: Accept**
(210.12(B))

Submitter: Code-Making Panel 2,
Recommendation: Add a new FPN after the main paragraphs of 210.12(B) to state:
FPN No.2: See 11.6.3(5) of NFPA 72-2007, National Fire Alarm Code® for information related to secondary power supply requirements for smoke alarms installed in dwelling units.
Substantiation: At the request of the NFPA 72 Technical Correlating Committee, the panel has added a new FPN to reference the specific requirement in NFPA 72 for a secondary power source for smoke alarms that are installed on AFCI protected circuits. The panel notes that the provision for a secondary power source is required for all new installations of smoke alarms under the provisions of NFPA 72 and the addition of the FPN correlates with the revision by the NFPA 72 Technical Correlating Committee to require that all AC powered smoke alarms (whether new installation or retrofit) that are supplied by an AFCI protected circuit must have a secondary power source.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-120 Log #96 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Kenneth Stevens, Corunna, MI
Recommendation: Add a new sentence at the end of the paragraph as follows:
"Fire alarm circuits shall not be supplied through arc-fault circuit-interrupters."
Substantiation: This statement is in 760.21 and 760.41, but it probably will not be seen by too many persons in the field. This statement needs to be made clear.
Panel Meeting Action: Reject
Panel Statement: Fire alarm circuits are covered in Article 760 which modifies the general requirements of 210.12(B). See panel action and statement on Proposal 2-150.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-121 Log #107 NEC-P02 **Final Action: Accept in Principle**
(210.12(B))

Submitter: Virgil Alexander, Saginaw, MI
Recommendation: Add a new second paragraph as follows:
"Closets and other rooms accessible only from a bedroom shall have all outlets supplied by 125 volt, 15- or 20-ampere circuit protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.
Substantiation: The first sentence of paragraph (B) states only 125 volt 15- and 20-ampere outlets in bedrooms shall be arc-fault circuit-interrupter protected. The question has been raised as to whether closets and dressing rooms off a bedroom are also included. Some inspectors say yes and others say no. This issue needs to be clarified. As I am proposing, all rooms accessible only from a bedroom are to have the 125 volt, 15- and 20-ampere outlets arc-fault circuit-interrupter protected. This would include bathrooms as well as closets, storage areas, and dressing rooms. I do not have any strong feelings as to which rooms should be included, I just want the issue clarified so as an electrician I can wire a dwelling correctly the first time and not have to go back and fix a Code violation.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-142.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-122 Log #391 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Stephen Schaefer, DCCC
Recommendation: Revise text as follows:
All 120-volt single phase, ~~15- and 20-ampere~~ branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault interrupter, combination type installed to provide protection of the branch circuit. Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.
Substantiation: It seems as if there would be a way around putting arc-fault protection in dwelling unit bedrooms if the branch circuits covered by the Code only listed 15- and 20-ampere branch circuits. One could get around installing arc-fault protection simply by installing either a 10- or 30-ampere breaker. A 10-amp breaker could be installed to serve the smoke detectors in dwelling unit bedrooms. This could lead some to believe that this would also be all right for the bedroom branch circuit. One could also try installing #10 wire with a thirty amp breaker. This would not be acceptable because there could be box fill problems. In not so many words, it would provide more clarity for this article by saying that ALL 120-volt single phase branch circuits, and not just 15- and 20-ampere branch circuits.
Panel Meeting Action: Reject
Panel Statement: The submitter of this proposal has not provided any technical substantiation to support his recommendation. Section 210.3 does not permit 10 ampere rated multi-outlet branch circuits. The panel notes that the use of a 30 ampere overcurrent protective device on a receptacle and general lighting circuit would not be compliant with other provisions of the NEC.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-123 Log #395 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Goddson Blair, Thomasville, NC
Recommendation: Revise text to read as follows:
All 120-volt, single phase, ~~15- and 20-ampere~~ branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.
Substantiation: I propose that all 120-volt, single phase, branch circuits shall have arc-fault circuit interrupters protecting the circuits supplying outlets that are installed in dwelling unit bedrooms, so 10- and 30-ampere branch circuits cannot be used to bypass the arc-fault circuit interrupter.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-122.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-124 Log #401 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: David Miklos, Miklos Electric Inc.
Recommendation: Add text to read as follows:
210.12(B) Dwelling Unit Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms <u>and all 120-volt, single phase, 15- and 20-ampere outlets supplying equipment installed in dwelling unit bedrooms</u> shall be protected by an arc-fault circuit interrupter listed to provide protection of the entire branch circuit.
Substantiation: 2005 NEC 210.12(B) Does not require AFCI protection for electric fireplaces that are installed in bedrooms because the outlets are not located in the bedrooms. The outlets are located outside of the finished bedroom walls, accessible only after removing the fireplace. The outlets are located in unfinished areas of the dwelling unit. This "Dead Space" is not within the bedrooms. Therefore, the outlet is NOT required to be AFCI protected even though the equipment it supplies is located in the bedroom.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel intends that the current requirement applies only to branch circuits supplying outlets in bedrooms. The use of the term "equipment" is too broad in the context of the submitter's recommendation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.
KING, D.: The panel action on proposal 2-142 satisfies the submitter's intent.

2-125 Log #471 NEC-P02 **Final Action: Accept in Principle in Part**
(210.12(B))

Submitter: Richard Lockhart, Lexington, NC
Recommendation: Revise text to read as follows:
All 120-volt, single phase, ~~15- and 20-ampere~~ branch circuits supplying outlets installed in dwelling unit <u>s</u> ~~bedrooms~~ <u>whether new construction or remodeling,</u> shall be protected by a listed arc fault circuit interrupter, combination type installed to provide protection of the branch circuit.
Substantiation: NFPA statistics for the period 1999-2002 show an annual average of 32,000 fires caused by electrical distribution equipment, with an average of 240 civilian deaths, 1000 injuries and property damage in the billions of dollars. Seventeen percent of the fires, resulting in 28 percent of the fatalities, were attributed to damaged or defective cords and plugs. Seventeen percent of the fatalities were children aged five and under. Fires were most frequent during the winter months, due to the increased use of heating equipment, but also due to short circuits caused by overloading outlets and cords during the Christmas holiday season. The use of arc-fault circuit interrupters on all receptacle outlet branch circuits will greatly decrease the number of fires caused by defective or overheated drop cords, plugs, or receptacle outlets.
Panel Meeting Action: Accept in Principle in Part
The panel rejects the deletion of text: "15- and 20-ampere.The panel rejects the addition of the wording "whether new construction or remodeling" to this section. The panel accepts the deletion of the term "bedrooms" through their action on Proposal 2-142.
Panel Statement: The submitter has not given any substantiation to extend the requirement of AFCI devices beyond "15- and 20-ampere branch circuits. The word "remodeling" is too general of a term and does not specifically reference electrical renovations. See the panel action on Proposal 2-142 regarding the expanded use of AFCI protection.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 8 Negative: 4
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

KING, D.: This proposal should have been accepted. The submitter has provided adequate substantiation on the number of fires that occur in dwelling units that are electrical in nature. Not all of the electrical fires documented originate in 15-and-20 ampere branch circuits. Extending the requirement for AFCI protection to all 125 volt single phase circuits will further reduce the number of fires in dwelling units. Panel 2 has been presented with data both in the past and present code cycle that shows evidence that there is an increased risk of fire in homes that are older than 20 years old, with even a more significant increase in fires in homes that are 40 years or older. The installation of these devices in older dwelling units when remodeling will identify many wiring problems which will be corrected by the electrician after installing these devices. This will help to mitigate the number of fires due to the improper installation of branch circuit wiring while ensuring that protection in the future from fires associated with arcing faults is afforded to these homeowners.
NENNINGER, B.: See my explanation of negative vote on Proposal 2-105.
PURVIS, R.: See my Explanation of Negative for Proposal 2-115.

2-126 Log #596 NEC-P02 **Final Action: Accept in Part**
(210.12(B))

Submitter: Michael P. O'Quinn, MOGO Enterprises, Inc.
Recommendation: Revise text to read as follows:
(B) Dwelling Unit Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter <u>in accordance with 210.12(B)(1), (B)(2), or (B)(3)</u> , ~~combination type installed to provide protection of the branch circuit~~ .
~~Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.~~
FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, Standard for Arc-Fault Circuit Interrupters.
<u>(1) For outlets installed using non-combustible construction methods and employing metallic raceways or metal-sheathed cables, arc-fault protection shall only be required to protect appliances or equipment connected to the outlet.</u>
<u>FPN: For a listing of construction type, see Annex E.</u>
<u>(2) For outlets not covered in 210.12(B)(1), arc-fault protection shall be of the combination type provided to protect the entire circuit.</u>
Exception: The location of the arc-fault circuit interrupter shall be permitted to be at other than the origination of the branch circuit in compliance with (a) and (b):
(a) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.
(b) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.
<u>(3) For outlets supplying only a permanently installed fire alarm or burglar alarm shall not be required to have arc-fault circuit-interrupter protection.</u>
Substantiation: Arc-fault protection, as outlined in the UL White Book, is intended to provide protection for branch circuit wiring to the outlet (Branch/Feeder type), protection for cord-connected devices connected to the outlet (outlet type), or both (combination type). This means arc-fault protection is either circuit wiring protection to the outlet, or protection of device/equipment cords.
The dangers associated with arc-fault in the circuit wiring are centered in the use of non-metallic jacketed conductors or conductors not in metal raceways, installed in combustible walls in dwellings that could be subjected to construction-related damage. The NEC2005 210.12(B) Exception provides that conductors installed in metallic conduit or metal-sheathed cables are not a circuit arc-fault danger, or least not for 6 feet in combustible walls.
In this Proposal, 210.12(B)(1) requires no arc-fault protection for wiring to the outlet using metal-enclosed or metal-jacketed conductors in non-combustible walls, but does require arc-fault protection for devices or equipment cords downstream. This could be type UL-designated AWBZ, AFCI Outlet Branch Circuit Type, or UL-designated AWCG, Outlet Circuit Type as an example.
In this Proposal, 210.12(B)(2) would require arc-fault protection for the entire circuit for wiring not covered in 210.12(B)(1) – wiring not installed in metal conduit or metal-sheath cable in combustible walls. This follows the requirements of the 2005NEC version of 210.12(B).
Also note that 210.18 requires AFCI protection for bedroom outlets in Guest Rooms or Guest Suites provided with provisions for cooking as this is one of the "rules" for dwelling units implied in the 2005NEC® change. As a majority of these Guest Rooms or Guest Suites are constructed using non-combustible walls and wired in metal raceways or metal-sheathed cables, the installation of arc-fault circuit-interrupter protection for wiring to the outlet is unnecessary as the metallic covering over the conductors would provide substantial protection against construction-related damage. Likewise some jurisdictions have required the use of metal conduit or metal-sheath wiring methods in residential structures, and the installation of AFCI protection is likewise not necessary for the same reason.
210.12(B)(3) eliminates the requirement for arc-fault protection for permanently installed outlets serving fire alarm or burglar alarms, for the same reason 210.8(A)(5) Exception No. 3 eliminates ground-fault circuit-interrupter protection for these same outlets.
Panel Meeting Action: Accept in Part
CMP-2 accepts the deletion of "Branch / feeder AFCI's shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008." The panel rejects the remaining recomendations.
Panel Statement: The submitter has not provided any technical data to support his position that an electrical arcing is not a factor where metal sheathed cables are installed. Arc-fault circuit interrupters are not evaluated for

protection of appliances or equipment. The submitter has not provided any technical data that would indicate that AFCI devices are not compatible with listed burglar alarm systems. Fire alarm circuits are covered in article 760 which modifies the general requirements of Section 210.12(B). See panel action and statement on Proposal 2-143.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BECKER, R.: If premises wiring to outlets is in raceway, or is installed in noncombustible construction, an outlet AFCI should be accepted. There has been no substantiation of risk of combustion under these conditions. The substantiation presented to the CMP of risk in the premises wiring system does not differentiate between conditions that could be detected by AFCI circuitry. The AFCI detection circuit does not detect short circuits, high resistance "glowing" connections, or severed conductors in series with the load. There has been no substantiation of "arcing" risk in the premises wiring homerun.

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-127 Log #601 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Vincent Metallo, Sr., Baltimore County, MD / Rep. Baltimore County Electrical Inspections

Recommendation: Revise text to read:

(B) ~~(Dwelling)~~ Unit Bedrooms.

Substantiation: Delete the word dwelling in the heading. Many independent living and assisted living facilities are dwelling units with the exception that they do not contain cooking and have main dining areas. As now written in the code, the safety issue for arc faults in bedrooms is determined by the definition of a dwelling unit and its cooking conditions. This would allow the local jurisdictions to have the authority to define a bedroom by its use rather then by its cooking facilities. The purpose of arc fault protection was required by documentation submitted to the committee because of the amount of fires in bedrooms. This would allow an added level of safety especially for these type of facilities that consist of elderly residents.

Panel Meeting Action: Reject

Panel Statement: Deleting the word "dwelling" makes it unclear as to where the requirement applies.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

KING, D.: I agree with the submitter's substantiation that the requirement for AFCI protection should not be dependent on the type of cooking facilities that are available in a residence. The submitter's concern that AFCI protection should be extended to occupancies that are similar to dwelling units is valid. See my explanation of negative on proposal 2-106.

WEBER, R.: The submitter in his substantiation has raised many valid points when addressing the need for AFCI protection in the "independent living and assisted living and assisted living facilities" that do not meet the defined meaning of a dwelling type unit. Many of these structures have all of the similarities of a dwelling unit but lack the requirement for in unit or room area having permanent cooking facilities by virtue of the fact the building described does contain central cooking nad dining areas. We in the enforcement community take the position by expanding the AFCI protection availability, life threatening electrical incidents or fires will be decreased and public safety increased.

2-128 Log #949 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

Guest rooms and guest suites in <u>motels, hotels and dormitories</u> ~~provided with permanent provisions for cooking~~ shall have branch circuit outlets installed to meet the requirements for dwelling units.

Substantiation: The perceived intent is to protect cords susceptible to arcing. There is no need to include circuits supplying only fixed equipment such as lighting outlets or smoke/fire detectors. An arc-fault could deenergize such circuits just when needed. Many agencies such as fire departments report dead or removed batteries which make backup unreliable. It is not clear if guest rooms or suites apply to a dormitory. What relevance does permanent cooking facilities have re: this requirement? 210.8(A) and (B) have exceptions for GFCI requirements.

Panel Meeting Action: Reject

Panel Statement: The submitter's recommendation is unclear as it relates to the current text of 210.12(B) and the substantiation does not support his recommended action.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-129 Log #1293 NEC-P02 **Final Action: Accept in Principle**
(210.12(B))

Submitter: Ray C. Mullin, Ray C. Mullin Books

Recommendation: Revise wording as follows:

(B) Dwelling Unit Bedrooms and Closets Directly Associated with Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms <u>and closets directly associated with bedrooms</u> shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.

Substantiation: As presently worded, 210.12(B) requires AFCI protection for the branch circuits supplying outlets in bedrooms. The NEC does not have a definition of a bedroom.

Electricians are confused.

Is the intent of 210.12(B) to include closets associated with a bedroom? Circuit design for bedrooms and associated closets probably will include the closet lighting on the same branch circuit as the outlets in the bedroom.

Expanding the mandatory requirement of including closets in 210.12 will enhance electrical safety relative to arc faults, and will reduce the confusion as to the intent of 210.12.

Statistics of fires of all types are quite convincing.

Eighty three percent of residential fires originate in bedrooms (41 percent), living rooms (27 percent), or kitchen areas (15 percent).

Eighty percent of fire related deaths and 70 percent of fire related injuries occur in these rooms.

Webster defines a bedroom as: a room furnished with a bed and intended primarily for sleeping.

Webster defines a closet as: a cabinet or recess for especially china, household utensils, or clothing.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-142.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-130 Log #1657 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: John Steinke, Reno, NV

Recommendation: Replace entire section with:

All 120 volt single phase 15 and 20 amp circuits serving outlets in dwelling unit bedrooms shall be protected by an arc fault circuit interrupting device. The device may be located at the panel, or at any point in the circuit before the first outlet on the circuit in the bedroom itself.

New installations, and additions to existing installations, shall only be required to have the new outlets so protected.

A closet, dressing room, or other area associated with the bedroom shall be considered separate from the bedroom only if separated from the bedroom by a door.

FPN 1: It is not the intent of this code to require the use of equipment that does not exist, or is not available, at the time of construction.

FPN 2: Pleas note that this section applies only to 15 and 20 amp circuits. An alarm outlet on a smaller circuit that serves the bedroom need not be AFCI protected.

FPN 3: Where energy codes mandate the use of fluorescent lighting, or the use of surge protection equipment causes nuisance tripping problems, the AHJ may exempt specific outlets from this requirement.

Substantiation: There is a need for AFCI devices, especially in the case of remodels and extensions of existing circuits. Many older homes have service equipment for which AFCI breakers are not available. Others were wired in a manner that does not separate bedroom circuits from other circuits.

The manufacturers have repeatedly failed to deliver as promised. By broadening the use of AFCI devices, it is hoped that application will be broader, and that there will be more parties at work to improve things. As George Patton said, "Don't let "perfect" become the enemy of "good".

Finally, many electronic items can cause nuisance tripping of the AFCI. These include electronic light ballasts and computer surge suppressors. If we do not allow for exceptions, there will be disconnections. I submit that half a loaf is better than none.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its position that AFCI devices are to protect the entire length of all 120 volt, 15- and 20-ampere branch circuits supplying outlets in dwelling unit bedrooms and that the AFCI devices that are used be installed at the origin of the circuit. The submitter has not provided any technical data that would support his position that AFCI devices are not compatible with listed equipment.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-131 Log #1718 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Sam Bell, Mid Florida Tech
Recommendation: This section is interrupted to also include the smoke alarm system per/definition of outlets.
Substantiation: The arc-fault circuit interrupter could trip - thus the smoke alarm system is deenergized with possible fatalities.
Panel Meeting Action: Reject
Panel Statement: This proposal does not comply with Section 4.3.3(C) of the NFPA Regulations Governing Committee Projects, because the wording to be added, revised (and how revised), or deleted is not specified in the recommendation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-132 Log #2144 NEC-P02 **Final Action: Accept in Principle**
(210.12(B))

Submitter: John Fiorello, Fiorello Electric Inc.
Recommendation: Revise text to read:
(B) ~~(Dwelling Unit Bedrooms.)~~ (Dwelling Unit Rooms.) All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling ~~(unit bedrooms)~~ (unit rooms) shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.
Substantiation: The intent of this code proposal is to bring into alignment the discrepancies created during the expansion of Article 210 during the 2005 code cycle. Simultaneously, to fortify continuity, individuality, and proper application of the existing definitions found in the code.
210.18 requires in Guest Rooms and Suites that, "branch circuits and outlets installed to meet the rules for dwelling units." 210.12(B) is presently titled Dwelling Unit Bedrooms, which does not qualify compliance with 210.18 as no current rule regarding AFCI protection exists for Dwelling Units as a whole.
Attachment to this, and substantiation in favor of this proposal is that even if a code proposal would be made to correct the rules of 210.18 stating, "branch circuits and outlets installed to meet the rules for dwelling ~~(units)~~ (unit bedrooms) " the current requirement afforded to Guest Rooms and Suites specific to portions of Suites which are combination rooms for living, sleeping, and food preparation additionally support the requirement that Dwelling Unit Rooms be protected by AFCIs. Fact seems to be that these two types of premises cannot be viewed as different, regardless of term of occupancy.
210.18 expands the definition of a Guest Room/Suite to include permanent provision for cooking. Inherently what is being communicated is that AFCI protection is required in premises meeting the requirements of a Guest Room/Suite/Dwelling Unit, as all aspects of a Dwelling Unit as defined in Article 100 can found in 210.18 within its expanded definition of a Guest Room and Suite. This substantiates that Dwelling Unit Rooms be afforded the same AFCI protection as a Guest Rooms or Suites.
True benefits of AFCI protection can only be made through uniformity of minimum code standard in premises occupied for living whether they are temporary or permanent. In requiring Dwelling Unit Rooms to be protected by AFCIs such uniform protection will be accomplished. Likewise, the code will need not address construction design specifications needed in substitution of AFCI protection, as it seems design specifications of electrical installation would be the only other way to fundamentally eliminate the hazard of arc fault without use of AFCI. Need it be said, that the code is not intended for such purpose.
Multiple authorities having jurisdiction to effectively write out current requirements of AFCI have used the arguments noted above. As the general public has been made aware that these devices are available and that enforcement authorities due to code discrepancy are not mandating use, it is believed that in the interest of fire prevention and electrical safety that the CMP respond in the most progressive manner.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-142.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-133 Log #2161 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Charles Hayes, Takoma Park, MD
Recommendation: Suggested solution:
If the breaker were installed at the outlet, this would solve the problem. A second solution would be to start using #12 wire at bedroom outlets.
When jurisdictions start using ARC FAULT on the smoke detector circuits, this problem will be worse since this is #14 wire and has much longer runs. This is dangerous.
I am a home inspector with 17 years experience. I am concerned about this problem.
Substantiation: I am bringing your attention to a potentially dangerous situation involving ARC FAULT CIRCUIT INTERRUPTERS. The problem involves high impedance in the wiring interfering with the normal operation of an ARC FAULT CIRCUIT INTERRUPTER.
Problem:
The ARC FAULT CIRCUIT INTERRUPTER is not tripping when there is a resistance (impedance) in the circuit that is over 7 ohms. However, long runs of #14 wire in big houses frequently have such resistance levels. Even though the code recommended maximum impedance is 1 ohm. This is not an enforceable provision but, only a recommendation. When testing at the use end of the circuit with an Ideal SureTest tester, we send a surge of 140 amps in 8 half cycles (according to the UL 1436 specifications) but, the breaker normally doesn't trip. Under dynamic conditions, this breaker wouldn't trip and there could be injury.
Panel Meeting Action: Reject
Panel Statement: This proposal does not comply with Section 4.3.3(C) of the NFPA Regulations Governing Committee Projects, because the wording to be added, revised (and how revised), or deleted is not specified in the recommendation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-134 Log #2283 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Steve Campolo, Leviton Manufacturing Co., Inc.
Recommendation: Delete text:
Postpone any expansion of AFCI locations until the combination types (series arc) and receptacle types have been proven for at least one code cycle.
Substantiation: Much confusion exists regarding type of protection and availability of these devices.
Panel Meeting Action: Reject
Panel Statement: The submitter's substantiation does not support his recommended action.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-135 Log #2902 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Eugene Lucas, American Electronic Components
Recommendation: None.
Substantiation: With all of the other modifications in the NEC, I find it unnecessary to have an arc-fault circuit interrupter protection for the bedroom, its defining without reason. Why not every room.
Panel Meeting Action: Reject
Panel Statement: This proposal does not comply with Section 4.3.3(C) of the NFPA Regulations Governing Committee Projects, because the wording to be added, revised (and how revised), or deleted is not specified in the recommendation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-136 Log #3062 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Douglas A. Lee, U.S. Consumer Product Safety Commission
Recommendation: Add text in 210.12(B) to read as follows:

(B) Dwelling Unit Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit. <u>An outlet on each AFCI-protected branch circuit that supplies a smoke alarm shall include a luminaire.</u>

Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 201.12(B) until January 1, 2008.

FPN: For information on types of arc-fault circuit interrupters, see UL1699-1999, *Standard for Arc-Fault Circuit Interrupters* .

Exception: The location of the arc fault circuit interrupters shall be permitted to be at other than the origination of the branch circuit in compliance with (a) and (b):

(a) The arc-fault circuit interrupter installed within 1.8m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.

(b) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupters shall be installed in a metal raceway or a cable with a metallic sheath.

Substantiation: The AFCI requirements for bedroom outlets, as detailed in 210.12, include smoke alarms that are installed in bedrooms. There has been much debate over speculation that a smoke alarm (even with battery backup) may not be operable because of a tripped AFCI that supplies power to the branch circuit from which the smoke alarm is supplied. A luminaire on a circuit supplied by an AFCI could serve as an indicator that the device has tripped. See CPSC report, Considerations for Installation of Smoke Alarms on Residential Branch Circuits, CPSC-ES-0504, Lee and Lee, October 2005 (http://www.cpsc/gov/LIBRARY/FOIA/F01A06/os/acfismoke.pdf).
Panel Meeting Action: Reject
Panel Statement: The panel agrees that any overcurrent protective device that protects a branch circuit that supplies a smoke alarm outlet could go undetected if it trips or is inadvertently turned off by the occupant(s) of the dwelling. The indication that a smoke alarm has lost power should be required as part of the product requirements for listing. The panel reaffirms its position that AFCI devices are compatible with listed smoke alarm equipment and that AFCI protection shall be provided for all branch circuits that supply dwelling unit bedrooms.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-137 Log #3063 NEC-P02 **Final Action: Accept in Principle**
(210.12(B))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Accept in Principle" to correlate with the Panel Action on Proposal 2-147.

The Technical Correlating Committee understands that the Panel Action on this Proposal only adds text to Exception (A).

The Technical Correlating Committee understands that the Panel Action on this Proposal modifies the Panel Action on Proposal 2-105.

Submitter: Douglas A. Lee, U.S. Consumer Product Safety Commission
Recommendation: Add text in 210.12(B) to read as follows:

(B) Dwelling Unit Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.

Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.

FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, *Standard for Arc-Fault Circuit Interrupters.*

Exception: The location of the arc-fault circuit interrupters shall be permitted to be at other than the origination of the branch circuit in compliance with (a) and (b):

(a) The arc-fault circuit interrupter <u>shall be</u> installed within 1.8 m (6ft) of the branch circuit overcurrent devices measured along the branch circuit conductors.

(b) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupters shall be installed in a metal raceway or a cable with a metallic sheath.

Substantiation: The proposed text is to match the verb tense in (b).
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-138 Log #3126 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Douglas A. Lee, U.S. Consumer Product Safety Commission
Recommendation: Add text as follows:

210.12(B) Dwelling Unit Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.

Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008. <u>These requirements shall also apply to existing installations whenever the circuit protection device is replaced as part of a service capacity upgrade or renovation.</u>

FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, *Standard for Arc-Fault Circuit Interrupters* .

Exception: The location of the arc-fault circuit interrupters shall be permitted to be at other than the origination of the branch circuit in compliance with (a) and (b):

(a) The arc-fault circuit interrupter installed within 1.8 m (6ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.

(b) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupters shall be installed in a metal raceway or a cable with a metallic sheath.

Substantiation: According to CPSC staff estimates, an average of 41,500 residential fires annually are associated with the electrical distribution system, having remained relatively constant over the 10-year period from 1989 through 1998 (*Residential Fire Loss Estimates, 1998 (and prior), National estimates of Fires, Deaths, Injuries, and Property losses from Non-Incendiary, Non-Suspicious Fires* , CPSC Directorate for Epidemiology, 2002, see <u>http://www.cpsc.gov/LIBRARY/fire98.pdf</u>). A staff report issued by the U.S. Consumer Product Safety Commission in 1987 ("Residential Electrical Distribution System Fires"), Smith & McCoskrie, see <u>http://www.cpsc.gov/library/foia/foia04/os/reselecfire.pdf</u>) provided evidence that fires originating in branch circuit wiring predominately occurred in dwellings over 20 years old, with the highest rates of fires occurring in dwellings over 40 years old.

AFCI technology offers the greatest potential for mitigation of electrical fires propagating from failures in the electrical distribution system and the subsequent reduction in fire-related deaths, injuries, and property loss by its implementation into older homes. Because the *NEC* is an installation document, the only way to address this risk of electrical fires in older homes is when the overcurrent protection devices are replaced when the electrical service capacity is upgraded. When a panelboard is replaced, the existing wiring is rarely changed because it is cost prohibitive. Over the past 20 years the increased utilization of electrical appliances has stressed the branch circuit of homes that were designed to operate in previous decades with a lower demand of current on the branch circuit wiring.

While AFCIs can be added to all general purpose branch circuits to increase protection at the discretion of the installer, dwelling unit bedrooms especially need this protection. The bedroom circuits are typically the longest run from the panel and are often exposed to attics where environmental conditions increase the aging and stress placed on branch circuit wiring. Additionally, based on the highest rate of fire incidents and deaths, the bedroom is one of the higher risk areas in a home (seeTable, National Estimates based on NFIRS and NFPA survey, Marty Ahrens, NFPA, March 2001 that I have provided). Consumers may be sleeping during the start of an electrical fire incident and not be aware of the fire until it is out of control.

A CPSC staff economic analysis indicates that adding Arc-Fault Circuit Interrupters (AFCIs) to older homes outweighs the cost of installation. See CPCS staff memorandum on *Economic Considerations--AFCI Replacements* that I have provided . By adding this requirement, consumers of older homes will benefit by the more advanced circuit breaker technology. Otherwise, consumers will install conventional circuit breakers that are less effective in preventing electrical wiring fires in older homes.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: There is a wide variety of existing wiring configurations and the panel needs additional input on the compatiblity of these wiring systems with AFCI protection.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 9 Negative: 3
Explanation of Negative:

KING, D.: The submitter has provided adequate substantiation to support this change. The installation of these devices in older dwelling units will identify many wiring problems that will need to be corrected by the electrician installing these devices. This will help to mitigate the number of fires due to the improper installation of branch circuit wiring while ensuring that protection from fires associated with arcing faults is afforded to these homeowners. Panel-2 should give further consideration to this proposal.

LAROCCA, R.: Older dwellings are the ones most likely to have wiring systems that are compromised due to age, damage, or poor installation techniques. They are the dwellings that could benefit the most from the retrofitting of AFCIs during the replacement of circuit protection devices during a service upgrade or renovation. The panel's action to reject this proposal will make the extension of AFCI protection to these dwellings difficult.

Also, even though there are a wide variety of existing wiring configurations, all should be compatible with AFCIs if they are not damaged or otherwise compromised. Adding AFCIs to these systems will help identify potential dangers in existing wiring.

WEBER, R.: This proposal should have been accepted in Principle or in Part or a combination of both to recognize the submitter's concerns of bringing older type structures into code compliance with the use of combination AFCI equipment when changes to the system are being done. If we use the present recognition by many of the model building codes relative to smoke alarms installation and use which are to be installed in the older structure stock when changes are being made to them, it would seem logical that increased protection offered by the installation of AFCI protection is reasonable and prudent as well. Given the fire history in older type structures and years that normally go by before any of the electrical systems are changed or up-graded that addition of AFCI protection is warranted.

Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-139 Log #3147 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Joseph A. Ross, Ross Seminars
Recommendation: Revise as follows:

(B) Dwelling unit Bedrooms. All 120-volt, ~~single phase,~~ 15- and 20-ampere branch circuits supplying <u>receptacle</u> outlets installed dwelling unit bedrooms shall be...

Add a new second paragraph (present second paragraph becomes a third paragraph, if needed).

It shall be permitted to provide AFCI protection for branch circuits that supply other outlets in a dwelling unit.

Substantiation: In the last 50 years, there has never been an NEC requirement that has been so controversial and that has split the thinking and the enforcement into two sides. We are all aware that many states and hundreds of municipalities have amended their Codes to prohibit a life-saving smoke detector from being connected to a sensitive AFCI protected branch circuit. National organizations have developed disclaimers, many States have enacted disclaimer statements, and many AHJs (without the benefit of a disclaimer) are reluctant to enforce the CMP 2 intended mandate. It's time to end the Chaos!

This proposal is a win-win solution.

1) It will please the concerns of Contractor members of CMP 2 who wanted bedroom lights, fans, etc. to be permitted.

2) It will please representatives of the Nat'l. Assn. of State Fire Marshals and CPSC who proposed an expansion of "receptacles only" to other areas of a dwelling unit (See Comment 2-91, ROC).

3) It will please the Fire and Smoke Detection Alarm System experts of CMP 3 and the NFPA 72 Committees who have voted to support the concept that a smoke detector's ability to function should not be compromised in the event of a dwelling unit fire.

4) It will please the hearing impaired who depend on strobe-light type smoke detectors; and strobe lights do not function on batteries.

5) It will please the elderly and the underprivileged who must budget their funds to buy food, medicine, fuel, rent, insurance and utilities; there will be little left to pay a fee to have their batteries replaced.

6) It will please the smoke detector manufacturers who have witnessed AFCI nuisance tripping upon the operation of a smoke detector in laboratory tests.

7) It will please our Canadian neighbors, as the Country of Canada has expanded the application of AFCI protection, but prohibits a smoke detector system from being connected to an AFCI protected circuit. It will be a giant step toward international harmonization.

Most agree that placing a smoke detector on an AFCI protected circuit runs the risk of disabling that smoke detector when it is most needed. The technology is not sufficiently mature to assure reliability at this time. Battery backup is at best "better than nothing" as most batteries are dead, missing, or improperly installed.

Panel Meeting Action: Reject
Panel Statement: The panel reaffirms its position that all branch circuits that supply dwelling unit bedrooms shall be protected by an AFCI device and that the device shall protect the branch circuit. The submitter has not provided any technical substantiation that supports his position that listed AFCI devices are not compatible with listed smoke alarm equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-140 Log #3209 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: H. Dean Schumacher, H. Dean Schumacher Electrical Inspections
Recommendation: Revise text to read as follows:

210.12(B)...All 120 volt, single phase 15- and 20- ampere branch circuits supplying ~~outlets~~ <u>receptacles</u> installed in dwelling...

Substantiation: Arc fault protection has limited value in other than receptacle/cord applications. If Panel can substantiate need, then why is it required in bedrooms only?
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the submitter's statement that AFCIs have limited value in other than receptacle/cord applications. The protection is required for the branch circuit.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-141 Log #3222 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Dennis Anderson, Electrical Inspector
Recommendation: Revise text to read as follows:

Dwelling Unit Bedrooms. All 120-volt, single phase, 15 and 20 ampere branch circuits supplying <u>receptacle</u> outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter.

Substantiation: I believe the purpose of arc-fault circuit interrupters is to protect cord connected devices. Fixtures and smoke detectors don't need that protection room lighting should stay on even if there is a fault.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-140.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-142 Log #3488 NEC-P02 **Final Action: Accept**
(210.12(B))

Submitter: Alan Manche, Square D Co.
Recommendation: Revise 210.12(B) as shown below:

(B) Dwelling Units. All 120-volt, single phase, 15- and 20-ampere branch circuits ~~supplying outlets~~ installed in dwelling unit <u>s</u> ~~bedrooms~~ shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit. ~~Branch/feeder AFCIs shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.~~

Substantiation: For the past three NEC cycles, CMP 2 has reviewed extensive amounts of data and information pertaining to the benefit of AFCIs for the protection of dwelling unit branch circuits. After careful consideration the panel decided to required AFCIs on branch circuits that supplied bedrooms as a means to gain experience and to put the application in an easily defined area.

AFCIs have had an excellent track record in the field and their installation/use have found numerous wiring errors and in addition they have found wiring damage and equipment damage that could have been potential sources of fire. With the experience gained, it is an appropriate time to expand AFCIs to all 15 and 20 ampere branch circuits in the dwelling. There is no basis for limiting the protection to circuits that supply only bedrooms and the increased protection is needed for other circuits. This expansion will continue the effort to address fires of electrical origin in dwellings.

The text has been modified to apply to all 120V 15 and 20 ampere branch circuits that supply outlets in all locations. The second paragraph is proposed to be deleted since it is no longer applicable.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 8 Negative: 4

Explanation of Negative:

BECKER, R.: AFCIs should not be expanded to the entire dwelling unit. In reply to item 2-140, Log #1623, of the 2004 ROP, CMP 2 noted that there was not enough data to demonstrate the reliability and effectiveness of AFCIs to justify their expansion. Since 2004, there has been no substantiation presented regarding the effectiveness of AFCIs. The historic data cited justifying AFCIs largely relates to home fires and not the field performance of the device.

Substantiation must provide a demonstrable link between the AFCIs installed in bedrooms and a reduction in dwelling unit fires prior to expanding these to the entire dwelling unit. AFCIs add significant cost to homes without field data demonstrating that they prevent fires beyond the standard circuit breaker. Expanding the AFCI requirement as proposed will add as many as ten or twenty AFCI circuits (appliance, laundry, disposer, insta-hot, bath, basement, garage, HVAC maintenance, attic, storage, outside holiday lighting). The added cost is easily in the range of $250 to $500 per dwelling unit, plus the cost of dedicated neutrals and whatever the installer allows for “installation problems and call-backs.” There is no information provided on installing GFCIs on AFCI branch circuits.

BROWN, L.: Let’s get to the bottom line on this matter - There is absolutely no fire data that can be used to
support the expansion of AFCI’s to all receptacles, let alone the mandatory installation of AFCI’s in bedrooms.

Looking at the latest data from NFPA in the report “The U.S. Home Product Report (Appliances and Equipment Involved in Fires)”, by John R. Hall, Jr. of the Fire Analysis and Research Division of NFPA dated November 2005, the report shows that the annual average of number of home fires is 372,900, with direct property damage of $443,000,000. Of this number 32,000 (or 9% = $39,870,000) of these fires are caused by “electrical distribution equipment.” Of that 9%, only 14,500 (or 4% = $17,720,000) of those fires are attributed to “fixed wiring, switches, outlets, and receptacles.” And, there is no data or study to support that of these 14,500 fires an the installation of an AFCI device would have prevent the fire.

Using the U.S. Census Bureau data on building permits for 2004 (Table (S-3) Final) shows
1,656,413 one- & two-family dwelling units and 413,664 multifamily units for that year.

There are typically 20 (twenty) 20-volt, single phase, 15- and 20-ampere branch circuits in each one- & two-family dwelling unit, and 10 in each multifamily dwelling unit. Using these numbers, there will be 33,128,260 AFCI’s in OTFD’s and 4, 136,640 for multifamily units, for a total of 37,264,900 AFCI’s.

Using a wholesale cost of $34.00 per breaker, marked-up the industry standard percentage of 66%, produces a cost per breaker of $56.44 to the home owner.

In all, the average annual total cost to the public for the mandatory installation of AFCI’s will be
$2,103,230.956 ($1,267,006,600 wholesale). That is 2 BILLION, 130 MILLION, 230 THOUSAND, and 956 DOLLARS.

Using current fire loss data society will be spending $2,103,230.956 per year to cover losses of only $39,870,000. That means spending 52 times the amount of money that would be loss if the devices were not installed, and that is if the devices work 100% of the time. If you use the lossesrelating only to “fixed wiring, switches, outlets, and receptacles” (the part of the wiring that is claimed to be protected by AFCI breakers) the ratio to money spent relative to monetary loss ($17,720,000) is 119 times, again, if they work 100& of the time.

In addition to the Submitter’s Substantiation, there is no data to support the contention of a neither “excellent track record”, nor information that these “installations have found numerous wiring errors” or “they have found wiring damage and equipment damage that could have been a potential sources of fire”. That statement alone provides no correlation between the purported problems and the use of AFCI’s.

The Panel needs to reconsider the mandatory installation of AFCI’s, let alone the expansion of
requiring these devices for all 120-volt, single phase, 15- and 20-ampere branch circuits in dwelling units. Until true field test data on the efficacy of AFCI’s can be directly related to saving society monetary loss there is no cost-benefit in this provision.

NENNINGER, B.: See my explanation of negative vote on Proposal 2-105.

PURVIS, R.: See my Explanation of Negative for Proposal 2-115.

Comment on Affirmative:

KING, D.: I commend Panel 2 for accepting this proposal. The panel action on this proposal will save many lives and countless dollars due to the higher level of protection to persons and property where these devices are installed.

WEBER, R.: We in the inspection community want to applaud and thank the panel for its action on the proposal and by its recognition of the value and merits that are applied to electrical safety when AFCI protective means are present. It is a bold, and in my opinion, a logical step forward. The electrical industry has the means and technology available today and even though the requirement will not become mandatory until the acceptance of the 2008 NEC, it sends a clear message to the public that you and your family’s protection is our goal in making code changes to provide a higher level of protection throughout the house for the occupants.

2-143 Log #97 NEC-P02 **Final Action: Accept in Principle**
(210.12(B), FPN (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information.

Submitter: Brandon Whitman, Owosso, MI

Recommendation: Add a new fine print note at the end of this section to read as follows:

FPN: See 760.21 and 760.41 for circuits supplying fire detection and warning equipment.

Substantiation: Sections 760.21 and 760.41 specifically state that the supply for fire alarm circuits shall not be protected by a GFCI or an AFCI.

Panel Meeting Action: Accept in Principle

Revise the recommended text of the fine print note to read:

FPN No. 3: See 760.21 and 760.41 for power supply requirements for fire alarm systems.

Panel Statement: The submitter’s intent is satisfied with the panel’s action on this proposal.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB’s Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

In addition, please refer to the NFPA Technical Committee (TC) on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) actions on this same matter as shown in the 2006

Annual Revision Cycle Report on Comment, Comment 72-479 (Page 72-123).

2-144 Log #2733 NEC-P02 **Final Action: Accept in Part**
(210.12(B) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as “Accept in Part” to correlate with the Panel Action on Proposal 2-147.

The Technical Correlating Committee understands that the Panel Action on this Proposal is to accept the deletion of (b) in the Exception and to not accept the remainder of the Proposal in accordance with the Panel Statement.

Submitter: Jim Pauley, Square D Company

Recommendation: Delete the exception.

~~*Exception: The location of the arc-fault circuit interrupter shall be permitted to be at other than the origination of the branch circuit in compliance with (a) and (b):*~~

~~*(a) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.*~~

~~*(b) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.*~~

Substantiation: CMP 2 added the exception in the 2005 NEC to be able to handle situations where an existing panelboard may be obsolete and there are no AFCIs available. The exception allowed a limited length of the branch to be installed without AFCI protection. In addition that portion of the branch circuit was required to be in a metal raceway or metal sheathed cable. It was anticipated that the limited length along with the restriction on the wiring method would be a reasonable accommodation to the unique situation. However, as the 2005 NEC was being introduced a number of individuals and reputable companies have stated that there is no basis for the 6’ allowance. Some have even taken out ads to indicate that the 6’ is not justified. Given that there is a feeling that the 6’ allowance cannot be justified, the panel should delete the exception and stick to the main rule that the branch circuit must be protected.

Within the last year we have investigated a number of fires and at least two of them were determined to have started in the home run of electrical wiring between the panel and the first outlet. Had proper AFCI protection been provided at the origin of the branch circuit, these fires would likely have been prevented.

Given that protection of the home run is important and since the 6’ limitation is thought to not be justified, the panel should simply delete the exception.

The panel should resist any attempts to eliminate the home run from the protection of AFCIs. These are misguided efforts and ignore the basic premise that CMP 2 started with in 1996 which was to provide protection for the branch circuit wiring. One cannot distinguish the need for protection after the first outlet from the need to protection of the home run. The exception attempted to provide some stringent tradeoffs to allow a limited length. The tradeoffs should not be reduced. If they are not acceptable, then the exception should be deleted.

Panel Meeting Action: Reject

Panel Statement: The exception provides reasonable alternatives for dwelling unit owners that do not have service panels compatible with currently available AFCI products.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.
Comment on Affirmative:
KING, D.: I agree with the submitter that the intent of section 210.12 is to provide AFCI protection for the entire length of the branch circuit. The 6 foot limitation was implemented to provide an alternative to the combination type devices where an existing panel board was not compatible with the AFCI devices that are available today. The 6 foot limitation is intended to allow for enough branch circuit wiring for termination at the panelboard and the AFCI device while ensuring that the device is located adjacent to the panel board where the branch circuit originated. Additional physical protection of the unprotected portion of the branch circuit wiring is also required when applying the exception due to the hazard that exists with leaving that part of the branch circuit wiring unprotected by the AFCI device.

2-145 Log #2964 NEC-P02 **Final Action: Reject**
(210.12(B) Exception (New))

Submitter: Ron Alley, ELECTRICO
Recommendation: Exception: Outlets serving smoke detectors and fire detection devices.
Substantiation: Power to smoke and fire detectors should NEVER be cleared, especially if a fire danger could be present.
Panel Meeting Action: Reject
Panel Statement: Smoke detectors and fire detectors are components of fire alarm systems that are covered in Article 760. See panel action on Proposal 2-143.
For smoke alarm applications see panel action on Proposal 2-118a (Log #CP-200.)
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.
In addition, please refer to the NFPA Technical Committee (TC) on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) actions on this same matter as shown in the 2006 Annual Revision Cycle Report on Comment, Comment 72-479 (Page 72-123).

2-146 Log #3650 NEC-P02 **Final Action: Reject**
(210.12(B) Exception (New))

Submitter: Lawrence Brown, National Association of Home Builders (NAHB)
Recommendation: Add New Exception as follows:
Exception No. 1: *Circuits serving smoke alarms shall not contain AFCI protection.*
(Renumber current Exception as No. 2)
Substantiation: There is an inherent problem with having the smoke alarm system for a dwelling unit powered by an AFCI protected circuit. NEC Section 210.12 requires all electrical outlets in a bedroom, including the box in the ceiling that contains only the wiring for the bedroom smoke alarm, to be supplied by a circuit that is protected by an AFCI. As this is the requirement, the practice is to supply the power to the smoke alarm system for the entire house from a bedroom circuit. One needs to understand that the wiring to the smoke alarms in the bedrooms also serves the smoke alarms in all other areas of a dwelling. Except of the wiring to the first smoke alarm on a system, the wiring serving the other smoke alarms does not serve any other electrical outlet.
One main concern is situations where the smoke alarms do not contain a secondary power source such as a battery. This arises where the secondary power source is not required, such as allowed by the NFPA Life Safety Code, and in installations in older dwellings where the smoke alarms were installed prior to provisions requiring a secondary power source.
As the provisions of the NEC will require the installation of AFCI protection for bedroom circuits when the existing electrical distribution panel is replaced relates to this concern. In those installations where no secondary power source is provided there lays the distinct probability that the entire smoke alarm system for the dwelling would be incapacitated when the AFCI breaker protecting the bedroom circuit trips.
A belief that the occupants will know that the bedroom circuit has no power because the lights will not work may be an inaccurate assumption. The circuit supplying the smoke alarms could easily be from a circuit in a bedroom that is not often used, such as a guest bedroom.
This matter was discussed at the NFPA 72 TC on Single- and Multiple-Station Alarms and Household Fire Alarm Systems (SIG-HOU) ROC meeting that was held in October 2005. The intent of NFPA 72, Section 11.6.3 is to provide a minimum level of assurance that the integrity of the primary power supply to the smoke alarms is maintained. Subsections (3) and (5) addresses situations that may inadvertently disconnect the smoke alarms from its power source, thus rendering the alarm system useless to provide notification of a fire situation.
The first life-safety device used to protect the occupants of a dwelling during a fire occurrence is the smoke alarm system. Thus, to be effective in the saving of lives a reliable source of power needs to be provided and maintained.
There are Exceptions throughout the NEC, such as with GFCI protection, to address practical applications of the provision. Exempting the smoke alarm from being on AFCI protected circuits will not affect the NEC's intent to provide AFCI protection to the branch circuit serving the receptacle and lighting outlets within a bedroom.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any technical substantiation that supports his position that listed AFCI devices are not compatible with listed smoke alarms. See the panel action on Proposal 2-118a (Log #CP-200) for correlation with NFPA 72.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.
In addition, please refer to the NFPA Technical Committee (TC) on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) actions on this same matter as shown in the 2006 Annual Revision Cycle Report on Comment, Comment 72-479 (Page 72-123).

2-147 Log #3360 NEC-P02 **Final Action: Accept in Principle**
(210.12(B) Exception (b))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal modifies the Panel Actions on Proposals 2-105 and 2-137.
Submitter: Aaron B. Chase, Leviton Mfg. Co. Inc.
Recommendation: Revise text to read:
Exception: The location of the arc-fault interrupter shall be permitted to be at other than the origination of the branch circuit in compliance with (a) ~~and (b):~~
(a) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.
~~(b) The circuit conductors between the branch circuit overcurrent device and the arc fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.~~
Substantiation: During the ROC for the 2002, NEC CMP-2 voted unanimously to accept the current revision to 210.12 under Comment 2-105. I too concur with CMP-2's actions recognizing the importance of detecting low level arcing. CMP-2 has always sought to develop Code language that not only protects the branch circuit wiring but also the extended wiring. There is a significant amount of data already presented to this Panel that confirms many electrical fires are caused by damaged supply cords from products plugged into the outlets. Fire statistics have already led to one Code Making Panel to adopt dedicated AFCI/LCDI protection on room air conditioning supply cords. The Code Making Panel is reviewing these alarming statistics to look at protecting against dangerous arcing scenarios caused by damaged extension cords and appliance cords. The combination AFCI will provide this valuable protection especially in two-wire cords. Unfortunately this technology has not been made commercially available. This can be rectified by deleting Exception (b).
There has been combination AFCI technology listed and there are at least two other promising combination type AFCI technologies that can be made available if the 6 ft restriction was eliminated. The submitter of this proposal recalls CMP-2 members asking the device manufacturers about commercial availability during the 2003 ROC meetings in San Diego. Combination outlet box manufacturers cited they either have the technology or would release it (tool up the product) if Exception (b) was eliminated. Exception (b) was viewed by those manufacturers as a commercial restriction and not specifically an installation mandated restriction. Absence of supporting data to require this 6 ft section of conductor to be protected, the NEC should eliminate this text in the spirit of supporting technological advances that will lead to commercial availability for products designed to protect against the hazards associated with electricity.
In essence, Exception (b) has stifled technology yet there is no data to support Exception (b). The 6 ft between the service entrance and the specified location of the AFCI has never been identified through research as a location of fire origin.
At a recent UL/CPSC meeting, UL acknowledged that they did not identify in their review of fire data this one specific location as problematic and they did not foresee this location as being one.
In a preemptive response to an anticipated comment or question as to why the device manufacturers did not make a combination type AFCI available when it became evident that the break type was still not in the marketplace consideration should be given to the following:
The device manufacturers were not aware that there would not be commercially available combination AFCI breakers and still are not sure if this will hold true. Should these products become available (combination AFCI breakers) the commercial restriction (due to labor costs alone) would eliminate

any demand for their products. Device manufacturers would in essence make a significant capital investment in a product that would not be economically feasible to be used by the builder. Further, the required use is still over 2 years away with no assurances that this combination breaker-type would not be commercially available there is no motivation for the device manufacturers to take a huge risk.

If this proposal is accepted, based on UL's reported analysis of fire data, there would be no compromise in safety. Conversely, on the upside, the acceptance of this proposal would help foster new technological advances to help achieve the NFPA safety mission.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Revise the recommended text to read:

Exception: The location of the arc-fault interrupter shall be permitted to be at other than the origination of the branch circuit where the arc-fault circuit interrupter is installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.

Panel Statement: The revision to the recommendation has been made to comply with the NFPA Manual of Style.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

KING, D.: This proposal should have been accepted in principal in part. I agree with the panel that the recommended text should be revised to comply with the NEC manual of style. I disagree with the submitter's recommendation to delete subdivision (B) of the exception. The submitter of this proposal has not substantiated that the present requirement in subdivision (B) of the exception has stifled technology as is stated in his substantiation or that the requirement is cost prohibitive from an installation standpoint. The requirement for the additional physical protection provided in exception is necessary to reduce the risk of physical damage to this portion of the branch circuit wiring that is not protected by the AFCI device. It is the intent of this section that AFCI protection is provided for the entire length of the branch circuit. An exception to allow even a small portion of this circuit to be unprotected must be supplemented with some other means of physical protection.

PURVIS, R.: See my Explanation of Negative for Proposal 2-115.

2-148 Log #2851 NEC-P02 **Final Action: Reject**
(210.12(B) Exception No. 2 (New))

Submitter: Wendy B. Gifford, Invensys Climate Controls America

Recommendation: 210.12(B) Arc-Fault Circuit-Interrupter Protection

Add:

<u>Exception No. 2: Smoke alarms and carbon monoxide alarms shall not be installed on a circuit which can lose primary (main) power by operation of an arc fault circuit interrupter.</u>

Substantiation: A bedrock of fire protection is uninterrupted power to smoke alarms, with battery backup as insurance in case of loss of commercial power. Yet the current NEC would allow disruption of the main power circuit by an AFCI. Although the argument is made that the backup battery will power the alarms if the circuit trips, this argument does not apply once the battery needs replacement. Invensys continues to receive field complaints of problems in installation of smoke alarms on AFCI protected circuits. Most common are chirping, nuisance alarms, and tripping of the AFCI breakers. In addition to the problem of power loss, we are also concerned about the possibility that either an installer or a consumer, unable to complete installation without nuisance alarming, may somehow circumvent proper procedures in order to solve the problem, thereby compromising consumer safety.

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 2-146. The submitter has not provided any technical data to support the position that listed AFCI devices are not compatible with listed carbon monoxide alarms.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

In addition, please refer to the NFPA Technical Committee (TC) on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) actions on this same matter as shown in the 2006 Annual Revision Cycle Report on Comment, Comment 72-479 (Page 72-123).

2-149 Log #3148 NEC-P02 **Final Action: Reject**
(210.12(B) Exception No. 2 (New))

Submitter: Joseph A. Ross, Ross Seminars

Recommendation: Number the present *Exception* as *Exception No. 1* and add a new *Exception No. 2* as follows:

Exception No. 2: Arc-fault circuit-interrupter protection shall not be required for branch circuits within the scope of this article supplying permanently-installed equipment used to detect one or more of a through c. No circuit wired under the terms of this Exception shall supply other outlets for which arc-fault circuit-interrupter protection is required by this Code:

a. Fire;
b. Intrusion; or
c. carbon monoxide

Substantiation: In this world of lawyers, liabilities, disclaimers, and the protection of lives and property; this is another of several proposals that has been submitted to assure that a smoke detectors' ability to function will not be compromised in the event of a dwelling unit Fire.

There are many states and hundreds of municipalities that prohibit the connection of a life-saving smoke detector to a sensitive AFCI protected circuit. In the last 50 years, there has never been an NEC requirement that has divided the country as this one has. CMP 2 mandates that a smoke detector, because of its location in a bedroom, *(It is to be noted that nothing gets plugged into it and its location is certainly free from physical injury)* must be connected to an AFCI protected circuit. CMP 3 (760.21) exempts a smoke detector from being connected to an AFCI protected circuit (and both CMP's are addressing 120-volt smoke detectors). It's time to get this issue on a level playing field, reunite the country with an emphasis on fire protection, and put aside any interests other than the never ending quest toward saving lives and property.

Panel Meeting Action: Reject

Panel Statement: Smoke detectors and fire detectors are components of fire alarm systems that are covered in Article 760. See panel action and statement on Proposal 2-143. The submitter has not provided any technical data to support his position that listed AFCI devices are not compatible with listed carbon monoxide and intrusion alarms. For smoke alarm applications see the panel action on Proposal 2-118a (Log #CP-200.)

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

In addition, please refer to the NFPA Technical Committee (TC) on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) actions on this same matter as shown in the 2006 Annual Revision Cycle Report on Comment, Comment 72-479 (Page 72-123).

2-150 Log #3417 NEC-P02 **Final Action: Reject**
(210.12(B) Exception No. 2 (New))

Submitter: Edward Johnson, Flint, MI

Recommendation: Add and Exception to read:

Exception No. 2: AFCI protection shall not be required for smoke detectors in dwelling unit bedrooms.

Substantiation: A smoke detector on an AFCI circuit could be disabled when an arc fault occurs and this is a time when it is most needed.

Panel Meeting Action: Reject

Panel Statement: Smoke detectors and fire detectors are components of fire alarm systems that are covered in Article 760. See panel action and statement on Proposal 2-143. For smoke alarm applications see Proposal 2-118a (Log #CP-200). The panel notes that single and multiple station smoke alarms are devices that are powered by branch circuits under the purview of CMP-2. Smoke detectors powered through a fire alarm system are covered under the requirements of NFPA 72 and Article 760.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

In addition, please refer to the NFPA Technical Committee (TC) on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) actions on this same matter as shown in the 2006 Annual Revision Cycle Report on Comment, Comment 72-479 (Page 72-123).

2-151 Log #3549 NEC-P02 **Final Action: Reject**
(210.12(B) Exception No. 2 (New))

Submitter: Michael L. Savage, Sr., Middle Department Inspection Agency Inc.

Recommendation: Change exception to Exception <u>No. 1</u> .

Add new exception to read as follows:

<u>Exception No. 2: Smoke Alarms installed in dwelling unit bedrooms shall not be required to be installed on a branch circuit protected by an arc-fault circuit interrupter.</u>

Substantiation: Many times a smoke alarm receives its primary source of power from other than a bedroom area. NFPA 72 allows smoke alarms to be fed from a dedicated circuit, if the alarm is fed from a guest bedroom circuit and this circuit trips without the knowledge of the occupants the entire dwelling is left without smoke alarm protection.

There have been many cases of nuisance tripping, and in some cases recalls of defective AFCI circuit breakers. There have also been fire reports of smoke alarms being found without batteries installed. With a non-afci dedicated circuit or an exception allowing smoke alarms to not need AFCI protection, the smoke alarm will continue to serve the occupants. The State of Delaware and Queen Anne's County, Maryland currently allows this.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 2-146.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

In addition, please refer to the NFPA Technical Committee (TC) on Single- & Multiple-Station Alarms & Household Fire Alarm Systems (SIG-HOU) actions on this same matter as shown in the 2006 Annual Revision Cycle Report on Comment, Comment 72-479 (Page 72-123).

2-152 Log #1835 NEC-P02 **Final Action: Reject**
(210.12(C))

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician

Recommendation: Revise as follows:

(C) Institutional Bedrooms. All 120-volt, single phase, 15- and 20-ampere branch circuits supply outlets installed in institutional bedrooms shall be protected by a listed arc-fault circuit interrupter combination type installed to provide protection of the branch circuit.

Substantiation: There is no requirement for (word unreadable) protection in children's sleeping quarters at schools, dorms, and the like.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any technical substantiation to support his recommendation. CMP-2 action supporting the use and expansion of AFCI protection has been based on dwelling unit fire data.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-153 Log #2796 NEC-P02 **Final Action: Reject**
(210.12(C))

Submitter: Bradley Butters, City of Reynoldsburg, Ohio / Rep. IAEI

Recommendation: Add new section (C) to 210.12.

<u>(C) Required luminaires for stairway and equipment illumination shall not have arc-fault protection.</u>

Substantiation: It is common practice for our area for the residential stairway lighting to be added to the bedroom arc-fault protected circuit. I feel that on the occasion of the arc-fault tripping at night is precisely the worst time to lose the stairway illumination. Before and after dark, a loss of power event can be diagnosed, stairway illumination is critical for a safe path to the basement. In a true emergency the stairway illumination is critical to safe evacuation.

Panel Meeting Action: Reject

Panel Statement: The submitter of this proposal has not provided any technical substantiation to support his position that listed AFCI devices are not compatible with listed luminaires. The submitter describes a situation that can occur as a result of any overcurrent device tripping.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-142, especially the use of dwelling unit fire data to support the expansion of AFCI protection.

2-154 Log #1721 NEC-P02 **Final Action: Reject**
(210.13 (New))

Submitter: Michael McQuade, E.I. Dupont de Nemours and Company Inc.

Recommendation: Add new text to read:

"All 125-volt single phase receptacles shall have Overload Fault Interrupter Protection for Personnel."

For greater fire safety, newly constructed residential dwellings should include variable-threshold circuit disconnect relays in all electrical outlets, referred to by some companies as Overload Fault Interrupters. The trip threshold of this variable-threshold resettable switch should automatically match the electrical current or power rating of the appliance, lamp, extension cord or other device plugged into the receptacle. It should communicate with the electrical device to download this trip level. Additionally, the trip threshold should not allow more current than the electrical outlet rating to flow through the outlet. Upon sensing an overload condition it should disconnect electricity to the device before the device wires can overheat and ignite fires.

For greater shock protection, newly constructed residential dwellings should also include a normally-open relay in series with the line blade connection socket. When the outlet receptacle(s) are open and exposed (nothing plugged in) the technology would block electricity (keeps the relay open) from the receptacles drastically reducing the shock hazard. The relay should close only upon the detection of a valid electrical plug, not upon insertion of any other foreign objects.

Substantiation: Fire Risk

According to data from "The U.S. Home Product Report: appliances and equipment, 1 actual and potential fires caused by electrical overload faults produce up to 93% (57,900) of all the 62,400 reported fires triggered by electrical distribution equipment (excluding transformers, meters and meter boxes), appliances and tools (text illegible) even more concerning is the Consumer Product Safety Commission's estimated 890,000 unreported home electrical distribution equipment fires per year in the USA 2 .

Furthermore, overload caused fires from appliances, tools and distribution equipment, compared to all electrical causes, make up 95% (391) of the total 412 civilian deaths, 90% (1,901) of the 2,121 civilian injuries and 93% ($741 million) of the $800 million dollars in direct property loss.

Circuit breakers and fuse panels provide excellent protection for the permanent in-wall wiring, but cannot offer the protection necessary for the smaller gauge wires in extension cords, small appliances, lamps, and electronics. These electrical devices and extension cords can overload at less than 15 Amps of current and cause serious fires.

Furthermore, electrical devices experience wear, abuse and misuse through their product life. Wear can cause internal breakage and fraying of strands of copper wires resulting in shorts inside power cords. Wear can cause binding or motor bearings causing an increase in current during normal usage. Abuse and misuses can place larger loads on an electrical device than its design can safely support. Another form of misuse is replacement of circuit breakers with a higher current rated unit (20A breaker or fuses installed on a 15A circuit), thus negating adequate protection on that branch circuit.

Examples of fires caused by misuses, abuse and failure resulting in electrical device current overloads include the following:

"Four children were killed yesterday when a lightning-quick blaze ripped through their New Jersey home - just hours after their mother had firefighters check the house for smoke." 3 The dead children were three boys, ages 4, 6 and 15, and a 5-year old girl." A preliminary investigation by the Teaneck Fire Department found an overloaded 20-amp circuit caused the motor in a basement freezer to burn out and start the fire, Kadison, Dan et al. "Family of Young N.J. Fire Victims Holding Fire Officials Responsible", NY Times, March 24, 2005.

"The chief said about a dozen firefighters spent half an hour checking the home's appliances and furnace but found no signs of impending danger. He said they even checked a basement freezer, refrigerator, washer and dryer plugged into the overload circuit but did not detect an obvious threat." Samules, Tany et al., "N.J. blaze kills 4", NY daily news, March 23, 2005.

"A 71 year-old man died after trying to extinguish a small fire, reported by his 71 year old wife, in the living room of his single family home. He was able to leave the house, but he collapsed outside from smoke inhalation. Investigators determined that the fire began because the motor bearings of a fan had worn down, causing the fan to freeze and its wiring to overheat, igniting the insulation." NFPA Journal September/October 2005, Vol. 99 No. 5 Firewatch Page 24-29.

"Terrah Campbell [6 years old] was asphyxiated by smoke from the June 10 fire that broke out in the rental unit. Her body was found in her bed where she slept. The fire began in an extension cord connected to a "burned out electrical outlet" in a bedroom..." Whitehead, Sheely. "Probe: Girl could have escaped fire," The Kentucky Post, August 3, 2005.

"North Charleston officials say an overloaded surge protector caused an apartment fire that killed a mother and her teenage daughter last month." The Associated press, "Officials Blame Surge Protector For Fatal North Charleston Fire." September 16,2005,

"A fire early this morning killed a mother and child at a Baton Rouge apartment complex. Fire officials say 36-year-old Amie Williams, and her four-year old son Donnie Thomas Junior were pronounced dead at the scene. Fire officials said they believe that an overloaded electrical outlet sparked the fire, which quickly spread throughout the apartment. the victims were believed to have been overcome by smoke. Two other children were treated and released at a hospital for burns to their arms and face." WAFB-TC, Baton Rouge, "Fire in Baton rouge Apartment Kills Mother, 4-year old http://www.katc.com/Global/story.asp?S-366631>

"Three generations of a Queens family - including a 2-year old girl - were killed early yesterday when an air conditioner's overload extension cord sparked a fast moving fire inside their home." Belenkaya, Veronika, "Three Generations Perish". Daily News, July 20, 2005.

"An overloaded circuit on a fish tank filter is suspected as the cause of a fire at 421 Sixth Ave., S.E. on Saturday, Decatur Fire and Rescue reported." The Decatur Daily, Sunday, Sept. 25, 2005. http://www.decaturdaily.com/decaturdaily/news/050925/areabriefs.shtml>

"Terrah Campbell was asphyxiated by smoke from the June 10 fire that broke out in the rental unit. Her body was found in her bed where she slept. The fire began in an extension cord connected to a burned out electrical outlet" in the bedroom overlooking 10th Street," Shelly Whitehead, "Probe: Girl could have escaped fire." The Kentucky Post, Wednesday, August 3, 2005.

"The thought of a daycare fire strikes fear in every parent's heart. And when those words crackled over emergency radios in Williams County on Wednesday, the worst was feared. A faulty electrical outlet in a bedroom is blamed for the fire." Bundgaard, Chris. "Daycare Safely Evacuated During Fire." News 2 WKRN-TV, September 21, 2005.

"Three men were killed and three other people were critically injured yesterday morning after a fire broke out in a cellar apartment in Queens and surged through the building, a two-story attached home, forcing neighbors to run down the street to escape the heat and smoke...Fire officials said last night that an overloaded power strip in the cellar had caused the fire." O'Gilfoil, Patrick. "Apartment Fire Kills 3 people in Queens," January 31, 2005.

"An Oakland Street house fire on Oct. 26 is now believed to have been caused by an electrical problem, the fire chief said. We believe it was an electrical fire caused by the lamp cord. "Fire Chief Wayne Vinton said," Guha, Audit. "Electrical Fire Likely Cause of Medway Fire," November 5, 2004.

www.townonline.com>

"A 30-amp fuse in a 20-amp hole is being blamed for a fire that gutted a four-unit apartment house Thursday morning, displacing six people. Hainstock said a short circuit at the bedroom socket probably heated the wires like the elements in a toaster. The short circuit would have blown a smaller fuse, but the 30-amp fuse allowed the wires to continue heating and to start a fire, Hainstock said." Schwartz, Sid. "Wrong Sized Fuse Blamed for Blaze" Janesville Gazette, September 9, 2005.

"Quick response to reports of a fire in Charlestown saved a two bedroom dwelling place from total destruction...It is believed that the fire was caused by an electrical fan that was left running and which short circuited. McCall, Terresa "Fire Unit Contains House Fire in Nevis <http://sunstkitts.com> September 9, 2005.

"Nineteen firefighters were called to the six story retirement home at 59 Cedar St. N. The fire started in the living room of a third-floor apartment which was empty at the time...Once inside, firefighters found the unit filled with thick, black smoke...An upholstered chair near the lamp was burning, Taves said the lamp's electrical cord caught fire and then ignited the chair and rug." Record Staff: "Faulty Lamp Sparks Apartment Fire." The Kitchener Record, December 30, 2005.

Overload Fault Interrupter protection for personnel has the potential to significantly reduce the hundreds of thousands of electical overload fires in U. S. Homes that result in hundreds of deaths and thousands of serious burn injuries yearly.

Shock Risk. In fact, "3,900 injuries associated with electrical receptacle outlets are treated in hospital emergency rooms each year," 4 One third of them are young children inserting the metal objects. Existing solutions include plastic receptacle covers and tamper resistant covers, many of which do not provide adequate protection. Depending on the type, plastic receptacle covers can be removed by up to 100% of 2-4 year olds. 6

Thousand of serious shock injuries resulting in hospital visits from receptacles can be avoided every year. Furthermore, of the hundreds of electrocutions occurring in the United States each year (411 deaths in 2001), a substantial number are associated with electrical outlets and can also be avoided.

1 Rohr D. Kimberly, <u>"The U.S. Home Product Reports (Appliances and Equipment)</u> , Fire Analysis and Research Division NFPA (January 2002). All extrapolated data are based on 1994-1998 U.S. annual averages.

2" Residential Electrical Distribution System Fires," Consumer Product Safety Commission (CPSC), 1988.

3 Samules, Tany et al, "N.J. blaze kills 4, NY Daily News, March 23, 2005.

4 "Electrical Receptacle Outlets," Document #524, Consumer Product Safety Commission.

5 "Electrical Receptacle Outlets", Document #524, Consumer Product Safety Commission.

6 Binkinetics Research Laboratory of Temple University, 1997,"Children and Electrical Outlets", State Farm Insurance.

<http://www.statefarm.com/consumer/house/articles/childout.htm>

Panel Meeting Action: Reject

Panel Statement: There is insufficient information provided to determine if the proposed protective device would have prevented the incidents described in the substantiation. The proposed device should be independently evaluated to determine that it will perform the intended function and that there will be no unintended consequences such as false tripping of the device.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-155 Log #2278 NEC-P02 **Final Action: Reject**

(210.13 (New))

Submitter: Bob Boutin, BE Safe Consultants, Inc.

Recommendation: Add text to read:

Electrical outlets in residential and commercial environments should not provide electrical current without the insertion of a valid electrical plug.

Substantiation: Due to their design, all electrical outlets pose a potential electrocution hazard. Thousands of injuries and deaths could be prevented by utilizing technology that blocks electrical current from the outlet until a valid plug is inserted. Stopping the flow of electricity to improperly insert plugs, metal objects and other foreign material provides adequate protection from electrical currents.

Existing products designed to cover outlet openings fall short of full protection as they are not fail-safe. These devices only offer protection when they are properly inserted into the outlet, cannot be secured to prevent removal by the persons they are most intended to protect and, by the nature of their design eliminates the usefulness of the outlet which, often times prevents consumers from purchasing in the first place.

Panel Meeting Action: Reject

Panel Statement: There is insufficient information provided to determine if the proposed protective device would have prevented the incidents sited in the substantiation. The proposed device should be independently evaluated to determine that it will perform the intended function and that there will be no unintended consequences such as false tripping of the device. The submitter's use of the term "should not" could be interpreted as not being mandatory language and may not satisfy the submitter's original intent.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

(Note: Sequence 2-156 was not used)

2-157 Log #429 NEC-P02 **Final Action: Reject**

(210.15)

Submitter: Mark Magee, Journeyman, Idaho J22653

Recommendation: Add new text as follows:

<u>Line voltage smoke detectors and fire detection equipment shall be supplied by an isolated circuit, and clearly marked as such. The said circuit will have identification by means of a red tag with the writing "FIRE DETECTION ONLY" written upon the tag in the circuit panel from which it is supplied.</u>

Substantiation: Use of household smoke detectors on arc fault circuit interrupter lighting circuits creates a hazard in that the smoke detector may be switched off by de-energizing the circuit, or improperly wiring signaling circuits.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated that a problem exists where smoke alarms are installed on AFCI protected branch circuits.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: This should be under the purview of CMP 3 or the TC's of NFPA 72.

2-158 Log #1005 NEC-P02 **Final Action: Reject**

(210.18)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

Guest rooms in motels, hotels, <u>and dormitories,</u> ~~provided with permanent provisions for cooking~~ shall have branch circuits installed to meet the requirements for dwelling units.

Substantiation: The perceived intent is to protect cords susceptible to arcing. There is no need to include circuits supplying only fixed equipment such as lighting outlets or smoke/fire detectors. An arc-fault could deenergize such circuits just when needed. Many agencies such as fire departments report dead or removed batteries in smoke detectors which make such backup unreliable. It is not clear what relevance permanent cooking facilities have on this requirement. 210.8 has exceptions for GFCI requirements.

Panel Meeting Action: Reject

Panel Statement: The submitter's substantiation is not clear and lacks the necessary technical data to support his recommendation.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-159 Log #2160 NEC-P02 **Final Action: Reject**

(210.18)

Submitter: Richard E. Loyd, Sun Lakes, AZ

Recommendation: Delete Section 210.18 in its entirety.

Substantiation: The addition of this section has caused confusion in the industry. Many "guest suites" are nothing more than a single room with furniture arrangement and cooking provisions to make them suitable for extended stay, while others may clearly be a dwelling with multiple bedrooms within a hotel or motel. The countertop may be one 3 ft cabinet top adjacent to a combination sink - cooktop unit with a micro-oven exhaust fan hung above the unit.

NEC section requiring AFCI, GFCI, laundry, outside receptacle requirements, and other specific safety requirements should be dealt with in each individual section as applicable to extended stay suites.

Panel Meeting Action: Reject

Panel Statement: CMP 2 maintains that guest rooms and guest suites that have permanent provisions for cooking are required to have branch circuits installed to meet the rules for dwelling units.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-160 Log #2734 NEC-P02 **Final Action: Accept**
(210.18)

Submitter: Jim Pauley, Square D Company
Recommendation: Revise 210.18 as shown below:
210.18 Guest Rooms and Guest Suites.
Guest rooms and guest suites that are provided with permanent provisions for cooking shall have branch circuits ~~and outlets~~ installed to meet the rules for dwelling units.
Substantiation: The outlet provisions for guest rooms and suites are outlined in 210.60 and 210.70. 210.18 is a necessary section, but is only needed to indicate that the branch circuits for a guest room/suite with permanent cooking provisions need to have branch circuits installed in a similar manner to a dwelling unit. This would include the small appliance branch circuits and the bathroom branch circuit. The laundry branch circuit is included, but an Exception #2 to 210.52(F) would allow the omission of the laundry receptacle if no laundry facilities are contemplated.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-161 Log #3469 NEC-P02 **Final Action: Reject**
(210.19)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
210.19 Conductors - Minimum Ampacity and Size.
(A) Branch Circuits Not More Than 600 Volts.
(3) ~~Household~~ Dwelling Unit Ranges and Cooking Appliances. Branch circuit conductors supplying ~~household~~ dwelling unit ranges, wall-mounted ovens, counter-mounted cooking units, and other ~~household~~ dwelling unit cooking appliances etc.
Exception No. 2: The neutral conductor of a 3-wire branch circuit supplying a ~~household~~ dwelling unit electric range, etc.
Substantiation: We need to stay consistent with our wording in the NEC so as to not mislead or confuse the reader with an unorthodox term.
Panel Meeting Action: Reject
Panel Statement: The present text is clear. The submitter's recommended text does not add any clarity when describing types of cooking appliances.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-162 Log #2008 NEC-P02 **Final Action: Reject**
(210.19(3))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for action within Article 422.
This action will be considered by Code-Making Panel 17 as a public comment.
Submitter: Robert Caggiano, General Electric Company
Recommendation: Revise as follows:
(3) Household Ranges and Cooking Appliances. Branch-circuit conductors supplying household ranges, wall-mounted ovens, counter-mounted cooking units, and other household cooking appliances shall be protected by a listed ground fault circuit interrupter for personnel and shall have an ampacity not less than the rating of the branch circuit and not less than the maximum load to be served. For ranges of 8 3/4 kW or more rating, the minimum branch-circuit rating shall be 40 amperes.
Substantiation: Electric ranges make use of sheathed resistance heaters as heating elements. These heaters are susceptible to failures due to wear or corrosion. These failures result in an intense arcing similar to an arc welding operation. The arc can propagate and can be self-sustained for an extended period of time. The writer has witnessed such an event.
The arcing is caused by a fault from the electrical supply to ground. The leakage current during one of these events has been measured to be in the range of 3 to 5 amperes. A standard thermal/magnetic circuit breaker or fuse will not detect enough current to recognize this extraordinary event. A common ground fault circuit interrupter with 5mA trip setting would easily detect and interrupt this event. Ground Fault protection is also recommended for any appliance with a heating element (i.e., refrigerators, dish washers and cloths dryers).
Panel Meeting Action: Reject
Panel Statement: The panel recognizes that the event described in the submitter's substantiation is possible at end of life for sheathed heating elements. Because this proposal addresses a specific applicance, the panel recommends to the Technical Correlating Committee that this proposal be forwarded to CMP-17 for action.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-163 Log #3471 NEC-P02 **Final Action: Accept in Part**
(210.19(3) Exception No. 1)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
210.19(3) Exception No. 1: Conductors tapped from a 40- or 50-ampere branch circuit supplying electric ranges, wall-mounted electric ovens and counter-mounted electric cooking units shall have an ampacity of not less than 20 amperes and shall be sufficient for the load to be served. These taps, etc.
Substantiation: The article needs a rewording in order to clarify the whole intent of what is intended here and the rule will now match the graphic used in the IAEI Power Point presentation.
Panel Meeting Action: Accept in Part
The panel accepts the rewording of the exception but rejects the addition of the 40 ampere branch circuit.
Panel Statement: The submitter has not substantiated the addition of the 40 ampere branch circuit
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-164 Log #1465 NEC-P02 **Final Action: Reject**
(210.19(A), 210.20, Table 210.24)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term “fixture wires” to “luminaire wires” in 210.19(A)(4)(b); 210.19(A)(4), Exception No. 2; 210.20(B) and Table 210.24.
Substantiation: With the changing of the term “fixture” to “luminaire” it only makes sense that the term “fixture wires” be changed to “luminaire wires”.
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: While the term “fixture” as relating to lighting fixtures has been changed to luminaries, the term for fixture wires applies to conductors that serve appliances or other devices and not just luminaries. The change in terminology will impose changes on the wire industry and those associated with no increase in safety or apparent benefit to users of the code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-165 Log #2836 NEC-P02 **Final Action: Reject**
(210.19(A), FPN 4)

Submitter: Robert P. McGann, City of Cambridge
Recommendation: Make this Fine Print Note into mandatory text.
Substantiation: This is necessary to properly facilitate the operation of overcurrent protection. We are all looking at ways to reduce the number of electrical fires. This will aid us in achieving that goal.
Panel Meeting Action: Reject
Panel Statement: The fine print note deals with efficiency of operation and it is not clear from the substantiation that making the fine print note mandatory will reduce electrical fires.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-165; and 2-268.

2-166 Log #1319 NEC-P02 **Final Action: Accept in Principle**
(210.19(A)(1))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal is to identify the existing Exception as “Exception No. 1” and the Exception being added as “Exception No. 2” to be located immediately following the existing Exception.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
210.19 Conductors – Minimum Ampacity and Size.
(A) Branch Circuits Not More Than 600 Volts.
(1) General. Branch-circuit conductors shall have an ampacity not less than the maximum load to be served. ~~Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size,~~ Branch-circuit conductors that are connected to an overcurrent device assembly shall have a minimum allowable ampacity, before the application of any adjustment or correction factors, ~~shall have an allowable ampacity~~ not less than the noncontinuous load plus 125 percent of the continuous load.
Substantiation: “Minimum Rating and Size”: The identical wording should be used for 210.19, 215.2, and 230.42.

Confusion reigns as to under what conditions grounded conductors are subject to the same 125 percent of continuous load sizing requirements as are ungrounded conductors. During the 2005 *Code* cycle this issue was addressed for feeders, but action was deferred. ROC No. 2-145 included a lucid, sound "substantiation" that unfortunately was rejected by CMP 2 at that time. Now is an excellent time to re-evaluate that "substantiation" and adopt its intent.

The basis for the 125 percent requirement stems from the manner in which listed overcurrent devices are tested. During continuous load tests of enclosed overcurrent devices, in order to prevent nuisance tripping, it has been found that it is necessary to limit the current to 80 percent of the device's rating. Conductors are sized, then, (1) at 125 percent of the continuous current in accordance with the allowable ampacity determined from Table 310.16, and (2) per the terminal temperature limitations of 110.14(C).

The reality is that the enclosed overcurrent devices rely on the mass of the conductors to act as heat sinks that dissipate excess thermal energy and thereby avoid unacceptable nuisance tripping. Of course, since overcurrent devices cannot distinguish between ungrounded and grounded conductors, in both cases the conductor sizes must be based on calculations that include an additional 25 percent factor when the load is continuous. On the other hand, there is no reason to add 25 percent to the load of a conductor that is not connected to a device that is not subject to nuisance tripping, such as in the case of a grounded conductor connected a neutral terminal bus.

The end result of this proposal is twofold:

1. The additional 25 percent continuous load requirement applies only to conductors, both ungrounded and grounded, that connect to an overcurrent device (unless, of course, the assembly is listed for operation at 100 percent of its rating).

2. Grounded conductors that carry continuous loads and that connect only to neutral buses, or to devices not subject to nuisance tripping, are not required to have their loads increased by 25 percent.

This proposal accomplishes that goal and, in hand with similar proposals made in two other Articles, brings into conformity the requirements for branch circuits (210.19), feeders (215.2), and services (230.42).

Panel Meeting Action: Accept in Principle

Add a new exception to 210.19(A)(1) to read:

Exception: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100% of the continuous and non-continuous load.

Panel Statement: The panel has accepted the submitter's concept, but has added the provision as an exception to the main rule. The concern with the submitter's proposed language is that it may be interpreted that the conductors have to terminate directly to an overcurrent device.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-167 Log #1647 NEC-P02 **Final Action: Reject**

(210.19(A)(1))

Submitter: Larry T. Smith, National Electrical Seminars

Recommendation: Revise text to read as follows:

(1) General. Branch-circuit conductors shall have an ampacity not less than the maximum load to be served. Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size, before the application of any adjustment or correction factors, shall have an allowable ampacity not less than the noncontinuous load plus 125 percent of the continuous load <u>in accordance with the temperature limitations of 110.114(C)</u> .

Substantiation: Ignoring the temperature rating of equipment is the most common mistake being made in conductor sizing today. Entirely too many wiremen take no notice of the temperature limitations of 110.14(C) when sizing conductors. They disregard the temperature rating of equipment, and use the 90°C column of Table 310.16 when 90°C rated conductors, such as THHN, are being used. The equipment rating will either be 60° or 75°C, not 90°C.

Observing the temperature rating of the equipment is an integral part of sizing branch circuit conductors; it should be included as a requirement of 210.19(A)(1).

Panel Meeting Action: Reject

Panel Statement: The panel agrees that 110.14(C) is an important section, but its application in conductor selection is a much broader application than 210.19. Adding another reference to this section would not improve the usability because 110.14(C) is a general requirement.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-168 Log #1723 NEC-P02 **Final Action: Reject**

(210.19(A)(1), FPN 4)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"... and where the maximum total voltage drop on service equipment, feeders, and branch circuits (including outlet devices) to the farthest...".

Substantiation: The present wording is based on nominal voltage minus 5 percent reliably being high enough for reasonable efficiency of operation. If voltage predictable runs lower than that, there may be problems. I have encountered service equipment that added 1 percent or more impedance. Standard VD testers, after all, indicate total drop, not merely drop through feeders and branch circuits.

Panel Meeting Action: Reject

Panel Statement: The fine print note is advisory with respect to total voltage drop not exceeding 5% and does not cover all possible causes for the voltage drop.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-169 Log #915 NEC-P02 **Final Action: Reject**

(210.19(A)(2))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete or substitute:

Conductors of branch circuits supplying two or more receptacles or outlets shall comply with the requirements in Table 210.24.

Substantiation: Edit. This is already covered in Table 210.24. Present wording does not apply where one receptacle and other type outlets are supplied.

Panel Meeting Action: Reject

Panel Statement: Section 210.19 provides the requirements for branch circuit ratings and Table 210.24 provides a summary of the requirements. Deleting 210.19(A)(2) does not improve the usability or clarity of the code.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-170 Log #2124 NEC-P02 **Final Action: Reject**

(210.19(A)(3))

Submitter: Charles Swathwood, Electrical Contracting Inc.

Recommendation: Add paragraph No. 3 to read:

(3) Microwave ovens shall not be considered meeting the requirements of 210.8(A)(3).

Substantiation: Microwave ovens are a cord and plug appliance and have their own name plate specifications for installation.

Panel Meeting Action: Reject

Panel Statement: The recommendation is not clear as to the section referenced which does not apply to microwave ovens.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Perhaps the Recommendation should read: "Add Exception No. 3", not "paragraph No. 3".

2-171 Log #541 NEC-P02 **Final Action: Accept in Part**

(210.19(A)(4) Exception No. 1 (b.))

Submitter: Edward G. Kroth, Academy Electric, Inc.

Recommendation: Revise text to read:

(b) A <u>luminaire (lighting fixture)</u> ~~fixture~~ having tap conductors as provided in 410.67.

Substantiation: Article 410 is titled Luminaires (Lighting Fixtures), Lampholders and Lamps. The proposed change is suggested to provide consistency with this title.

Panel Meeting Action: Accept in Part

Revise the present Code text to read:

(b) A <u>luminaire (fixture)</u> having tap conductors as provided in 410.67.

Panel Statement: The panel has deleted the word "lighting" to be consistent with the use of only the term "fixture" in 410.67.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-172 Log #1698 NEC-P02 **Final Action: Reject**

(210.19(B)(2))

Submitter: Charles M. Trout, Maron Electric Company

Recommendation: Add a new last sentence to 210.19(B)(2)(2) to read:

Evidence of documentation of qualified person shall be kept in a permanent file at the office of the establishment where the installation is made.

Substantiation: No requirements are present to ensure the conditions of maintenance and supervision to ensure that only qualified persons service the installation actually exist.

Panel Meeting Action: Reject

Panel Statement: The portion of the recommendation calling for documentation is already covered by the existing requirement of 210.19(B)(2)(2). In addition the proposed text is overly restrictive by requiring documentation to be maintained at the place where the installation is made.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: The submitter's recommendation to add a new last sentence requiring that the documentation be located in a permanent file on site where the work is performed is necessary to ensure that the documentation is available for the authority having jurisdiction at the time of inspection. I disagree with the panel statement that the proposed language is to restrictive. Facilities seeking to perform electrical installations under the provisions of this section should have a set location on site, preferably in the office of the supervising engineer employed by the facility, where the documentation is accessible to whoever may require it. It is difficult for the authority having jurisdiction to enforce the provisions of this section without clear prescriptive language as to what determines the presence of a qualified person at a facility. The additional language recommended by the submitter would aid the authority having jurisdiction in determining if the application of this section should be permitted.

2-173 Log #1411 NEC-P02 **Final Action: Reject**
(210.20)

Submitter: George Stolz, II, Pierce, CO
Recommendation: Delete 210.20, 210.20(B) through (D). Move 210.20(A) with Exception to new section Article 240.4(H) and change the words relating to branch circuits to apply to all conductors.

~~210.20(A)~~ 240.4(H) Continuous and Noncontinuous Loads. Where ~~a branch circuit supplies~~ conductors supply continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly, including the overcurrent devices protecting the ~~branch circuit~~ conductor(s), is listed for operation at 100 percent of its rating, the ampere rating of the overcurrent device shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

Substantiation: In general, this will reduce redundant text in the NEC. General overcurrent rules are more appropriate (and are already present) in Article 240, Overcurrent Protection. What follows are substantiations for each deletion.

210.20: With (A) through (D) relocated or deleted, this text becomes obsolete.

(A): This is a uniform requirement for all conductors: a similar rule in 215.3 requires the same for feeders. It would be clearer for users of the NEC if the requirements were merged into an all-encompassing requirement for all conductors, located in an appropriate article.

(B): Redundant 240.4 and 240.5 are enforceable over branch circuit conductors without 210.20 referencing them.

(C): Redundant 240.3 is enforceable over branch circuit conductors without 210.20 referencing it.

(D): 210.21 is enforceable over branch circuit conductors without 210.20 referencing it.

The deletions would require revisions to the following: Sections 210.24; 225.9; 368.13; Index: “Appliances, Overcurrent Protection, Single”, “Branch Circuits, Individual, Overcurrent Protection”, “Branch Circuits, Overcurrent Protection”, “Continuous Load, Application”, “Overcurrent Protection, Branch Circuits”, and “Overcurrent Protection, Single Appliance”.

Panel Meeting Action: Reject
Panel Statement: The current wording provides clarity in the use of the code as applied to branch circuits.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-8 Log #822 NEC-P02 **Final Action: Reject**
(210.21(B)(1))

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise text to read as follows:

Single Receptacle on an Individual Branch Circuit. A single receptacle installed on an individual branch circuit shall have an ampere rating ~~not less than~~ equal to that of the branch circuit.

Substantiation: As currently written, it is currently being interpreted to allow a 20 ampere single receptacle to be installed on a 15 ampere individual branch circuit. 20 ampere single receptacle is not less than that of the branch circuit. This would allow a 20 ampere rated piece of equipment to be connected to a 15 ampere circuit.

See supporting material for response to a question posed to Code Question of the day, hosted by NEIS, and answered by Ed Holt (Electrical Inspector - Architect of the Capitol - Instructor - The College of Southern Maryland)

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: The recommendation would be overly restrictive in the case of some larger receptacle applications that do not directly correspond to the standard ratings of overcurrent protective devices. The panel notes that a 20-ampere receptacle installed on a 15-ampere branch cirrcuit is protected within it’s rating.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-174 Log #3133 NEC-P02 **Final Action: Reject**
(210.21(B)(2))

Submitter: Eric Stromberg, Stromberg Engineering, Inc.
Recommendation: Delete Section 210.21B(2) and associated table.
Substantiation: As written, this section is unenforceable, because it applies to all cord-and-plug devices; not just those fastened in place at the time of installation. According to this section, every time I use my circular saw, I violate the *Code* . If this section is for the purpose of after-the-fact application, as would be the case for a fire investigation, it seems that 210.23 could be cited instead.
Panel Meeting Action: Reject
Panel Statement: The panel continues to maintain that the cord and plug connected load must not exceed the maximum load specified in Table 210.21(B)(2).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-175 Log #1089 NEC-P02 **Final Action: Reject**
(210.21(B)(2) and Table 210.2(B)(2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete.
Substantiation: This section has nothing to do with safety and is virtually unenforceable when the load is portable or transient, or connected after inspection. In Proposal 1-64 of the 1994 ROP, the panel rejected the proposal to define an individual circuit as one supplying a single receptacle inferring that a circuit supplying a duplex receptacle with only one equipment plugged in is an individual circuit. If this is the intent, the receptacle can supply any load for which it is rated. Receptacles are evaluated for their full ratings. There are listed appliances with rated current over 12 amperes with factory equipped 15 ampere plugs with no instructions to utilize an individual circuit, such as hair dryers, central vacuums, pressure water sprayers, etc. implying the testing agency found no hazard with a multiple receptacle circuit.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-174.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-176 Log #1394 NEC-P02 **Final Action: Reject**
(210.21(B)(2), Table 210.21(B)(2))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Delete the text and chart.
Substantiation: Item (1) and (3) in 210.21(B) address receptacle ratings, whereas Item (2) addresses connected loads, which are more appropriately and already addressed in 210.23(A)(1). 210.21(B)(2) is redundant.

The following sections reference this section and would need to be amended to either reference 210.21 in general, or 210.23:

210.21, the FPN to 406.2(B), 406.3(A), 520.9, 530.21(A). Index “Heavy Duty Lampholders”, and “Maximum Connected Load to Receptacles”.

No coordinating proposal will be submitted to request these amendments.

Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-174.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-177 Log #1849 NEC-P02 **Final Action: Reject**
(210.21(B)(5) (New))

Submitter: David Williams, Lansing, MI
Recommendation: Add new text to read as follows:

(5) Bathroom Receptacle Rating. The rating of dwelling unit bathroom receptacles shall be rated 20 amperes.

Substantiation: The code section requires a maximum cord and plug connected load to a 15 ampere receptacle to be 12 amperes. Most personal hair dryers draw in excess of that amount and should be using a 20 ampere receptacle.
Panel Meeting Action: Reject
Panel Statement: Section 210.23(A)(1) requires cord and plug connected utilization equipment to not exceed 80% of the branch circuit rating. Equipment with a 15 ampere rated plug should not exceed the load shown in Table 210.21(B)(2).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

BROWN, L.: The submitter may also want to refer to Section 210.24 for additional guidance.

2-178 Log #3132 NEC-P02 **Final Action: Reject**
(210.23(A)(1))

Submitter: Eric Stromberg, Stromberg Engineering, Inc.
Recommendation: Delete section 210.23(1) and renumber (2) to (1).
Substantiation: As written, this section is unenforceable, because it applies to cord-and-plug devices not fastened in place at the time of installation. According to this section, every time I use my circular saw, I violate the *Code* (if I use it on a 15 amp branch circuit). If this section is for the purpose of after-the-fact application, as would be the case for a fire investigation, it seems that 210.23 could be cited instead.
Panel Meeting Action: Reject
Panel Statement: The panel continues to maintain that the cord and plug connected load must not exceed the maximum load specified in Table 210.21(B)(2)
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: It should be noted this Section could apply to equipment in commercial kitchens where the equipment is cord-and-plugged-connected for ease of cleaning.

2-179 Log #71 NEC-P02 **Final Action: Reject**
(210.23(A)(1) Exception (New))

Submitter: Wesley Gerrans, Northwest Kansas Technical College
Recommendation: Add an exception to read as follows:
Exception No. 1: A single cord and plug connected load connected to a single receptacle on an individual branch circuit shall not exceed the rating of the branch circuit.
This could also be worded:
210.23(A)(1) The rating of any one cord and plug connected utilization equipment <u>not on an individual branch circuit</u> shall not exceed 80 percent of the branch circuit rating.
Substantiation: Without this Exception 210.23(A)(1) appears to defeat the reasoning behind 210.21(B)(1) requiring the single receptacle on an individual branch circuit a rating not less than that of the branch circuit, and that of 210.23 that says an individual branch circuit shall be permitted to supply any load for which it is rated.
Panel Meeting Action: Reject
Panel Statement: This requirement is already covered by 210.23.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-179; and 2-181.

2-180 Log #3485 NEC-P02 **Final Action: Reject**
(210.23(A)(2))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
210.23(A)(2) Utilization Equipment Fastened in Place. The total rating of a <u>single</u> utilization equipment fastened in place etc.
Substantiation: This article needs clarification because as it stands now it is allowable to connect a dishwasher, garbage disposal, dish warmer and trash compactor all on one 20 ampere branch circuit.
Panel Meeting Action: Reject
Panel Statement: The present language is clear in it's intent. The section refers to the "total rating of utilization equipment fastened in place" which permits more than one utilization equipment as long as the total rating does not exceed 50% of the branch-circuit rating.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-181 Log #72 NEC-P02 **Final Action: Reject**
(210.23(B))

Submitter: Wesley Gerrans, Northwest Kansas Technical College
Recommendation: Revise as follows:
<u>The</u> ~~A~~ rating of any one cord and plug connected utilization equipment <u>not on an individual branch circuit</u> shall not exceed 80 percent of the branch circuit ampere rating.
Substantiation: Clarification of Section "B" based on 210.23, "an individual branch circuit shall be permitted to supply any load for which it is rated."
Panel Meeting Action: Reject
Panel Statement: This requirement is already covered by 210.23.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-179; and 2-181.

2-182 Log #1320 NEC-P02 **Final Action: Reject**
(210.24)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete the following:
~~210.24 Branch-Circuit Requirements — Summary. The requirements for circuits that have two or more outlets or receptacles, other than the receptacle circuits of 210.11(C)(1) and (C)(2), are summarized in Table 210.24. This table provides only a summary of minimum requirements. See 210.19, 210.20, and 210.21 for the specific requirements applying to branch circuits.~~
~~Table 210.24 Summary of Branch-Circuit Requirements~~
Substantiation: 210.24 is not enforceable code, as is clearly indicated in the last two sentences of the section. A "summary of requirements" should be in a document such as the National Electrical Code Handbook, not the *Code* itself.
Panel Meeting Action: Reject
Panel Statement: The table provides a useful summary of the branch circuit requirements which are enforceable by the authority having jurisdiction.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-183 Log #612 NEC-P02 **Final Action: Reject**
(210.25)

Submitter: Robert Bourke, Northeastern Regional Fire Code Dev.
Recommendation: Revise to read:
210.25 Common Area Branch Circuits. Branch circuits in dwelling units shall supply only loads within that dwelling unit or loads associated only with that dwelling unit. Branch circuits required for the purpose of lighting, central alarm, signal, communications, or other needs for public or common areas of a ~~two-family or~~ multifamily dwelling shall not be supplied from equipment that supplies an individual dwelling unit. <u>Branch circuits required for the purpose of lighting, central alarm, signal, communications, or other needs for public or common areas of a two-family dwelling shall be allowed to be supplied from equipment that supplies an individual dwelling unit provided that the disconnecting means of the branch circuit is accessible to the occupants of both dwelling units.</u>
Substantiation: The model building codes do not distinguish between one and two family homes. The common area branch circuit requirements serve no safety purpose if all occupants of the building have access to the disconnecting means. The requirement for a separate branch circuit for common areas in a two family dwelling results in a separate meter socket, breaker panel and wiring at a great expense to the owner. Many power companies charge commercial rates for power when there is more than one meter on a property while some other power companies charge a fixed minimum per month for each meter that is much greater than the usage for alarm and lighting for the common area.
Panel Meeting Action: Reject
Panel Statement: The common area branch circuit requirements for two family dwellings had this provision added by the panel in lieu of the potential that an occupant could have the service meter disconnected by the utility company for a variety of reasons such as vacancy or non payment, or by having the branch circuit internally disconnected.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: The Submitter's Substantiation is incorrect as there are differences in the application of provisions for one- and two-family dwellings constructed using the ICC International Residential Code (IRC) and multifamily buildings constructed using the ICC International Building Code (IBC). There are also differences in the types of two-family dwellings such as side-by-side or above-and-below configurations in which the common area may or may not be present, and may not require a separate house meter and circuit(s)

2-184 Log #823 NEC-P02 **Final Action: Accept in Principle in Part**
(210.25)

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise text to read as follows:
Common Area Branch Circuits. Branch circuits in ~~dwelling~~ <u>individual</u> units shall supply only loads within that ~~dwelling~~ <u>individual</u> unit or loads associated only with that ~~dwelling~~ <u>individual</u> unit. Branch circuits required for the purpose of lighting, central alarm, signal, communications, or other needs for public or common areas of a ~~two-family or multifamily dwelling~~ <u>multi-occupant building</u> shall not be supplied from equipment that supplies an individual ~~dwelling~~ unit.
Substantiation: Current code language allows multi-tenant retail buildings to have life safety and security systems connected to a tenant meter. When this design is utilized, there is the possibility that the Fire Alarm Control Panel (FACP), Monitor System, Sprinkler Tamper-Flow Switch, Site Lighting, etc., may have the power source disconnected if space becomes vacant and the utility meter is removed leaving the building in an unsafe condition.

Installation of an FACP, Monitoring System, Sprinkler Tamper-Flow Switch, Site Lighting, etc., using a tenant meter would not allow ready access to the overcurrent devices as required by 240.24 when the tenant space is not occupied for business. Therefore, making the OCPD for common area systems not readily accessible during non-business hours.

2003 IFC Section 907.5 requires the power supply for Fire Protection Systems to comply with NFPA 72. 1999 NFPA 72 Section 1-5.2.5.2 requires that the circuit shall be accessible only to authorized personnel. Allowing a tenant meter as the power supply for a common area Fire Protection System would allow access to non-authorized personnel.

Panel Meeting Action: Accept in Principle in Part

Revise the 210.25 text to read:

210.25 Branch Circuits in Buildings With More Than One Occupancy.

<u>(A) Dwelling Unit Branch Circuits.</u> Branch circuits in each dwelling unit shall supply only loads within that dwelling unit or loads associated only with that dwelling unit.

<u>(B) Common Area Branch Circuits.</u> Branch circuits required for the purpose of lighting, central alarm, signal, communications, or other needs for public or common areas of a two-family, ~~or~~ multifamily dwelling <u>, or a multi-occupancy building</u> shall not be supplied from equipment that supplies an individual dwelling unit <u>or tenant space</u> .

Panel Statement: The panel has revised this section into two subdivisions for compliance with the NEC style manual. The revisions made in new (B) accomplish the intent of the submitter. The panel added the word "each" in (A) for clarity. The panel did not accept the recommedation for the first sentence of 210.25 because the revision would be overly restrictive in many commercial applications.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: It should also be noted that a two-family dwelling is not classified as a multifamily building in the International Building Code (IBC) or the International Residential Code (IRC). In addition, the Submitter should consult the NFPA 17 (NEC) definitions of Dwelling Unit; Dwelling, One-Family; Dwelling, Two-Family; and Dwelling, Multifamily.

2-185 Log #3139 NEC-P02 **Final Action: Reject**
(210.25 Exception (New))

Submitter: Dale Rooney, Municipality of Anchorage

Recommendation: Add exception to read:

Exception: For common area lighting it shall be permitted to provide lighting from each unit such that all the lighting and switching requirements are met. Switching shall be accessible to all occupants unless the branch circuit overcurrent devices are accessible to all occupants.

Substantiation: A recent building design includes an interior stairway common to two dwelling units. This exception will eliminate the need for a separate service for just one circuit.

Panel Meeting Action: Reject

Panel Statement: See the panel action statement on proposal 2-183.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Depending on the configuration, there may not be a need for a separate panel for a two-family dwelling common area as both dwelling units may have their own lighting for their portion of the common areas. In addition, the "equipment" required by this Section to control shared lighting, etc., would not necessarily require a "separate service."

2-186 Log #3168 NEC-P02 **Final Action: Accept**
(210.50(C))

Submitter: Wally Harris, Atlantic Inland Inspections

Recommendation: Change title of section to "Appliance Receptacle Outlets" instead of "Appliance Outlets".

Substantiation: Section does in fact address "Appliance Receptacle Outlets" as indicated in the first three words of the Section.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-187 Log #118 NEC-P02 **Final Action: Reject**
(210.52)

Submitter: Bill Elder, B.E. Electric

Recommendation: None.

Substantiation: Every residential electrician agrees, get rid of requiring breakfast room and dining room plugs to be on a 20 amp circuit. No one even uses those plugs much, accept in rare cases. We should be able to use a general lighting 15 amp circuit to feed those plugs. It's overkill to be required to put them on a 20 amp circuit!! Every electrician agrees.

Panel Meeting Action: Reject

Panel Statement: The proposal does not recommend specific code text as is required by Section 4.3.3(c) of the NFPA Regulations Governing Committee Projects.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-188 Log #1321 NEC-P02 **Final Action: Reject**
(210.52)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise as follows:

210.52 Dwelling Unit Receptacle Outlets.

(1) **Receptacle Outlets Served** . In the kitchen, pantry, breakfast room, dining room, or similar area of a dwelling unit, the two or more 20-ampere <u>2-wire</u> small-appliance branch circuits <u>or the one or more 20-ampere 3-wire multiwire branch circuits</u> required by 210.11(C)(1) shall serve all wall and floor receptacle outlets covered by 210.52(A), all countertop outlets covered by 210.52(C), and receptacle outlets for refrigeration equipment.

(2) **No Other Outlets** . The two or more 20-ampere <u>2-wire</u> small-appliance branch circuits <u>or the one or more 20-ampere 3-wire multiwire branch circuits</u> specified in 210.52(B)(1) shall have no other outlets.

Substantiation: The key here is that there must be a minimum of two 20-ampere small-appliance branch circuits. These circuits may either be fed individually from the panel, or they may be fed from a single 3-wire branch circuit.

Panel Meeting Action: Reject

Panel Statement: The additional text in not necessary. Section 210.4(A) already permits this application.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: Section 210.11(C)(1) does not require a "3-wire multiwire" branch circuit. It only requires two or more 20-ampere small-appliance circuits to serve the kitchen/dining areas, however they may be provided.

2-189 Log #1409 NEC-P02 **Final Action: Accept in Principle**
(210.52)

Submitter: George Stolz, II, Pierce, CO

Recommendation: Add the following to 210.52:

<u>Receptacles in the areas defined in this section shall be permitted to be switched, provided uninterrupted receptacles are installed at the spacings required by this section.</u>

Substantiation: As this section is currently written, there is no prohibition from allowing the required receptacles to be switched. A requirement that constant power is required at the intervals specified in 210.52(A)(1), and (C)(1) would add clarity to the existing text. It is generally perceived that this section is to reduce the use of extension cords in residences. The prohibition of switching required receptacles would further assure this reduction.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-190.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-190.

2-190 Log #3324 NEC-P02 **Final Action: Accept in Principle**
(210.52)

TCC Action: It was the action of the Technical Correlating Committee that consideration be given to using a list format as recommended in 2.1.5.1, 3.3.1.2, and 3.3.2 of the NEC Style Manual.

This action will be considered by the Panel as a Public Comment.

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Revise the second sentence to read as follows:

The receptacles required by this section shall be in addition to any receptacle that is part of a luminaire (lighting fixture) or appliance, <u>or that is controlled by a wall switch in accordance with 210.70(A)(1) Exception No. 1, or that is</u> located within cabinets or cupboards, or <u>that is</u> located over 1.7 m (5½ feet) above the floor.

Substantiation: When both halves of a duplex receptacle are switched together, the common result is to simply leave the switch permanently in the closed position. Note that the word "outlets" was removed from the NEC text in order to clarify that a split receptacle, with two receptacles in one outlet (See Article 100 definition of a receptacle, etc.), can be used.

If the room is laid out such that a load that should remain energized, such as an alarm clock, happens to be near a receptacle outlet that is entirely under the control of a snap switch, then the switch will either be left in the "ON" position [defeating the purpose of 210.70(A)(1)], or (perhaps more likely) an extension cord will be run across a traveled area from a receptacle not controlled by the switch, defeating the purpose of 210.52(A). Surely when the result of current wording routinely results in the effective cancellation of provisions within the same article, it is time to reexamine the language.

Panel Meeting Action: Accept in Principle

Revise the second sentence in 210.52 to read:

The r eceptacle s ~~outlets~~ required by this section shall be in addition to any receptacle that is part of a luminaire (lighting fixture) or appliance, or is controlled by a wall switch in accordance with 210.70(A)(1) Exception No. 1, or is located within cabinets or cupboards, or is located more than 1.7 m (5½ ft) above the floor.

Panel Statement: The changes made by the panel provide additional clarity and address the submitter's concerns.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: The proposed change, developed by the Panel, referring to Section 210.70(A)(1) Exception #1, should not be accepted. The other modifications to this Section of deleting the word "outlets" is correct in the application of the NEC and should be accepted. The intent of Section 210.70 (A)(1) is to provide "switch-controlled lighting" for habitable rooms. The Exception to this rule is to allow a design feature of a switched receptacle to be used in lieu of a switched lighting outlet in the ceiling or wall. It is a matter of design. There is no basis, nor was any supporting documentation presented, the support the Submitter's belief that it is a "common" practice to "leave the switch" controlling a duplex outlet "permanently in the closed position." Nor is there any substantiation to support the "switch will either be left in the "ON" position [defeating the purpose of Section 210.70(A)(1), or (perhaps more likely) an extension cord will be run across a traveled area from a receptacle not controlled by the switch." The receptacle required by Section 210.70(A)(1) is a receptacle that could be easily be used for a lighting fixture for the room whether or not the receptacle is switched. This design feature of convenience should not be penalized as a basis to require additional general lighting wall receptacles.

2-191 Log #3371 NEC-P02 **Final Action: Reject**
(210.52, FPN (New))

Submitter: Jared DeWitte, MSU

Recommendation: Add new FPN to read:

FPN: All measurements required by Article 210.52 are to be made to the center of the device.

Substantiation: Numerous measurements are required in this Article, but no where in the article does it tell measure to what.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree that the addition of the new FPN improves clarity, as other uniform points of measurement will also meet the requirements.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-192 Log #1399 NEC-P02 **Final Action: Reject**
(Figure 210.52)

Submitter: George Stolz, II, Pierce, CO

Recommendation: Delete the text from the upper left corner representing the area requiring outlets behind a sink or range in a corner from Figure 210.52: Outlets not required ~~if X < 450 mm (18 in.)~~ .

Substantiation: This figure is a good addition to the 2005. However, in practice, when a kitchen sink is placed in the corner of a kitchen, it is frequently flanked by windows. Just as frequently, the corner of the space lies just outside of 18 in. from the sink. This places an undue burden on the installer to not compromise the structure by cutting a receptacle outlet into load bearing corners or bearing studs surrounding windows.

In addition, the receptacle required is usually not readily accessible to most medium-height adults; a typical countertop is around 36 in. tall, and 24 in. deep. In the corners, this distance can increase dramatically, precluding the likelihood that such a receptacle outlet would ever be used for small appliances with 2 ft cords, behind a sink. I am 6 ft 1 in., and I nearly have to get on the counter to touch kitchen corners that barely fall under this requirement.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel disagrees with the submitter and notes that a corner mounted sink that has countertop exceeding the 450mm (18") dimension does create a usable counter space.

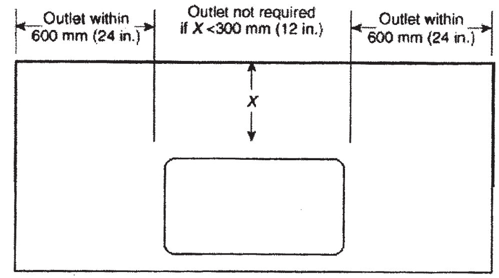
Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

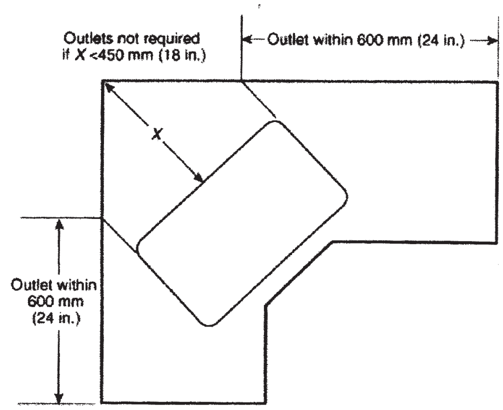
2-193 Log #1463 NEC-P02 **Final Action: Reject**
(Figure 210.52)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise Figure 210.52 as shown:



Sink or range mounted in counter



Sink or range mounted in corner

Substantiation: Having this apply only when the sink or range extends beyond the front of the countertop is not substantiated. When does it apply? When the sink extends 12 in. from the face of the counter? When it extends 1/2 in. from the face of the counter? Accepting this proposal will assist in the uniform interpretation of the code.

Panel Meeting Action: Reject

Panel Statement: Figure 210.52 is applicable to sinks or ranges mounted in wall counter spaces. The submitter's concern is already addressed in 210.52(C)(1). The part of Figure 210.52 referenced applies to a sink or range extending from the counter face.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-195 Log #397 NEC-P02 **Final Action: Reject**
(210.52(A))

Submitter: Bradly Shoaf, Davidson County Community College

Recommendation: Revise text to read as follows:

General Provisions states that, in every kitchen, family room, dining room, living room, parlor, library, den and foyers and unoccupied wall space of laundry room, or similar room or areas of dwelling units, receptacles outlets shall be installed according to 210.52(A).

Substantiation: Convenience receptacles will be required for these areas of dwelling units. With the addition of these areas 210.52(A) will reduce the possibilities of a homeowner running a extension cord under a rug and through the foyer room. All receptacles should be placed in as easily accessible location.

Panel Meeting Action: Reject

Panel Statement: The submitter's concern about the receptacle outlet requirements in foyer areas is already addressed in 210.52(H). The submitter has not substantiated the requirement to add additional receptacles in the laundry space.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: This proposal should have been accepted in part. The submitter's recommendation to require receptacles to be installed in foyers in accordance with section 210.52(A) is warranted. I disagree with the panel statement where it states that the submitter's concerns are addressed in 210.52(H). There are many foyers that are comprised of separate wall spaces that are divided by doors and open entryways to adjacent rooms. These separate wall spaces in many cases are 2 or more feet in width. The dimensions of these foyers in any one direction may not be 10 or more feet in length, thus making the provisions of 210.52(H) not applicable. With this scenario it is possible to have separate wall spaces that are large enough in width to require a receptacle(s) to be installed under the provisions of section 210.52(A). The absence of a requirement for receptacle outlets in these locations would require the use of extension cords to supply power to lamps or other utilization equipment that may be used at these wall spaces as is indicated in the submitter's substantiation. This would greatly increase the risk of fire due to arcing faults from damaged cords placed across doorways end entryways to provide power to these wall spaces. Requiring foyers to comply with 210.52(A) is warranted and should be given further consideration by Panel 2.

2-196 Log #390 NEC-P02 **Final Action: Reject**
(210.52(A)(1))

Submitter: Antonio Rubin, DCCC student
Recommendation: Add sentence to the end of 210.52(1).

210.52 Dwelling Unit Receptacle Outlets.

(A) General Provisions. In every kitchen, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provision specified in 210.52(A)(1) through (A)(3).

(1) Spacing. Receptacles shall be installed so that no point measured horizontally along the floor line in any wall space is more than 1.8 m (6 ft) from a receptacle outlet. Layout of receptacle outlets shall be readily accessible after placement of furniture.

Substantiation: It is my belief that it would be of great convenience to have an outlet readily accessible for the odds and in. Having outlet receptacles accessible after furniture layout is necessary to keep from running an extension cord under a rug, throw rug, and/or maybe daybed etc. Any rubbing of the cord could lead to rupturing which will cause a spark, next comes fire. This causes you to use the cord to do everyday activities such as vacuum cleaner, ironing clothes, and curling irons for women, electrical shaver for men. I live in a house that was built in the 1950's which causes me to have my bed to be positioned on one side of the room and use an extension cord under my bed and behind a chest for the TV, DVD, Play Station 2, and also a lamp. On service calls electrician(s) can always find the outlet behind a bed, nightstand, china cabinet or another piece of furniture. This is why I recommend putting one opposite of the door hinge or straight down from the light switch within 24 in. of the door.

210.60(B) Receptacle Placement. In applying the provision of 210.52(A), the total number of receptacle outlets shall not be less than the minimum number of that section. "These receptacle outlets shall be permitted to be located conveniently for permanent furniture layout. At least two receptacle outlets shall be readily accessible." Where receptacles are installed behind the bed, the receptacle shall be located to prevent the bed from contacting any attachment plug that may be installed or the receptacle shall be provided with a suitable guard.

Panel Meeting Action: Reject
Panel Statement: The spacing requirements in 210.52(A)(1) provide for the placement of an adequate number of receptacles in lieu of the use of extension cords. Layout of receptacles to coordinate with furniture locations is impractical and could lessen the present requirements.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-197 Log #1977 NEC-P02 **Final Action: Reject**
(210.52(A)(1))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Add new text to read as shown:

210.52(A)(1) Spacing. Receptacles shall be installed so that no point measured horizontally along the floor line in any wall space is more than ~~1.8 m (6 ft)~~ 0.9 m (3 ft) from a receptacle outlet.

Substantiation: Electrical cord fires are one of the leading causes of residential fires in the United States. According to the 1998 Residential Fire Loss Estimates published by the United States Consumer Product Safety Commission (CPSC), during the five-year period between 1994-1998 there were 27,400 fires associated with electrical cords that required response by the fire service. These fires resulted in 350 deaths and 1,680 injuries. Extension cords were responsible for over half of these incidents. CPSC estimates that about 3,300 residential fires originate in extension cords each year, killing 50 people and injuring 270 others.

Recent CPSC statistics indicate that there are over 4,000 injuries associated with electrical extension cords that result in treatment in hospital emergency rooms annually. Half the injuries involve fractures, lacerations, contusions or sprains from people tripping over extension cords. Thirteen percent of the injuries involve children under the age of 5.

Although there has been a significant increase in the number of cord connected household electrical products used in dwellings, there has been no corresponding change in the NEC that addresses the need for the additional receptacle outlets that are necessary to accommodate the use of these products by the homeowner. Since 1956, the receptacle spacing requirements in 210.52(A)(1), and the resultant number of receptacles installed, has remained unchanged.

The lack of a sufficient number of available receptacle outlets leads the homeowner to use extension cords. The NEC has long recognized the hazards presented by the use of extension cords, especially where extension cords are used in place of permanent wiring. With the proliferation of cord connected home use electrical products such as room air conditioners, dehumidifiers, humidifiers, air purifiers, cordless phones, home entertainment systems, computer equipment, electronic games, multiple TVs, appliances, etc., it is evident that the number of receptacles required 50 years ago is no longer adequate for today's home. Reducing the spacing between receptacles as recommended in this proposal will help ensure that there are an adequate number of receptacles available for connection of the large number of cord connected appliances now being used in the typical dwelling.

Previous editions of the NEC Handbook (e.g., 1981) stated, "Receptacles are to be located so that no point in any wall space is more than 6 ft from a receptacle. This rule intends that an appliance or lamp with a flexible cord attached may be placed anywhere in the room and be within 6 ft of a receptacle, thus eliminating the need for extension cords." Since most cord connected equipment will have 6 ft cords, based on the UL standards requirements for these products, it is still true that the receptacle spacing requirements now in the NEC will allow the cord on any single product to reach a receptacle from any point along the wall without the use of extension cords. However, this requirement did not anticipate the extraordinary increase in the availability and use of cord connected electrical equipment in the home. Due to the large number of cord connected products that may be used in any room of a home, all available receptacles within reach of a cord can easily be in use. This results in the homeowner using extension cords to reach other unused, available receptacles. The increased use of cord connected equipment results in the same condition that the 6 ft spacing rule was intended to prevent. Reducing the required spacing will have the effect of making more receptacles available for the increased number of cord connected products now used in homes.

Panel Meeting Action: Reject
Panel Statement: The spacing requirements of 210.52(A)(1), as noted by the submitter, allow for appliances or lamps with standard lengths of flexible cord to be within 6' of a receptacle outlet. Decreasing the spacing requirements for receptacle outlets is not practical when addressing the unknown application of cord connected equipment and should be a design consideration. The panel is looking for specific documentation from the field that the current spacing requirement is inadequate.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:

KING, D.: The submitter of this proposal has provided adequate substantiation to support this change. There is a significant increase in the number of electrical appliances used in dwelling units today resulting in an increased use in extension cords to accommodate the homeowner's needs. There are also many listed appliances available today that have cord lengths that are less than 6 feet. The purpose of this section is to eliminate the use of extension cords in dwelling units, thus reducing the risk of fires. Further consideration should be given to this proposal.

PAULEY, J.: NEMA recognizes that the panel was not in support of reducing the receptacle spacing to 3 ft coverage of wall space. However, the discussions of the panel did reveal that since the inception of the 6 ft rule, the product standards have changed to allow a minimum cord length of 5 ft of many appliances (e.g. table lamps). Given this reduction, it is prudent for the panel to consider reducing wall space coverage for a single receptacle from six feet down to four or five feet. This issue should be revisited in the comment stage so that the code requirements are consistent with the requirements on cord length.

2-198 Log #1976 NEC-P02 **Final Action: Reject**
(210.52(A)(4) (New))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Add new text to read as shown:

(4) Large Area Rooms. A floor receptacle outlet shall be installed at least 450 mm (18 in.) from the wall in rooms other than basements, kitchens, bathrooms, hallways, and swimming pool rooms that are 60 m^2 (625 ft^2) in area or greater. A floor receptacle outlet shall be installed for each 60 m^2 (625 ft^2) in area in a room.

Substantiation: The purpose of this new section is to eliminate the use of extension cords in large family rooms, great rooms, bedrooms and living rooms. Damaged extension cords are a cause for shock and fire. Furniture and lights are placed in the middle of these rooms away from any wall receptacles. Requiring provision for receptacles to be installed in listed floor boxes will eliminate the need for extension cords. The proposed language is written so that there is flexibility in where to locate the floor receptacle(s).

Electrical cord fires are one of the leading causes of residential fires in the United States. According to the 1998 Residential Fire Loss Estimates published by the United States Consumer Product Safety Commission (CPSC), during the five-year period between 1994-1998 there were 27,400 fires associated with electrical cords that required response by the fire service. These fires resulted in 350 deaths and 1,680 injuries. Extension cords were responsible for over half of these incidents. CPSC estimates that about 3,300 residential fires originate in extension cords each year, killing 50 people and injuring 270 others.

Recent CPSC statistics indicate that there are over 4,000 injuries associated with electrical extension cords that result in treatment in hospital emergency rooms annually. Half the injuries involve fractures, lacerations, contusions or sprains from people tripping over extension cords. Thirteen percent of the injuries involve children under the age of 5.

Although there has been a significant increase in the number of cord connected household electrical products used in dwellings, there has been no corresponding change in the NEC that addresses the need for the additional receptacle outlets that are necessary to accommodate the use of these products by the homeowner. Since 1956, the receptacle spacing requirements in 210.52(A)(1), and the resultant number of receptacles installed, has remained unchanged.

The lack of a sufficient number of available receptacle outlets leads the homeowner to use extension cords. The NEC has long recognized the hazards presented by the use of extension cords, especially where extension cords are used in place of permanent wiring. With the proliferation of cord connected home use electrical products such as room air conditioners, dehumidifiers, humidifiers, air purifiers, cordless phones, home entertainment systems, computer equipment, electronic games, multiple TVs, appliances, etc., it is evident that the number of receptacles required 50 years ago is no longer adequate for today's home. The addition of floor receptacles as recommended in this proposal will help ensure that there are an adequate number of receptacles available for connection of the large number of cord connected appliances now being used in the typical dwelling.

Previous editions of the NEC Handbook (e.g., 1981) stated, "Receptacles are to be located so that no point in any wall space is more than 6 ft from a receptacle. This rule intends that an appliance or lamp with a flexible cord attached may be placed anywhere in the room and be within 6 ft of a receptacle, thus eliminating the need for extension cords." Since most cord connected equipment will have 6 ft cords, based on the UL standards requirements for these products, it is still true that the receptacle spacing requirements now in the NEC will allow the cord on any single product to reach a receptacle from any point along the wall without the use of extension cords. However, this requirement did not anticipate the use of cord connected electrical equipment used in large rooms where the furniture is placed in the middle. The addition of floor receptacles will allow lamps and other electrical appliances to be used in the center of large rooms without the use of extension cords.

The use of additional listed floor boxes would require an increase in labor and cost, but these costs would be offset by the increased degree of safety and the reduction in the probability of a fire.

Panel Meeting Action: Reject

Panel Statement: The addition of a floor receptacle at least 450mm (18") from a wall for each 625 sq. ft. of room area in large area rooms would not be practical considering that they would be in close proximity to already required wall receptacle outlets and would promote the use of extension cords in these areas.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

KING, D.: I concur with Mr. Weber's explanation of negative vote for this proposal. The absence of a requirement for receptacle outlets in large area rooms would promote the use of extension cords which would greatly increase the hazard of fire or electrical shock. The submitter of this proposal has provided the panel with adequate substantiation on the hazards associated with the use of cords in dwelling units. Panel 2 should give further consideration to this proposal.

WEBER, R.: I believe that the panel should have accepted this proposal in Principle and addressed the need for electrical receptacles in large open room areas. Since a floor receptacle installed within 450 mm (18 in.) of a wall per 210.52(A)(3) is considered as acceptable as a required wall outlet, the submitter in his proposal should have identified a greater dimension from the walls for his indicated location for a receptacle. The fact remains that when large rooms are encountered there is presently no additional receptacle requirement other than those along the wall space. The concept of requiring a floor receptacle for each 625 sq. ft. of room area or a second receptacle for that space beyond that size is valid. If they are not made available the use of extension cords will be provided to meet the occupants need. Many of these large rooms will have furniture locations away from the walls and will have lamps, electrical appliances or other electrical needs that are presently being met by the use of cord. Cords run under carpet or placed under rugs become damaged without the occupants knowledge, thus creating a potential fire or shock hazard. With the requirement for other than wall receptacles in large rooms, a mandatory floor receptacle would help alleviate some of the potential problems.

2-199 Log #1708 NEC-P02 **Final Action: Reject**
(210.52(B)(1) Exception No. 2)

Submitter: Danny Thomas, Henderson, NC

Recommendation: Add text to read as follows:

Exception No. 2: Receptacle outlet(s) installed to serve refrigeration equipment or any equipment that is installed within kitchen cabinets shall be permitted to be supplied from an individual branch circuit rated 15 amps or greater.

Substantiation: This would allow microwaves, disposal motors, trash compactors, and perhaps even some dishwashers to be supplied from a 15 amp circuit rather than having to install a 20 amp circuit for them which increases the cost of a new home, just because it is located in the rooms specified in 210.52(B)(1).

Panel Meeting Action: Reject

Panel Statement: The current requirement for kitchens is that receptacles that serve refrigeration equipment and serve the countertop must be on the 20 ampere small appliance branch circuits. The small appliance branch circuits are not permitted to supply dishwashers, trash compactors or disposals because these outlets do not serve the countertop.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: It should be noted that Section 210.52(B)(1) Exception #3 already allows the receptacle outlet for refrigeration equipment to be on an individual branch circuit of 15 amperes or greater. I see no reason to limit individual circuits for these types of permanently installed appliances, such as the disposer and dishwasher, that would not require a circuit rated greater than 15 amperes. I believe the Panel Statement is somewhat misleading in its assertion that Section 210.52(B)(1) and the proposed text relate only to the countertop receptacles that are covered in Section 210.52(B)(3) and 210.52(C). In other words, I do not believe the Panel Statement is a good response to the Submitter's Substantiation. If the Panel believes these appliances are already allowed to be on a circuit(s) that do not supply the receptacles as outlined in Section 210.52(B)(1) it should be acknowledged.

2-200 Log #1404 NEC-P02 **Final Action: Reject**
(210.52(B)(1))

Submitter: George Stolz, II, Pierce, CO

Recommendation: Revise text to read:

210.52(B)(1) Receptacle Outlets Served. In the kitchen, pantry, breakfast room, dining room, or similar area of a dwelling unit, the two or more branch circuits required by 210.11(C)(1) shall serve all wall, ~~and~~ floor, ~~receptacle outlets covered by 210.52(A), all~~ and countertop outlets, ~~covered by 210.52(C),~~ and receptacle outlets for refrigeration equipment.

Exception No. 1: In addition to the required receptacles specified by 210.52, switched receptacles supplied from ~~a general purpose branch circuit as defined in 210.70(A)(1), Exception No. 1,~~ another circuit for lighting purposes shall be permitted.

Substantiation: The numerous references to other sections do not contribute to the effectiveness of this section, so omitting them will add clarity while not changing the substance of this section.

210.70(A)(1), Exception No. 1 states that "in other than kitchens and bathrooms one or more receptacles controlled by a wall switch shall be permitted in lieu of lighting outlets." There is no evident reason why small appliance branch circuits cannot perform this function, as most cord-and-plug connected lamps do not constitute a large enough load to compromise the primary function of these circuits. As a minimum standard, permitting the small appliance circuit to perform this function would be preferable to installing a 15-ampere receptacle beside a 20-ampere receptacle, inviting a small appliance load to be connected to the 15-ampere circuit.

In addition, the last statement in 210.52(B)(1), Exception No. 1, is not literally correct, as no general purpose branch circuit is defined in 210.70(A)(1), Exception No. 1.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree that deletion of the references will add more clarity. Exception No. 1 allowing for the switched receptacles is permitted but not required.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-201 Log #2222 NEC-P02 **Final Action: Reject**
(210.52(B)(1))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
(B) Small Appliances.
(1) Receptacle outlets served in the kitchen, pantry, breakfast room, dining room, or similar area of a dwelling unit, the two or more 20-ampere small-appliance branch circuits required by 210.11(C)(1) shall serve all wall and floor receptacle outlets ~~covered by 210.52(A)~~ , all countertop outlets ~~covered by 210.52(C)~~ , and receptacle outlets for refrigeration equipment.
Substantiation: Under the 2005 code wording, if receptacles in addition to those that are required by 210.52(A) or (C), these additional receptacles are not required to be supplied by the two or more 20 ampere small appliance branch circuits. This proposed change will require all installed receptacles in these areas to be supplied by the small appliance branch circuits.
Panel Meeting Action: Reject
Panel Statement: The panel added the references to make it clear as to what receptacles had to be on the small appliance branch circuit. The use of the term "covered" in the text was very specifically chosen instead of "required" to avoid the exact issue raised by the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-202 Log #1300 NEC-P02 **Final Action: Reject**
(210.52(B)(2))

Submitter: Joseph Whitt, JW Electric
Recommendation: Revise text to read:
No Other Outlets. The two or more small-appliance branch circuits specified in 210.52(B)(1) shall ~~have no other outlets~~ <u>supply only the required receptacle outlets specified in 210.52(B)(1) and supply no other receptacle outlet, appliance outlet or luminaries (lighting fixtures) outlined in 410.1</u> .
Substantiation: As worded, a duplex receptacle above a countertop for the small appliances could be used to supply a permanently installed cord and plug connected under cabinet area luminary leaving one receptacle to fulfill the small appliance receptacle requirement.
Refer to the definition of lighting outlet, "Lighting Outlet. An outlet intended for the (direct connection) of a lamp holder...".
The words "direct connection" in the definition of alighting outlet lends to the belief that a cord and plug connected luminary would not constitute a lighting outlet, therefore, an under cabinet luminary plugged into the small appliance receptacle would not violate 210.52(B).
This will lead to the use of outlet multipliers, plug strips and extension cords that could have sixteen gauge conductors.
As an instructor of inspector classes in the state of North Carolina, I see those inspectors coming through my classes are split about fifty/fifty on this issue. This issue needs clarity.
Panel Meeting Action: Reject
Panel Statement: The definition of "outlet" in Article 100 is a point on the wiring system where current is taken to supply utilization equipment and includes all of the equipment types noted in the recommendation. A luminaire that can be plugged into a countertop outlet is not prohibited on the small appliance branch circuit.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-203 Log #1391 NEC-P02 **Final Action: Reject**
(210.52(B)(2) Exception No. 3 (New))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Add an Exception to (B)(2) to read:
Exception No. 3: Receptacles installed on an island or peninsula to serve other areas in compliance with the requirements of 210.52(A)(1) and (2) shall be permitted on the same small appliance branch circuit(s) installed to comply with 210.52(C)(2) or (3).
Substantiation: Islands and peninsulas that are adjacent to living areas not covered under the provisions of 210.52(B) sometimes require an installation of a 15 or 20 amp receptacle to conform with 210.52(A)(2)(3). There is the risk of a "living room" outlet that is not required to be GFCI protected being installed in a location where GFI protection is required on the 20 amp circuit installed per 210.52(C)(2) or (3).
In addition, given that the use of said receptacles is remote, it should be acceptable to allow a receptacle that is on an island to serve an adjacent "living room." It doesn't seem to constitute a high potential for load, and is generally installed for code's sake, not because a true need is perceived by the installer or AHJ.
Panel Meeting Action: Reject
Panel Statement: The receptacles in the adjacent room should not be permitted on the small appliance branch circuit. Some of the arrangements encountered would fit well into the submitter's concept, but others may indeed place a burden on the small appliance branch circuit. Given the wide and varying types of construction, it is prudent to keep the receptacles delineated between the two rooms.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-204 Log #594 NEC-P02 **Final Action: Reject**
(210.52(C))

Submitter: Michael P. O'Quinn, MOGO Enterprises, Inc.
Recommendation: Revise text to read as follows:
(C) Countertops. In kitchens and dining rooms of dwelling units, receptacle outlets for counter spaces shall be installed in accordance with 210.52(C)(1) through (C)(5).
(1) Wall Counter Spaces. A receptacle outlet shall be installed at each wall counter space that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.
<u>Where a rangetop or sink is installed in the countertop, the rangetop or sink is considered to divide the countertop into separate countertop spaces as defined in 210.52(C)(4).</u>
~~Exception: Receptacle outlets shall not be required on a wall directly behind a range or sink in the installation described in Figure 210.52.~~
~~Figure 210.52 Determination of Area Behind Sink or Range.~~
(2) Island Counter Spaces. At least one receptacle shall be installed at each island counter space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. Where a rangetop or sink is installed in an island ~~counter and the width of the counter behind the rangetop or sink is less than 300 mm (12 in.)~~ , the rangetop or sink is considered to divide the island into two separate countertop spaces as defined in 210.52(C)(4).
(3) Peninsular Counter Spaces. At least one receptacle outlet shall be installed at each peninsular counter space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. A peninsular countertop is measured from the connecting edge.
(4) Separate Spaces. Countertop spaces separated by rangetops, refrigerators, or sinks shall be considered as separate countertop spaces in applying the requirements of 210.52(C)(1), (C)(2), and (C)(3).
(5) Receptacle Outlet Location. Receptacle outlets shall be located above, but not more than 500 mm (20 in.) above, the countertop. Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, ~~or~~ rangetops ~~as covered in 210.52(C)(1), Exception~~ , or appliances occupying dedicated space shall not be considered as these required outlets.
Exception to (5): To comply with the conditions specified in (1) or (2), receptacle outlets shall be permitted to be mounted not more than 300 mm (12 in.) below the countertop. Receptacles mounted below a countertop in accordance with this exception shall not be located where the countertop extends more than 150 mm (6 in.) beyond its support base.
(1) Construction for the physically impaired
(2) On island and peninsular countertops where the countertop is flat across its entire surface (no backsplashes, dividers, etc.) and there are no means to mount a receptacle within 500 mm (20 in.) above the countertop, such as an overhead cabinet.
Substantiation: While the change in 210.52(C) in the NEC2005 appears to cover some new kitchen designs, the requirement of receptacles on the wall behind a sink or rangetop with a distance at or greater than 12" or 18" would allow cords installed in these receptacles to run across the sink or rangetop, causing a possible dangerous situation.
By eliminating references to 210.52(C) Exception, the mandating of the receptacle behind the sink or rangetop is eliminated. 210.52(C)(5) would allow the installation of receptacles behind sinks and countertops, but would require proof to the AHJ that any installed appliance cord would not cause a shock or fire hazard.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the submitter and notes that the current rule requires that the space be included in the measurements, since if it exceeds the dimensions shown, it becomes usable space. The panel notes that the text doesn't "mandate" that a receptacle be installed in that space, but it does require that the space be used as part of the wall measurement.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-205 Log #835 NEC-P02 **Final Action: Reject**
(210.52(C))

Submitter: Eugene Swisher, City of Tampa / Rep. IBEW Local 915, IAEI Southcoast Division
Recommendation: Revise text to read as follows:
Countertops. In kitchens ~~and~~ , dining rooms <u>, breakfast rooms, pantry or similar areas,</u> of dwelling units, receptacle outlets for counter spaces shall be installed in accordance with 210.52(C)(1) through (5).
Substantiation: 210.52(B)(1) requires the 20 amp small appliance branch circuits to serve in the receptacles in these areas. The new text would recognize the fact that counter spaces in pantry and breakfast rooms also need properly spaced receptacles to eliminate the use of extension cords in these areas, just as in the kitchen and dining room.
Panel Meeting Action: Reject

Panel Statement: The panel does not agree that it is necessary to separately identify the additional proposed areas in the code. The panel notes that if a receptacle is installed for these counter tops they must be supplied from the small appliance branch circuits.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
KING, D.: This proposal should have been accepted. Countertop spaces installed in areas described in the submitter's substantiation are intended for the use of small appliances and should meet the requirements of 210.52(C)(1) through (5). The panel statement indicates that if receptacles were to be installed that they would be required to be supplied from the small appliance branch circuits. The additional language recommended by the submitter would ensure that the proper number of receptacles is installed to serve these countertop spaces.
WEBER, R.: The submitter has identified a problem area and it could be clarified by the acceptance of the proposed language or accepted in part. As is indicated in the Panel statement for the reject action proposed to be taken on the proposal is that presently it is implied that if a receptacle is installed for these countertop spaces, they must be supplied from the small appliance branch circuits. But is that understood by all of the code users? Does the proposed added language clear the issue up? Breakfast room countertops should be treated similarly to those in the kitchen area. Many times appliances are in service or are temporarily placed on breakfast room countertops that are not provided with receptacles and then cores are being utilized to provide an outlet for the needed use.

2-206 Log #2331 NEC-P02 **Final Action: Reject**
(210.52(C))

Submitter: Haddi Horri, U.S. Army Corps. of Engineers
Recommendation: My proposal and recommendation is to revise the wording in this statement to read as:
Outlet shall not be installed if X< 300 mm (12 in.) behind the countertop sink.
Substantiation: My name is Hadi Horri, an Electrical Engineer working for the US Army Corps of Engineers in Jacksonville District.
Recently, during one of my inspections at the project site, I observed a receptacle installed behind a sink faucet in the kitchen countertop.
I thought that it would be a Code violation but when I look into the Code 210.52(C), it states that "Outlet is not required if X< 300 mm (12 in.)". The wording in this statement is not enforceable and I couldn't direct the contractor to remove the receptacle based on the Code requirements to a new location.
At this time we decided to install a plan cover plate. To have a receptacle behind the countertops sink is not practical and it is dangerous because of water splashing on it.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel does not intend that a receptacle outlet be prohibited from being located in space behind a sink. The installation of a receptacle in this space is a convenience issue when Figure 210.52 is applicable. Figure 210.52 is intended to identify when the space behind a sink or range is not required to be included in determining the receptacle spacing.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Locating a receptacle behind a sink or countertop cooking unit may be a design consideration for the convenience of the end user. It may be possible the receptacle is for some type of kitchen equipment to be used in the sink (glass scrubber) or on the stove. If a window is located behind the sink or stove the receptacle could be used for decorative lighting. There is no more the possibility of water splashing on this receptacle that a receptacle located directly adjacent to the sink. Section 210.5(C)(1) requires a receptacle within the first 24 inches from a sink. There is no provision that the receptacle be located exactly 24 inches from the sink. In addition, these receptacles are required to have ground-fault protection.

2-206a Log #CP201 NEC-P02 **Final Action: Accept**
(Figure 210.52)

Submitter: Code-Making Panel 2,
Recommendation: Revise Figure 210.52 as follows:
In both diagrams, change the words "Outlet(s) not required" to "Space exempt from wall line measurement"
In both diagrams, change the caption on both diagrams from "Sink or Range" to "Sink, Range, or Counter-Mounted Cooking Unit".
Substantiation: The panel has revised the diagram to make it clear that the space in question is exempt from the wall line measurements if the dimension between the sink and wall are as shown in the drawings. The figure caption has been revised to "Determination of Area Behind a Sink, Range, or Counter-Mounted Cooking unit" to be consistent with the terms defined in Article 100.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-207 Log #3382 NEC-P02 **Final Action: Accept in Principle**
(210.52(C))

TCC Action: The Technical Correlating Committee directs that the Panel Action on this Proposal be correlated with Figure 210.52 by changing the title of the Figure to "Figure 210.52(C)(1)" to comply with 2.3.1 of the NEC Style Manual, and change the Table titles from "Sink or range…" to "Range, counter-mounted cooking unit or sink…" to correlate with Panel Actions on this Proposal and Proposals 2-211 and 2-218.
The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as to the placement of the proposed text within 210.52(C).
This action will be considered by the Panel as a Public Comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the last sentence of 210.52(C)(2); add the following sentences to the parent language in 210.52(C);
Where a rangetop or sink is installed in an island or peninsular countertop and the width of the counter behind the rangetop or sink is less than 300 mm (12 in.), the rangetop or sink is considered to divide the countertop space into two separate countertop spaces as defined in 210.52(C)(4). Each separate countertop space shall comply with the applicable requirements in 210.52(C).
Substantiation: This proposal corrects an oversight. If a sink divides an island countertop, the result is two islands. If the same sink divides a peninsular countertop identical in size to the island, the result is still a peninsula with the resulting "island" not covered by any receptacle placement rule unless it is large enough to invoke 210.52(A), and even here there is no requirement to require a receptacle to serve the countertop. The wording in the proposal moves the requirement so it covers both peninsulas and islands on an even basis.
Panel Meeting Action: Accept in Principle
In the three occurrences in the recommendation, change "rangetop or" to "range, counter-mounted cooking unit or".
Panel Statement: The panel accepts the submitter's recommendation, but has replaced "rangetop" with "range, counter-mounted cooking unit " to be consistent with the terms defined in Article 100.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-208 Log #2824 NEC-P02 **Final Action: Reject**
(210.52(C)(1))

Submitter: Gary Boughton, Town of Bethel Building Deparment
Recommendation: 210.52(C)(1) Wall Counter Spaces. Second sentence insert after the word no to read:
Receptacle outlets shall be installed so that no horizontal counter space length is located more than 24 in. from a receptacle .
Substantiation: As now written you are penalized for having a wall or cabinet at the end of a counter top space. A 24 in. by 24 in. with a wall or cabinet at two adjacent sides will require 2 receptacles where a wall or cabinet is on only one wall only one would be required. Why is this extra receptacle outlet required, where is the extra hazard. These receptacles are to serve the counter not the wall space.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The submitters language would eliminate the measuring of the space for receptacles around the corner of a countertop as is required in a standard kitchen layout.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-209 Log #3225 NEC-P02 **Final Action: Reject**
(210.52(C)(1))

Submitter: Erik Goulish, Burton, MI
Recommendation: Delete the following text:
~~Exception: Receptacle outlet shall not be required on a wall directly behind a range or sink in the installation description in Figure 210.52~~
Substantiation: The distance behind sinks and ranges are too great of a distance to safely use the outlet with out risk of personal injury. To reach over a hot stove or a sink that should be grounded and contain water is a personal hazard.
Panel Meeting Action: Reject
Panel Statement: Under certain conditions this is usable counter space. See panel statement on Proposal 2-206 for how the space is utilized.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-206.

2-210 Log #2635 NEC-P02 **Final Action: Reject**
(210.52(C)(1) and 210.52(C)(4))

Submitter: David Hansen, Simi Valley, CA
Recommendation: Add an Exception to read:
Exception:
(c) Receptacle outlets adjacent to kitchen sinks shall not be installed closer than (600 mm) 24 in., and no further than (900 mm) 36 in. measured horizontally along a wall counter space. Additional receptacle outlets shall be installed in accordance with 210.52(C)(1) and 210.52(C)(4).
Substantiation: 1) With small appliance attachment plugs and flexible cords measuring approximately 24 in. in length, the installation of a receptacle outlet closer than 24 in. to a sink allows for the possibility of accidental submersion of the appliance. Physical damage to the attachment plug and flexible cord, as well as the receptacle outlet could also occur if the appliance were to fall from the counter top into the sink. By allowing proposed "210.52(C), Exception (c)", the installation of the receptacle outlets no closer than (600 mm) 24 in. and no further than (900 mm) 36 in. from the sink, the possibility of submersion would be greatly reduced and would still allow the close proximity to the sink.
2) With the more advanced architectural design of today, windows adjacent to kitchen sinks are becoming larger, without vertical surfaces adjacent to, and behind sinks to place receptacle outlets, and the increased structural support required to accommodate the larger openings makes compliance in accordance with 210.52(C)(1) and 210.52(C)(4) more difficult. By allowing proposed "210.52(C), Exception (c)", the required receptacle outlets adjacent to the sink may be placed no closer than (600 mm) 24 in. and no further than (900 mm) 36 in. measured horizontally along the wall counter space. This will allow the receptacle outlets to be placed and/or located more easily, conveniently, and safely in accordance with 210.52(C)(1) and 210.52(C)(4).
In summary, by allowing proposed "210.52(C), Exception (c)" to be adopted, the risk of harm to person and property would be reduced, and it would give greater latitude in design, both architecturally and structurally.
Panel Meeting Action: Reject
Panel Statement: The submitter has not substantiated the claims that receptacles located closer than 24" to a sink are being misused and pose a hazard. The panel notes that the submitters wording also creates a conflict with the basic rule, by allowing the receptacle to be up to 36" away, when the basic rules require a receptacle be within 24" of the counter space.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-206.

2-211 Log #2151 NEC-P02 **Final Action: Accept in Principle**
(210.52(C)(1) Exception)

Submitter: Lawrence Seekon, Coon Rapids, MN
Recommendation: Revise text to read:
210.52(C)(1) Exception: Receptacle outlets shall not be required on a wall directly behind a range, cooktop or sink in the installation described in Figure 210.52.
Substantiation: The exception should also apply to a cooktop. My dictionary defines a range as having burners on the top surface and one or two ovens. Therefore the current wording would not apply to a cooktop.
Panel Meeting Action: Accept in Principle
Revise the recommended text to read:
Exception: Receptacle outlets shall not be required on a wall directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52.
Panel Statement: The panel revised the recommended text to be consistent with Article 100.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BECKER, R.: I agree with the comments expressed in Mr. Nenninger's explanation of negative vote.

2-212 Log #3046 NEC-P02 **Final Action: Reject**
(210.52(C)(1) Exception)

Submitter: Randy Anderson, Nebraska State Electrical Division
Recommendation: Revise text to read as follows:
Exception: Receptacle outlets shall not be required on a wall directly behind a range or sink, however, they shall be allowed where the distance is greater than that listed in the installation described in Figure 210.52
Substantiation: The current code as it is written, requires a receptacle behind a range or sink if the distance is greater than that listed in Figure 210.52. This requirement creates a great safety hazard, as cords could come in contact with hot surfaces. I feel it should be allowed, to serve equipment in the area, but not required.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree with the submitter's substantiation and notes that this space is usable counter space where it is equal to or greater than the "X" dimension shown in Figure 210.52.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-213 Log #1701 NEC-P02 **Final Action: Reject**
(210.52(C)(1) Exception and Figure 210.52)

Submitter: Charles M. Trout, Maron Electric Company
Recommendation: Delete Figure 210.52 in its entirety and revise the exception to read:
Exception: Receptacle outlets serving countertops shall not be installed directly behind a sink or counter mounted cooking top.
Substantiation: In the drawing shown in Figure 210.52 the shape of the countertops has been enhanced or enlarged. I have never seen standard countertops shaped in this manner. Most kitchen sinks (33 in. x 22 in.) are placed in 24 in. countertops with barely 1 in. behind the sink but with a back splash or wall where a receptacle could be placed since it is not prohibited. What is being called a range would be more accurately described as a cooking unit (see Article 100) and again would probably be installed in a standard 24 in. countertop. If installed in a corner, there would be less than 12 in. behind the cooking unit but with a back splash or wall where a receptacle outlet could be placed since it is not prohibited.
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 2-206.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-214 Log #1640 NEC-P02 **Final Action: Reject**
(210.52(C)(1) Exception & Figure 210.52)

Submitter: L. Keith Lofland, International Association of Electrical Inspectors
Recommendation: Revise text to read as follows:
210.52(C) Countertops In kitchens and dining rooms of dwelling units, receptacle outlets for counter spaces shall be installed in accordance with 210.52(C)(1) through (C)(5).
(1) Wall Counter Spaces. A receptacle outlet shall be installed at each wall counter space that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.
Exception: Receptacle outlets shall not be ~~required~~ permitted on a wall directly behind a range or sink ~~in~~ unless the installation meets the requirements described in Figure 210.52.
Change wording in Figure 210.52 to read: Outlets ~~not~~ required if X ~~<~~ ≥ 300mm (12 in.) and Outlets ~~not~~ required if X ~~<~~ ≥ 450mm (18 in.)
Substantiation: The diagram in Figure 210.52 pertaining to a straight countertop seems to represent a very small percentage of the dwelling unit kitchen countertops encountered by installers and inspectors. On the vast majority of countertops, there is typically only an inch or two behind the rangetop or sink. Permitting a receptacle outlet to be located directly behind the typical range or sink would subject any flexible cord from a small appliance to physical damage. Currently, inspectors are prohibiting a receptacle outlet behind a rangetop or sink by referencing 400.8(7) for uses not permitted for flexible cords and cables. This proposal would put language directly in 210.52 to prohibit such receptacle outlets from being installed directly behind ranges or sinks with very limited countertop space behind the range or sink.
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 2-206.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-215 Log #2728 NEC-P02 **Final Action: Reject**
(210.52(C)(1) Exception No. 2 (New))

Submitter: David Zinck, Newburyport Wiring Inspector
Recommendation: Change existing Exception to Exception No. 1: and add Exception No. 2.
Exception No. 2: Counter space where the access to the wall is prevented by cabinets or accessories shall not be counted as counter spaces.
Substantiation: It is becoming increasingly popular to have accessories such as fixed wine racks, drawer units, or custom cabinets fill in the nominal 18 in. between the counter top and the upper cabinets. These typically have a depth of about 12 in. so there is still a 13 in. deep counter top in front of them. There is no way to provide an outlet for these spaces. I have seen the width of these units 4 ft or greater although 2 ft -3 ft units are more common. This rule will make it unnecessary for an electrician to be looking to the wiring inspector for an exception.

Panel Meeting Action: Reject
Panel Statement: The panel disagrees with simply exempting the space because of an accessory being installed. Either the accessory can be moved, or the receptacles may have to be spaced in a manner to avoid the accessory, but still comply with the 24" requirement.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-194 Log #1748 NEC-P02 **Final Action: Reject**
(210.52(C)(2))

Submitter: Ronald Martin, Martha Martin, Citizens Input
Recommendation: Revise as follows:
In private residences the homeowner may elect not to install receptacles in the center island if the following conditions are met.
● A minimum of 12 linier feet of countertop that is not part of the center island (need not be continuous).
● The above countertop shall be within 4 ft of the island.
● Homeowner makes provisions for future installation of receptacles in center island by installing a junction box within the island cabinet for that purpose.
Substantiation: Receptacles installed on center islands pose a safety hazard whereas appliances have been knocked down due to the cord being snagged by people passing close by in crowded conditions. In addition, a toddler just learning to walk could grab hold of the cord, lose their balance, and pull the appliance down on top of them. This in fact did happen in our old home.
Receptacles installed on center islands where the sink divides the center island and there is 12 in. or more counter top between the sink and the edge of counter top also poses a safety hazard as small slow cookers fit nicely in that space and could be knocked into the sink or on the floor.
If adequate adjacent counter space and receptacles are provided, there is no reason to place receptacles in the island.
Furthermore, fine cabinetry with drawers and raised panel doors make installation and aesthetics less than satisfactory.
<u>Summary</u>
I believe the function of the NEC should be to protect people from hazards that they may not be aware of. Having receptacles in a center island may produce more hazards than they eliminate. There needs to be room for choices. Our personal freedoms are continuously being eroded. Government regulations are making attempts to idiot proof our lives. Citizens need to be responsible for their own actions concerning safety in their homes. I believe that common sense should prevail over bureaucracy mandates.
We spent a lot of money designing our kitchen and made provisions for plenty of receptacles and do not want them in our center island. Please consider this change for future requests so that others don't have to go through what we are going through. Thank you for considering these changes.
Panel Meeting Action: Reject
Panel Statement: The panel has debated the issue of where to mount receptacles on islands over numerous code cycles. The current wording of the NEC provides a reasonable set of rules to address practical mounting based on the construction of the countertop and cabinets.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-216 Log #413 NEC-P02 **Final Action: Accept in Principle in Part**
(210.52(C)(2))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 2-207.
This action will be considered by the Panel as a Public Comment.
Submitter: Alan Chech, Trenton, NJ
Recommendation: 2nd sentence. Change "width" to DEPTH.
Revised:
Where a rangetop or sink is installed in an island counter and the DEPTH of the counter behind the rangetop or sink is...
Also: This article denotes "rangetop" where as 210.52 (C)(1) Exception denotes "range" - stay consistent.
Substantiation: These changes will clarify new sections.
Maybe...rangetop / sink meeting dimensions of fiqure 210.52 should just divide counter into 2 separate counter spaces...end of problem.
Panel Meeting Action: Accept in Principle in Part
The panel accepts changing the term "rangetop". The panel does not accept changing "width" to "depth".
Panel Statement: The term "depth" is no more or less accurate than "width" and is dependent upon where one is in relationship to the island. The current text is well understood.
For the revision on "rangetop", see the panel action on Proposal 2-207.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-217 Log #2164 NEC-P02 **Final Action: Reject**
(210.52(C)(2).)

Submitter: James Shaw, Jim Shaw Electric Co.
Recommendation: I believe the section should be rewritten as follows:
210.52(C)(2)(a) Island Counter Spaces With A Backsplash. (All other wording in this paragraph remains the same).
210.52(C)(2)(b) Island Counter Spaces Without A Backsplash. Receptacle outlets are allowed but not required in islands that do not have a back plash. If receptacle outlets are installed, they shall comply with 210.52(C)(5).
Substantiation: I can see no safety reason why an outlet is required in ALL islands. In fact, I can see several safety issues as to why outlets should NOT be installed in islands. To be more specific, I am talking about islands which do not have a backsplash. Looking at it from a safety stand point, the cord hanging down over the edge of the counter is a magnet for being caught by just about anyone or anything. Once the cord has become caught, the appliance could now be hanging from its cord, and creating an unsafe condition. (Yes, it is most likely connected to GFCI circuit. Not everyone checks these outlets for proper operation, and they are known to fail and not trip.) From a logical standpoint, who is going to place an appliance on an island with no backsplash? Would you want to look at the back side of your microwave or toaster oven? I think not.
I have several customers that have told me that they do not want an outlet in their island for the very same reason that I stated above and for other reasons. I have had several inspectors that have agreed and not forced me to install an outlet there.
Panel Meeting Action: Reject
Panel Statement: The text is clear as written and conveys the panel intent. The panel does not agree that the receptacle should be eliminated from the island simply because there is no backsplash.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-218 Log #153 NEC-P02 **Final Action: Accept in Principle**
(210.52(C)(3))

TCC Action: The Technical Correlating Committee understands that the Panel Action changed the term in three places and correlates with the Panel Action on Proposal 2-207.
Submitter: Don A. Hursey, Durham County Inspections Department
Recommendation: Revise as follows:
Peninsular Counter Spaces. At least one receptacle outlet shall be installed at each peninsular counter space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. A peninsular countertop is measured from the connecting edge. <u>Where a rangetop or sink is installed in a peninsular counter and the width of the counter behind the rangetop or sink is less than 300 mm (12 in.) the rangetop or sink is considered to divide the peninsular into two separate countertop spaces as defined in 210.52(C)(4).</u>
Substantiation: Many peninsulas have range tops and sinks installed as island countertops as well. Requirements for peninsulas should be the same as for islands.
Panel Meeting Action: Accept in Principle
Change the term "rangetop" to "range, counter-mounted cooking unit or..."
Panel Statement: The panel revised the recommended text to be consistent with Article 100. See also the panel action on Proposal 2-207.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-219 Log #2165 NEC-P02 **Final Action: Reject**
(210.52(C)(3))

Submitter: James Shaw, Jim Shaw Electric Co.
Recommendation: I believe the section should be rewritten as follows:
210.52(C)(3)(a) Pennisular Counter Spaces With A Backsplash. (All other wording in this paragraph remains the same.
210.52(C)(3)(b) Pennisular Counter Spaces Without A Backsplash. Receptacle outlets are allowed but not required in pennisulars that do not have a backsplash. If receptacle outlets are installed, they shall comply with 210.52(C)(5).
Substantiation: I can see no safety reason why an outlet is required in all peninsulars. In Fact I can see several safety issues as to why outlets should not be installed in peninsulas. To be more specific, I am talking about peninsulars which do not have a back splash. Looking at it from a safety stand point, the cord hanging down over the edge of the peninsular is a magnet for being caught by just about anyone or anything. Once the cord has become caught, the appliance could now be hanging from its cord, creating an unsafe condition. (Yes it is most likely connected to a GFCI circuit. Not everyone checks these outlets for proper operation, and they are known to fail and not trip.) From a logical stand point, who is going to place an appliance on a peninsular with no back splash? Peninsulars many times have overhangs in which one can place

stools underneath and use the space for eating. Would you want to look at the back side of your microwave or toaster oven? Would you want to read the label plate of your toaster oven or coffee pot? I think not.

I have had several customers that have told me that the do not want an outlet in their peninsular for the very same reasons that I stated above and for other reasons. I have had several inspectors that have agreed and not forced me to install an outlet there.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Proposal 2-217

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-220 Log #443 NEC-P02 **Final Action: Reject**

(210.52(C)(4))

Submitter: W. Creighton Schwan, Hayward, CA

Recommendation: After "refrigerators," add " <u>appliance garages</u> " so as to read:

(4) Separate Spaces. Countertop spaces separated by rangetops, refrigerators, <u>appliance garages,</u> or sinks shall be considered as separate countertop spaces in applying the requirements of 210.52(C)(1), (C)(2), and (C)(3).

Substantiation: An appliance garage separates the counter space to the same degree that a range top, refrigerator, or sink does. This change will require that a countertop receptacle be placed not more than 24 inches on each side of an appliance garage.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree that appliance garages generally split the countertops into separate spaces. The face of the appliance garage does not typically extend to the outer edge of the countertop; a work surface is available directly in front of the appliance garage that is contiguous with the counters on either side of the appliance garage.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-221 Log #2536 NEC-P02 **Final Action: Reject**

(210.52(C)(5))

Submitter: Timothy D. Curry, Curry Electric, Inc.

Recommendation: I would propose that after the last sentence in part (5), to add two new sentences to read:

<u>Receptacles shall be permitted to be mounted not more than 300 mm (12 in.) below the countertop. Receptacles mounted below the countertop, in accordance with this rule, shall not be located where the countertop extends more than 150 mm (6 in.) beyond its support base.</u>

I would further propose to completely delete the entire ~~Exception to (5)~~ .

Substantiation: This location (below countertops) is allowed for several other areas. Obviously, if you feel it is safe enough for bathrooms, peninsulas, and islands, and even regular countertops for the physically impaired, then I would think it should be plenty safe for regular countertop spaces, if that is the owner's desire.

Panel Meeting Action: Reject

Panel Statement: The current language was developed after reviewing a large number of proposals and comments and from extensive discussion of the panel. The language is a balance in accordance with the basic approach of the panel which recognizes that the receptacles in the kitchen should be above the countertop. The exception takes into consideration some of the design difficulties and provides for a limited means to mount the receptacle below the countertop.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-224.

2-222 Log #1847 NEC-P02 **Final Action: Reject**

(210.52(C)(5) Exception)

Submitter: Mark T. Rochon, Peabody, MA

Recommendation: Revise as follows:

Receptacles mounted below a countertop in accordance with this exception shall not be located where the countertop extends more than 150 mm (6 in.) beyond its support based <u>on one side only.</u>

Substantiation: Countertops are being built with 6 in. overhangs to avoid receptacle installation on peninsulars and islands.

Panel Meeting Action: Reject

Panel Statement: If the countertop extends more than 6" beyond the support based on all sides, the receptacle would have to be mounted above the countertop.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-223 Log #2166 NEC-P02 **Final Action: Reject**

(210.52(C)(5) Exception)

Submitter: James Shaw, Jim Shaw Electric Co.

Recommendation: I think that the first sentence should be rewritten to read as follows:

Exception to (5): To comply with the conditions specified in (1) or (2) or (3), receptacle outlets shall be permitted to be mounted not more than 300 mm (12 in.) below the countertop.

Substantiation: I believe that the exception is missing a number.

Panel Meeting Action: Reject

Panel Statement: The exception only contains items (1) and (2). There is no item (3) in the exception.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-224 Log #840 NEC-P02 **Final Action: Reject**

(210.52(D))

Submitter: Stephen W. Drayton, Eastern Idaho Electrical JATC

Recommendation: Revise text to read as follows:

The receptacle outlet shall be located on a wall or partition that is adjacent to the basin or basin countertop, <u>or installed on the side or face of the basin cabinet not more than 300 mm (12 in.) below the counter top.</u> ~~EXCEPTION: The receptacle shall not be required to be mounted in the wall...countertop~~

Substantiation: We think this is an exception that could be deleted by including it in the general rule. We were led to believe that deleting exceptions is one of the goals of the NEC CMPs.

Panel Meeting Action: Reject

Panel Statement: The exception is clear as currently stated. Deleting exceptions is not a "goal" where the exception can best communicate what is intended.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: Contrary to the Committee Statement, the current Exception is actually a rule. Reading both the Section text and the Exception text, the requires receptacle can be located either in a wall or partition, or on the side or face of the basin. What is the Exception? This would also apply to Section 210.5(C)(5). In this day and age of providing greater accessibility to those who are disabled, of limited ability, and the 50+ population, the Panel should not consider accessibility to electrical receptacle outlets an exception to the rule.

2-225 Log #2910 NEC-P02 **Final Action: Reject**

(210.52(D))

Submitter: Raymond C. Paulson, City of Lincoln, NE

Recommendation: Revise as follows:

In dwelling units, at least once receptacle shall be installed in bathrooms ~~within 900 mm (3 ft) of the outside edge of each basin~~ . The receptacle outlet shall be located on a wall or partition that is adjacent to the basin or basin countertop.

Substantiation: Bathroom appliances (hairdryers, curlers, shaving machines, etc.) do not need a basin to operate. The 900 millimeter requirement does not add any degree of safety. There are many extra long vanities that do not lend themselves to conformance with this requirement. Delete the reference to 900 millimeters.

Panel Meeting Action: Reject

Panel Statement: Most bathroom appliances are used near the basin. If the receptacle is located further away, the user may need an extension cord to use the appliance near the basin. The 900mm requirement was specifically mandated to address this concern.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In actual practice, it is really the mirror that is relative to the use of a hair dryer, not the sink. Though, for the use of oral care equipment, the receptacle location relative to the sink is the main consideration.

2-226 Log #2963 NEC-P02 **Final Action: Reject**

(210.52(D))

Submitter: Timothy D. Curry, Curry Electric, Inc.

Recommendation: Last sentence by modified thusly:...basin, countertop, <u>or installed on the face or side of the basin cabinet not more than 300 mm (12 in.) below the countertop.</u>

I would further propose to completely delete the entire: ~~(D) Exception~~

Substantiation: Changing the exception to positive langage.

Panel Meeting Action: Reject

Panel Statement: The exception as stated, clearly conveys the intent and objective of the rule.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: Please see NAHB's Ballot Comment on Proposal 2-224.

2-227 Log #2976 NEC-P02 **Final Action: Reject**
(210.52(D))

Submitter: Raymond C. Paulson, City of Lincoln, NE / Rep. Building & Safety, City of Lincoln, NE
Recommendation: In dwelling units, at least one receptacle shall be installed in bathrooms ~~within 900 mm (3 ft) of the outside edge~~ of adjacent to each basin. The receptacle outlet shall be located on a wall or partition that is adjacent to the basin or basin countertop.
Substantiation: Many bathroom vanities are too long to meet this 900 mm requirement. No advantage is offered by having the outlet this close. Bathroom appliances are not for use "in the basin", hair dryers, shavers, etc. are well served by an outlet "adjacent to each basin" without the distance requirement.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 2-225. The 900 mm dimension defines the extent of adjacency.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-228 Log #394 NEC-P02 **Final Action: Accept in Principle**
(210.52(E))

Submitter: Frank Foster, Thomasville, NC
Recommendation: Add a new sentence to the end of the following section:
For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible at grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed at the front and back of the dwelling. For each dwelling unit of a multifamily dwelling where the dwelling unit is located at grade level and provided with individual exterior/egress, at least one receptacle outlet accessible from grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed. See 210.8(A)(3).
(1) A receptacle outlet shall be installed within the footprint of every porch, deck, patio, and similar structure.
Substantiation: Electrical fire and trip hazard. By requiring that a receptacle outlet be installed within the footprint of every porch, deck, patio, and similar structure, the chance that someone will run an extension cord through a window or doorway to an indoor receptacle outlet (not GFCI-protected) for lights, radios, electric weed-eaters, etc., is greatly reduced. This requirement will lessen the possibility of an electrical fire and eliminate any unnecessary trip hazards around doorways.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-229.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-228 and 2-299. Please see NAHB's Ballot Comment on Proposal 2-229.

2-229 Log #637 NEC-P02 **Final Action: Accept in Principle**
(210.52(E))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise text to read as follows:
(E) Outdoor Outlets.
(1) One-family and Two-family Dwellings. For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible at grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed at the front and back of the dwelling.
(2) Multi-family Dwellings. For each dwelling unit of a multifamily dwelling where the dwelling unit is located at grade level and provided with individual exterior entrance/egress, at least one receptacle outlet accessible from grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed.
(3) Balconies. Dwelling unit balconies with exterior entrance/egress shall have at least one receptacle outlet installed accessible from the balcony.
Substantiation: The revised text takes into consideration those units that are above the first floor level that may have balconies. It is common for holiday lighting and other electrical appliances to be used on the balconies of these units. Without receptacles, extension cords are run from inside the unit and pinched between sliding doors or windows.
The section was numbered for ease of use.
Panel Meeting Action: Accept in Principle
Revise the recommended text to read:
(E) Outdoor Outlets. Outdoor receptacle outlets shall be installed in accordance with (E)(1) through (E)(3).
(1) One-Family and Two-Family Dwellings. For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible at grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed at the front and back of the dwelling.
(2) Multifamily Dwellings. For each dwelling unit of a multifamily dwelling where the dwelling unit is located at grade level and provided with individual exterior entrance/egress, at least one receptacle outlet accessible from grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed.
(3) Balconies, Decks and Porches. Balconies, decks and porches that are attached to the dwelling unit and are accessible from inside the dwelling shall have at least one receptacle outlet installed accessible from the balcony, deck or porch.
Panel Statement: The revised text meets the intent of the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-228 and 2-299. Concerning new 210.52(E)(3): It would be more appropriate for there to be a minimum size balcony, deck, or porch for the application of this new provision. As was discussed at the ROP meeting, some members would consider exterior area in front of a door used for solely ventilation a "balcony", just because there is the installation of a protective guard (railing) to prevent falls. In reality there is no actual floor space. Also, may designs of high-rise multifamily buildings include a very small standing area, perhaps 3 feet by 6 feet, to allow for fresh air and a place to have a smoke and not contaminate the interior environment. There is barely room for a single chair. The Panel should consider the use of the deck area relative to the need for a receptacle. For a floor space large enough to allow outdoor cook (electric grill) or sunbathing (radio) the installation of a receptacle may be appropriate. For a floor space that is a result of a designed ventilation opening a receptacle would be of no practical use.
It should also be noted that for all multifamily construction the guards are required to be a minimum of 42 inches in height above the deck surface. For the small deck areas the guard usually is attached to the building directly adjacent to the door frame. This provides no wall surface with the guard to install a receptacle. If the receptacle was to be install it would be located approximately 46 inches above the deck surface, and due to structural framing around the door would be located 12 or more inches outside the deck area.
The installation of a receptacle for usable deck areas would seem appropriate, and is usually already included in the design of the unit as a convenience for using outdoor appliances. The contention that that outlet is needed in the event holiday lighting is installed is not the basis for requiring a receptacle. If you require a receptacle for holiday lighting on the deck, why not one for all of the gutters and rake boards? As with any use of holiday or other decorative lighting, this is a use and design consideration of the user. Not one of minimum electric safety regulations. The use of holiday lighting cords and fixtures are already covered in the NEC and the product's listing.
Comment on Affirmative:
KING, D.: This is a much needed revision to section 210.52. The additional requirement for the installation of receptacles on balconies, decks and porches will eliminate the use of extension cords and the hazards that exists from these cords being passed through doorways in order to supply power to these locations. The additional requirement that these outdoor receptacles be provided with GFCI protection will potentially save many lives.
PAULEY, J.: The new item (3) added by the panel may need some additional clarification. The discussions of the panel indicated that the intent of the requirement is to require a receptacle be installed on any porch, deck or balcony. This receptacle was intended to be in addition to those that are installed to meet (1) or (2). It may be clearer if the new item (3) were written as "(3) Balconies, Decks and Porches. Balconies, decks and porches that are attached to the dwelling unit and are accessible from inside the dwelling shall have at least one receptacle outlet installed accessible ~~from~~ on the balcony, deck or porch." This will prevent the argument that a receptacle installed elsewhere on grade can meet the requirement of (3) because you can walk down the steps of the porch or deck. The panel's language in item (1) makes it clear that a receptacle on a deck could only serve as the receptacle meeting item(1) if it is accessible AT grade level.
It should also be noted that the panel is intentional in its use of differing language (AT grade level versus FROM grade level) in items (1) and (2) because of the configurations of multifamily dwellings.

2-230 Log #862 NEC-P02 **Final Action: Reject**
(210.52(E))

Submitter: Ray C. Mullin, Ray C. Mullin Books
Recommendation: Revise as follows:
(E) Outdoor Outlets. For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible ~~at~~ when standing on grade level, ~~and~~ not more than 2.0 m (6 1/2 ft) above grade nor less than 600 mm (24 in.) above grade shall be installed at the front and back of the dwelling.
For each dwelling unit of a multifamily dwelling where the dwelling unit is located at grade level and provided with individual exterior entrance/egress, at least one receptacle outlet accessible from grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed. See 210.8(A)(3).

Substantiation: As a past member of CMP 4, I readily understand that after much discussion around the table at the CMP meetings discussing precisely how the wording of a Code section should be, the intent is finally understood by the CMP members. They hear all of the discussion. They know what the intent is. They decide on the wording. But, electricians are not privy to these actual CMP meeting discussions. They merely read the NEC. As an author of electrical text books, I know how difficult it is to select the right wording to get the point across with no confusion to the reader. The simpler the wording, the easier to understand.

Regarding the 210.52(E), the word "at" results in a lot of confusion in the field. It is the intent that the receptacle be accessible when a person is standing on grade. So I suggest that we say so. I have deleted the word "at" and replaced it with the simple and understandable phrase "when standing on grade level."

This wording leaves no doubt as to the intent.

The second part of my proposal addresses the minimum height of the receptacle.

The current maximum height restriction addresses the requirement that the receptacle be accessible for the average person. No problem with that.

Stipulating a minimum height above grade will improve safety by reducing the possibility of the receptacle being buried in snow...or being flooded out for whatever reason.

I ask the Code Making Panel to accept this proposal.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 2-231. The panel does not agree with adding the "24" dimesion because it is overly restrictive. The panel reaffirms its position that the present code text requires that the receptacle be accessible "at" grade level. A receptacle that cannot be reached while standing on grade and be within the 6 feet, 6 inches height requirement would not meet the requirement of 210.52(E).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

WEBER, R.: See my comments and explanation for Negative vote on Proposal 2-231.

Comment on Affirmative:

BROWN, L.: It should be noted that the lower reach-range dimension for wheelchair accessible equipment is 15 inches. With respect to snow or flooding conditions, snow ground cover could easily be well over 24 inches in many areas of the country. In the case of flooding, as we have witnessed over the past several years, a future flooding condition is not easily predicted. In addition, some equipment may be less than 24 inches in height. Would this equipment not be subject to the same snow or water conditions as a receptacle?

2-231 Log #1624 NEC-P02 **Final Action: Reject**
(210.52(E))

Submitter: James Tente, City of Naperville

Recommendation: Revise text to read as follows:

For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible <u>while standing</u> at grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed at the front and back of the dwelling where the dwelling unit is located at grade level and provided with individual exterior entrance/egress, at least one receptacle outlet accessible. <u>While standing</u> from on grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed. See 210.8(A)(3).

Substantiation: Present language is vague. The interpretation of "accessible" can vary greatly and is commonly misinterpreted. The panel statement for 2005 ROP 2-236 (Log #3197) clarifies the meaning of "accessible" and should be included in code text for clarity.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms it's previous position that "at grade" means "while standing on grade". See the panel action and statement on Proposal 2-230.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

WEBER, R.: The panel should have accepted this proposal as submitted, when we consider the full range of the persons using the code simplified language as recommended will solve a lot of confusion of the requirement being encountered out in the field. The addition of the term "while standing" at grade will make it clear that a receptacle installed on an elevated porch, that is accessible by stairs from grade, would not meet the requirements of section 210.52(E).

2-232 Log #2223 NEC-P02 **Final Action: Reject**
(210.52(E))

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise as follows:

(E) Outdoor Outlets. For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible ~~at~~ <u>from</u> grade level and not more than 2.0 m (6 1/2 ft) above grade shall be installed at the front and back of the dwelling.

Substantiation: There is no safety hazard in having the required outdoor receptacles located above an open porch or deck. The intent is to have the receptacles located in a location that is easily accessible from the outside. In many dwelling units it is not possible to comply with the existing code rule as there are open porches or decks installed across the front and back of the building.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 2-230.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-233 Log #3326 NEC-P02 **Final Action: Reject**
(210.52(E))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Add the following sentence at the end:

For the purposes of this section, the phrase "accessible at grade level" and the phrase "accessible from grade level" shall mean readily accessible from grade, and no more than 2.0 m (6½ ft) above grade level.

Substantiation: Major jurisdictions are applying the current wording to disqualify a receptacle on a low open deck as the required outdoor receptacle on one side of a dwelling unit. Unlike the receptacle behind the doorway issue, where there is an excellent reason to count that space, there has never been a good reason to disallow a receptacle on an open porch or deck as counting as the exterior receptacle, especially under the terms of this proposal. It would still need to be readily accessible, which means not obstructed from someone approaching from grade, and not up more than a few steps. It would not be more likely to require an extension cord, and in fact, it might be less likely since it would be placed nearest the likely location for electrical appliance usage. It might even be in a damp, as opposed to a wet location, resulting in a less hazardous condition. This proposal also removes a distinction between a one- and two-family dwelling (still subject to the potential deck disqualification), and a multifamily dwelling (certainly not so restricted, in fact, their decks don't even require stairs to grade.)

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 2-230.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-234 Log #3484 NEC-P02 **Final Action: Reject**
(210.52(E))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read:

210.52(E) Outdoor Outlets....at least one receptacle outlet <u>125 V, 15- or 20-ampere</u> accessible at grade level etc.

Substantiation: This article needs clarification because as it stands now it is allowable to install a different voltage or current level than what is intended.

Panel Meeting Action: Reject

Panel Statement: This provision is already covered in the main paragraph of 210.52.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-235 Log #1407 NEC-P02 **Final Action: Reject**
(210.52(F))

Submitter: George Stolz, II, Pierce, CO

Recommendation: Change 210.52(F) to read:

210.52(F) Laundry Areas. In dwelling units, at least one receptacle outlet shall be installed for the laundry <u>equipment</u> .

Substantiation: This will clarify that the receptacle is required to supply the laundry equipment, not the entire room as a whole.

Please note: This proposal is submitted in coordination with a similar proposal to revise 210.11(C)(2).

Panel Meeting Action: Reject

Panel Statement: The panel rejected the companion proposal to this proposal. See the panel statement on Proposal 2-98.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-236 Log #2871 NEC-P02 **Final Action: Reject**
(210.52(F) Exception No. 3 (New))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Add exception No.3.

Where the laundry equipment consists of a stacked washer/dryer combination. The required receptacle shall be permitted to be a 30 ampere, 240V dryer type.

Substantiation: The existing requirements are for 125V receptacles and do not reflect current practice.

We see the LAUNDRY AREA consisting of a recess in a hall wall just the width of the washer/dryer appliances. To require a 125V receptacle within 6 feet of the intended location of the laundry equipment makes no sense unless we have to allow for ironing - but in the hallway?

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 2-95.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-237 Log #3140 NEC-P02 **Final Action: Reject**

(210.52(F) Exception No. 3 (New))

Submitter: Dale Rooney, Municipality of Anchorage

Recommendation: Add new exception No. 3 to read:

Exception No. 3: Where a laundry space only permits a stackable washer/dryer with no provision for a ga s dryer a 240 volt receptacle only shall be permitted.

Substantiation: The first sentence of 210.52 specifies that the section applies to 120 volt 15 and 20 volt receptacles. The two exceptions in sub-part (F) do not specifically address this situation. The 120 volt receptacle is redundant since a stackable combo without a gas dryer will almost always require a 240 volt receptacle. The few combos available for 120 volts require two separate circuits and the 240 volt circuit can be relatively easily converted to such use.

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 2-95.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-238 Log #125 NEC-P02 **Final Action: Reject**

(210.52(G))

Submitter: Ryan Price, Benfield Electric Contractors, Co.

Recommendation: Revise as follows:

For a one-family dwelling, at least one receptacle outlet, in addition to any provided for laundry equipment, shall be installed in each basement and in each attached garage, <u>with a minimum mounting height above finished floor of 18 in.</u> and in each detached garage with electric power.

Substantiation: Receptacles in basements that may be effected by water/flooding.

Sparks from outlets in garages where chemical fumes are present.

Panel Meeting Action: Reject

Panel Statement: The 450mm (18") dimension in the basement is arbitrary and may or may not be adequate relative to flooding. Residential garages are not classified as hazardous locations.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: See NAHB's Ballot Comment on Proposal…

2-239 Log #419 NEC-P02 **Final Action: Reject**

(210.52(G))

Submitter: Ryan Price, Benfield Electric Contractors, Co.

Recommendation: Revise to read as follows:

For a one-family dwelling at least one receptacle outlet, <u>mounted at a minimum height of 18 in. above grade level,</u> in addition to any provided for laundry equipment, shall be installed in each basement and in each attached garage, and in each detached garage with electric power. See 210.8(A)(2) and (A)(5). Where a portion of the basement is finished into one or more habitable rooms, each separate unfinished portion shall have a receptacle outlet installed in accordance with this section.

Substantiation: Most basements, attached garages, and detached garages with electric power store or have the presence of flammable or ignitable vapors that could build up and ignite. Most harmful vapors pertaining to the NEC, hover about 8 in. to 12 in. above grade level. Placing all receptacles at a minimum height of 18 in. above grade level would insure that electrical sparks from the receptacles will not ignite the vapors.

Panel Meeting Action: Reject

Panel Statement: The submitter's claim that most basements and garages "have the presence of flammable or ignitable vapors" is unsubstantiated. Neither of these areas are classified as hazardous locations.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-240 Log #1265 NEC-P02 **Final Action: Accept**

(210.52(G))

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the proposal relative to the grammar and the use of complete sentences. This action will be considered by the panel as a public comment.

Submitter: Mark Shapiro, Farmington Hills, MI

Recommendation: Revise the rule to require "general-use" receptacles in basements and garages.

"For a one-family dwelling, at least one <u>general-use</u> receptacle outlet ~~, in addition to any provided for the laundry equipment,~~ shall be installed in each basement and in each attached garage, and in each detached garage with electric power. See 210.8(A)(2) and (A)(5). Where a portion of basement is finished into one or more habitable rooms, each separate unfinished portion shall have a <u>general-use</u> receptacle outlet installed in accordance with this section."

Substantiation: As presently written, a single receptacle installed for a basement sump pump would satisfy this sections requirement for a basement receptacle that is in addition to the laundry receptacle. The same could hold true for a receptacle, mounted on the side of a furnace, for a humidifier.

Why is a "general-use receptacle" proposed here rather than the more familiar sounding phrase "general-purpose receptacle"? "General-use" is proposed to avoid confusion with the term "general-purpose branch circuits".

"Branch circuits, general-purpose" are defined in Article 100. They are defined as having 2 or more outlets. Unfortunately, I fear that the use of the term "general-purpose receptacle" here, would result in some people arguing that this basement or garage receptacle was required to be on a general-purpose branch circuit and could not be on a separate circuit.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BROWN, L.: This is nonsense. The addition of the term "general-use" to describe a typical receptacle adds absolutely no additional clarification to these provisions. Looking at the 2005 NEC this term is only used in Article 220 (Branch-Circuit, Feeder, and Service Calculations); Section 440.62(C) (Air-Conditioning and refrigerating Equipment - Provisions for Room Air-Conditioners); and Section 552.46(B)(3) (Park Trailers - Branch Circuits - General Appliances). But, what is a "general-use" receptacle? There is no definition, as there is for "General-Use Switch", in the NEC. Regarding the Submitter's Substantiation, adding this term will provide no more enforcement of having a useable receptacle in these locations than the current language already provides. What would ever make someone think a single receptacle is not a "general-use" receptacle? If you really want to address the Submitters purported problem, make these receptacles in addition to any other receptacle used for equipment installed in those areas.

2-241 Log #3627 NEC-P02 **Final Action: Reject**

(210.52(I))

Submitter: Raymond C. Paulson, City of Lincoln, Nebraska

Recommendation: Add a new section 210.52(I) Walkways.

In dwelling units where an area is defined by change of architecture or a permanent differentiation of floor covering as a walkway, a receptacle shall be placed on the occupiable side of the walkway in addition to any receptacle(s) that are required by 210.52(A) & (H). This receptacle or receptacles may be installed in lieu to any receptacle that would otherwise be installed as a floor receptacle by a railing in the walkway.

Substantiation: As the Code evolves, so does the space in which we dwell. Just as we achieve safe usage of electricity by the requirement of receptacle outlets each 2,6 & 12 feet(More is better), this change can alleviate a hazard that we are inadvertantly introducing. It is a VERY common design that is used to create a "walkway" by the use of a hard floor covering such as tile or hardwood directing foot traffic around a seating area in a living room or great room. By Code we must enforce an outlet in the floor next to the open railings for the stairways. Sometimes waging turf wars with the homeowner and interior designer for ownership of space in the Italian marble tile, we forget the reason for the outlet and just fall back on "because the Code says so". We should step back and see what is happening here and allow the receptacle by the furniture grouping and get rid of the trip hazard and cord damage hazard by allowing a reasonable alternative to "always requiring a receptacle in the walkway" by the railing. This allowance will provide a convenient receptacle by the chair or table for the floor lamp and eliminate the hazard of stretching a cord to the outlet by the railing on the other side of the "walkway".

Panel Meeting Action: Reject

Panel Statement: The situation described by the submitter is too vague to attempt a specific code rule. The specified text of "change of architecture or a permanent differentiation of floor covering" is too subjective.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-242 Log #1184 NEC-P02 **Final Action: Accept in Part**

(210.60(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

Guest rooms in hotels, motels, <u>dormitories</u> , and similar occupancies shall have receptacle outlets installed in accordance with <u>310.11(C),</u> 210.52(A), and 210.52(D).

Substantiation: Rooms in hotels, motels, and dormitories meeting the definition of dwelling unit are required to comply with 210.11(C)(3), but if without permanent provisions for cooking are exempt. It is difficult to see how a cooking appliance affects the need for application of 210.11(C)(3). It is my impression this section was adopted due to widespread use of high wattage hair blow dryers or portable electric space heaters. Occupants of guest rooms or dorms with or without provisions for cooking are just as prone to use these appliances.

Panel Meeting Action: Accept in Part

The panel accepts the recommendation to add "dormitories".

Panel Statement: The panel agrees that receptacle requirements for domitories are not currently covered and need to be treated similarly to hotel and motel guest rooms. The panel does not accept the reference to 210.11(C) because those requirments would not be applciable to all dormitory configurations.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

PURVIS, R.: Proposal 2-242 (Dormitories) should have been rejected. The submitter did not provide any technical substantiation that electrical requirements in a dormitory room are like the electrical requirements of hotel or motel rooms. Dormitories are a much different occupancy than a hotel or motel room. For example, colleges and universities often set rules for dormitories and dormitory occupants that limit the use of equipment in the room. Colleges and universities also have been attentive in the design of dormitory room electrical systems to accommodate the typical loads and the needs for receptacles for these occupancies and uses. Unlike hotel or motel rooms, dormitories are likely to have coincident loads lacking the diversity of hotel and motel loading.

Typically, dormitory occupancies are different because student housing at colleges and universities are much different than the occupancy at a hotel or motel room with transient occupancy.

The submitter has not provided any examples or cases of fire or problems that would show there is a problem with the current Code and its application to dormitories.

Comment on Affirmative:

BROWN, L.: The occupancy "Dormitory", as used and defined in other NFPA documents, would not include individual cooking facilities. But, there may be other problems with including dormitories along with guest rooms and guest suites. The dormitory would consist of sleeping rooms for the occupants, and all other areas would be classified as public or general use areas. It may be better to break this out into a separate subsection. A guest room and a guest suite are defined to differentiate these types of spaces from the other parts of the lodging building, But, with a dormitory you need to relate these provisions only to the sleeping accommodations. Not the entire dormitory building.

PAULEY, J.: With this change, the panel should consider revising the title of 210.60 to "210.60 Guest Rooms, Guest Suites and Dormitories" to make it clear that dormitories are now included.

2-243 Log #3383 NEC-P02 **Final Action: Reject**
(210.60(B))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Revise the second sentence of 210.60(B) to read as follows:

These receptacle outlets shall comply with the spacing requirements in 210.52(A), but adjustments to the extent necessary to accommodate a permanent furniture layout shall be permitted.

Substantiation: On numerous occasions, this submitter has been asked for advice with respect receptacle placements and this section. In several cases, the size of the room would require a given number of receptacle outlets, and the architect had specified one or two fewer than this number. The electrical contractor proposed placing an additional receptacle outlet one foot (and in the same stud bay) from one of the existing receptacle outlets. In support of this, he said he was accommodating a permanent furniture layout. The room, indeed, had a permanent furniture layout, but this section was never intended to allow, for example, all the receptacles to be located on one wall just because some of furniture somewhere had a permanent location. This proposal (using slightly stronger language than is prior version in the previous cycle) provides an opportunity to clarify that installers must follow 210.52(A), with only those adjustments "to the extent necessary" to meet the permanent layout.

Panel Meeting Action: Reject

Panel Statement: The submitter's use of the phrase "to the extent necessary to accommodate" is vague and unenforceable.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-244 Log #1895 NEC-P02 **Final Action: Accept**
(210.62)

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Recommendation: Revise text to read as follows:

210.62 Show Windows. At least one receptacle outlet shall be installed ~~directly~~ <u>within 450 mm (18 in.) of the top of</u> ~~above~~ a show window for each 3.7 linear m (12 ft) or major fraction thereof of show window area measured horizontally at its maximum width.

Substantiation: As the Authority Having Jurisdiction, we see many instances that involve ceiling heights that in some cases are as much as 16 to 18 ft above the top of show windows. The Code currently does not address the location of height above the window, only that it be above the show window. The required show window outlets then are placed on the ceilings 16 to 18 ft above the top of the show windows and are in compliance with the letter of the code. The object of this section is to eliminate or lessen the use of extension cords used for display items or advertising placed in the show window. Placing limits on the height of these receptacles above show windows would place these receptacles at a distance above a show window to make them usable to perform their intended use.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-245 Log #2290 NEC-P02 **Final Action: Reject**
(210.62)

Submitter: Gary Boughton, Town of Bethel Building Deparment

Recommendation: Rename 210.62 Show Windows. <u>To "210.62 Other Than Dwelling Units."</u> and add/change present 210.62 to <u>(A) Show Windows,</u> and keep present wording. Add <u>(B) Kitchens Where a kitchen is installed, countertop receptacles shall be installed according to 210.52 (B) and (C).</u> Add <u>(C) Bathrooms. Where a basin and toilet are installed with one of more of the following: A tub or shower, Receptacles shall be installed according to 210.52(D).</u>

Substantiation: There was a time when having a kitchen in a workplace was unheard-of now almost every business has a kitchen area for the warming and preparation of food, coffee etc. There is much competition for these receptacles during lunch and other busy times. We have had several kitchens in business and industrial occupancies, two of which have over 25 feet of counter space, with only 3 receptacles. The code as now written does not require any receptacles for nondwelling unit kitchens. The dangers and hazards are the same as dwelling units and the counter top appliances are the same, limited cord lengths etc. This is not meant for diners or restaurant kitchens that are specifically designed for their use. 210.8(B) already requires these receptacles <u>when</u> installed to be GFCI protected.

Bathrooms are similar in that a private bathroom that includes a shower or tub in business occupancies is not required to provide a receptacle outlet but provides the same danger and hazard. This also arises in health spas, firehouse trucking and towing businesses to name just a few all at some time being remedied with the use of long extension cords through walls of doors to provide the needed receptacle.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated the requirement for additional receptacles in kitchens and bathrooms of non-dwelling locations. Because of the intended use of some of these spaces, it may be desirable to have no receptacles installed to limit the use of the space.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: The submitter has adequately substantiated the need for consistent application of the requirements of 210.52(A),(B) and (C). The same hazards exist with the use of electricity in kitchens and bathrooms regardless of the type of occupancy where they are located. Accepting this proposal would provide the same level of safety that is now required in the same locations in dwelling units.

2-246 Log #2414 NEC-P02 **Final Action: Reject**
(210.62)

Submitter: Dan Frohberg, Northeast Community College

Recommendation: Revise text to read:

~~At least one receptacle outlet shall be installed directly above a show window for each 3.7 linear m (12 linear ft) or major fraction thereof of show window area measured horizontally at its maximum width.~~

No point along the show window shall be more than nine feet from a receptacle.

Substantiation: We calculate spacing of receptacles to fixed distances between or accessibility to receptacles. This would be easier to understand and provide the needed receptacles for show windows.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated changing the requirement in order to place a receptacle within nine feet of every point of the show window. The revision in Proposal 2-244 makes it clear as to where the receptacle can be placed.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-247 Log #1229 NEC-P02 **Final Action: Reject**
(210.63)

Submitter: Michael Dempsey, Municipal Code Inspections
Recommendation: Revise text to read as follows:
The receptacle shall be located on the same level and within 25 ft <u>and when the heating, airconditioning and refrigeration equipment is located outdoors, the receptacle shall be located outside, GFI protected and within 25 ft.</u>
Substantiation: This would prevent a situation when HVAC equipment is located on a deck or near a grade level door, that the receptacle on the same level and within 25 ft could be inside and not GFI protected.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree that the present rule would allow a receptacle located inside, to meet the requirement of 210.63 for equipment located outdoors. NEC 400.8 prohibits the use of flexible cord through doors, windows or similar openings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-248 Log #1266 NEC-P02 **Final Action: Reject**
(210.63)

Submitter: Mark Shapiro, Farmington Hills, MI
Recommendation: Delete “heating” from the section so that it reads:
“A 125-volt, single phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of ~~heating~~ , air-conditioning, and refrigeration equipment. The receptacle shall be located on the same level and within 7.5 m (25 ft) of the ~~heating~~ , air-conditioning, and refrigeration equipment. The receptacle shall not be connected to the load side of the equipment disconnecting means.”
Substantiation: Is there a need for receptacles for the servicing of furnaces? Is there a need for receptacles adjacent to unit heaters in the ceilings of industrial shops? Apparently not. And other people seem to agree, because I have yet to see one that has been provided for that purpose. Nonetheless, the present language puts countless unit heater installations in violation of the code.
The requirement is justifiable at cooling and refrigeration equipment. Even though most equipment these days, is battery powered, it assures a safe source of 120 volt power for the use of vacuum pumps to evacuate the system before refrigerant is installed.
Panel Meeting Action: Reject
Panel Statement: The current code language is consistent with the model mechanical codes which include heating equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-249 Log #3388 NEC-P02 **Final Action: Reject**
(210.63)

Submitter: Steve Moore, Romulus, MI
Recommendation: Add a definition for Evaporative Cooler to read:
Evaporative Cooler. Cooling system that cools by evaporation.
Substantiation: There is no definition in the current edition of the NEC that explains what an evaporative cooler is.
Panel Meeting Action: Reject
Panel Statement: The term “evaporative cooler” is well understood in the construction industry and does not need a specific definition in the NEC. The model mechanical codes define these units.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-250 Log #1442 NEC-P02 **Final Action: Reject**
(210.63 Exception)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
210.63 Heating, Air-Conditioning, and Refrigeration Equipment Outlet. A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration equipment. The receptacle shall be located on the same level and within 7.5 m (25 ft) of the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.
~~Exception: A receptacle outlet shall not be required at one- and two-family dwellings for the service of evaporative coolers.~~
FPN: See 210.8 for ground-fault circuit-interrupter requirements.
Substantiation: This exception does not belong, as it has nothing to do with “Heating, Air-Conditioning and Refrigeration” equipment. Evaporative coolers are listed as “evaporative fans” per the UL 507. Furthermore, because of the language existing, it falsely gives the impression that a receptacle outlet is required at other than dwelling units, which is incorrect. Once again, evaporative coolers are not HACR equipment.
Panel Meeting Action: Reject
Panel Statement: The submitter is incorrect in that an evaporative cooler is a form of air-conditioning. A receptacle is required for these units if they are installed at other than one or two family dwellings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: I agree with the panel statement that an evaporative cooler is a form of air conditioning and that a receptacle is required for these units if they are installed at other than one and two family dwellings. I disagree with the panel action to not delete the exception as recommended by the submitter. The requirements of section 210.63 should apply to evaporative coolers given the fact that they are a form of air conditioning equipment. Panel 2 added this exception in the 2005 code cycle based on a substantiation that was anecdotal in nature and lacked any technical data that would warrant the need for this exception. Deleting this exception would ensure that a receptacle outlet would be installed for the purposes of servicing this equipment and that the receptacle would be provided with GFCI protection. Persons servicing this type of equipment are at a greater risk of electric shock or electrocution as a result of this panel action.

2-251 Log #575 NEC-P02 **Final Action: Reject**
(210.70)

Submitter: Alan H. Nadon, City of Elkhart, IN
Recommendation: Revise as follows:
210.70 Lighting Outlets Required. Lighting outlets, <u>that provide illumination,</u> shall be installed where specified in 210.70(A), (B), (C).
Substantiation: As currently worded, only 210.70(A)(2)(b) requires a lighting outlet to actually illuminate anything. The definition of a lighting outlet, in Article 100 does not require anything more than a junction box with switched conductors intended to be connected to a lampholder, light fixture, or pendent light. A proposal has also been submitted to change or amend the definition of lighting outlet. Proper illumination ensures safe movement for persons thus preventing many accidents.
Panel Meeting Action: Reject
Panel Statement: The objective of the NEC is to provide the requirement for the lighting outlet. The requirements specific to illumination are in the building code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-252 Log #3164 NEC-P02 **Final Action: Reject**
(210.70)

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Add text as indicated in underlined font, and delete text as indicated in strikethrough text as shown:
210.70 Lighting Outlets Required. Lighting outlets shall be installed where specified in 210.70(A), (B), and (C).
(A) Dwelling Units. In dwelling units, lighting outlets shall be installed in accordance with 210.70(A)(1), (2), and (3).
(1)Habitable Rooms. At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom <u>, with switch control provided at each entrance to these rooms.</u>
(2) Additional Locations. Additional lighting outlets shall be installed in accordance with (A)2(a), (A)(2)(b), and (A)(2)(c).
(a) At least one wall switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power.
(b) For dwelling units, attached garages, and detached garages with electric power, at least one wall switch–controlled lighting outlet shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.
(c) Where one or more lighting outlet(s) are installed for interior stairways, there shall be a wall switch at each floor level, and landing level that includes an entry way, to control the lighting outlet(s) where the stairway between floor levels has six risers or more.
<u>(d) Where lighting outlets are installed as specified in 210.70(A)(2)(a), (b), and (c) above switch control shall be provided at each entrance to these locations.</u>
Substantiation: Consider the case of a basement with an exterior entrance, and the building users choose to enter the basement from an exterior door. All too often the only switch to control a basement luminaire is at the top of the stairs entering the basement from the interior. In a scenario where entry is made from the exterior there is no mechanism to turn on the luminaire, thus creating a possible trip or fall hazard to the occupant. Switched control of lighting at each entrance to a basement or a room as proposed would greatly contribute to safety of persons.

Panel Meeting Action: Reject

Panel Statement: The location and number of switches is a design requirement that is determined by the designer, user or installer. The panel disagrees with the submitter's example in the substantiation relative to the switch at the top of the basement stairs. If there are six risers or more, a switch is required at the top and bottom of the stairs.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: This proposal should have been accepted. Minimum requirements for the location of control of required lighting outlets is not a design consideration but rather a safety issue. Location and accessibility of switches is addressed in other sections of the NEC. Section 210.70(A)(3) Requires at least one point of control for illumination of equipment and storage spaces to be at the usual entry point to these spaces. This is intended to provide control of illumination at a location that will allow for safe access to these spaces. The reference to the requirement in section 210.70(C) in the panel statement does not address the submitter's concerns. The submitter is illustrating in his substantiation the need for the control of illumination at every point of entry to a basement regardless of whether or not stairs are needed to access this space. There have been several proposals submitted that alert panel 2 to the risk of injury to persons that can occur as a result of not including minimum requirements for the location of switches that control the required lighting outlets in 210.70. Adding these requirements will ensure that the control of illumination that is required in 210.70 is located to allow safe access to these areas. Panel 2 should give this proposal further consideration.

2-253 Log #3480 NEC-P02 **Final Action: Reject**
(210.70(3))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read:

210.70(3) Storage or Equipment Spaces. For attics, underfloor spaces, utility rooms , closets and basements, at least etc...

Substantiation: This article needs rewording because the contractor feels that every closet space is exempt from the rule because it is not mentioned in the requirement list.

Panel Meeting Action: Reject

Panel Statement: Closets are not intended to be covered in the present rule. The submitter has not substantiated a requirement for a lighting outlet in every closet.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: It would seem this Proposal would apply to Section 210.70(A)(3), not 210.70(3). A closet is used for storage and is not a habitable room or space, and vary greatly in size.

2-254 Log #1664 NEC-P02 **Final Action: Reject**
(210.70(A))

Submitter: David Nemchik, Median County Building Deparment

Recommendation: Change to 210.70(A)

210.70 Lighting Outlets Required. Lighting outlets shall be installed where specified in 210.70(A), (B), and (C).

(A) Dwelling Units. In dwelling units, lighting outlets shall be installed in accordance with 210.70(A)(1), (A)(2), and (A)(3).

(1) ~~Habitable Rooms.~~ General Provisions. Lighting outlets shall be installed in accordance with 210.70(A)(1)(a) and (A)(1)(b).

(a) At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom.

(b) For dwelling units, attached garages, and detached garages with electric power, at least one wall switch-controlled lighting outlet shall be installed to provide illumination on the interior side of outdoor entrances or exits with grade level access. One wall switch shall be located on the interior no more than 1.8 m (6 ft) from the exterior entrance door. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.

Exception No. 1 to (A)(1)(a) and (A)(1)(b) : In other than kitchens and bathrooms, one or more receptacles controlled by a wall switch shall be permitted in lieu of lighting outlets.

Exception No. 2 to (A)(1)(a) and (A)(1)(b) : Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to wall switches or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

(2) Additional Locations. Additional lighting outlets shall be installed in accordance with (A)(2)(a), (A)(2)(b), and (A)(2)(c).

(a) At least one wall switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power. In hallways of 3.0 m (10 ft) or more in length, there shall be a wall switch at no less than two locations, to control the lighting outlet(s).

As used in this subsection, the hall length shall be considered the length along the centerline of the hall without passing through a doorway.

(b) For dwelling units, attached garages, and detached garages with electric power, at least one wall switch-controlled lighting outlet shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade level access. One wall switch shall be located on the interior and no more than 1.8 m (6 ft) from the exterior entrance door. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.

(c) Where one or more lighting outlet(s) are installed for interior stairways, there shall be a wall switch at each floor level, and landing level that includes an entryway, to control the lighting outlet(s) where the stairway between floor levels has six risers or more.

Exception to (A)(2)(a), (A)(2)(b), and (A)(2)(c): In hallways, stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted.

(3) Storage or Equipment Spaces. For attics, underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed where these spaces are used for storage or contain equipment requiring servicing. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing.

Substantiation: Several factors are contributing to a market place shift that is increasing the focus on minimal lighting for the housing market.

First, there is an increased interest in legislation that decreases or eliminates the ability of the local jurisdiction from setting additional requirements for electrical installations. As example, the state of Ohio has a new law that would restrict the local jurisdictions from adding requirements beyond the NEC to insure a uniform business field across the state for construction contractors.

Secondly, the United States has an aging population that has more specific needs. Supporting material show the large increase in the over 65 year old segment of the population and the addresses their need for "light levels in transitional spaces such as hallways and entrance foyers". It also addresses studies that show fall injury in the elderly is caused by environment and rarely by illness. Two environmental factors that are highlighted as Home Hazards Conductive to Falls are: Inadequate illumination and No light switches at room entry.

The 2005 NEC does not allow inspectors to require control for inside lighting at the entrances to the home. It also does not support the inspector if he or she would like to require hallway lighting controls at more than one location in long hallways.

The above proposed changes in 210.70(A) would allow the inspector to require a minimal amount of protection to anyone living in the home and be particularly helpful for older adults. As an added bonus, these changes would prove to be very small to the electrical contractor and, in fact, are already being done by many. This change would level the playing field between contractors that build to minimum and those that consider the welfare of the consumer during installation of the home electrical system.

The language used in this proposed change duplicates sentences already in use in other parts of the code. It also uses the same types of trigger conditions, such as, applying a multiple switching requirement to the same "3.0 m (10 ft) or more" hallway category as the existing receptacle requirement.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The location and number of switches for the general areas described is a design issue and consideration.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-252.

2-255 Log #148 NEC-P02 **Final Action: Reject**
(210.70(A)(1))

Submitter: Victor Timpanaro, Municipal Electrical Inspectors

Recommendation: Revise as follows:

At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom (nearest the point of entry) (and at each point of entry).

Substantiation: The Code has never addressed how close to point of entry a switch shall be installed and where multiple entries exist if more than one switch is required. This language will prevent entry into a dark room looking for switch.

This would also coincide with argument on rule presented at Section 210.70(A)(2)(c).

Panel Meeting Action: Reject

Panel Statement: The location and number of switches for the general areas described is a design issue and consideration.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-252.

2-256 Log #603 NEC-P02 **Final Action: Reject**
(210.70(A)(1))

Submitter: Vincent Metallo, Sr., Baltimore County, MD / Rep. Baltimore County Electrical Inspections
Recommendation: Revise text to read:
(1) Habitable Rooms. At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom. (At least one point of control shall be at the usual point of entry to these rooms.)
Substantiation: Switches can be located in these rooms at any location in the room. This would add a level of safety to entering a room by being able to switch a light on at the entrance. A switch location is mandated in 210.70(3) for spaces that are not used as nearly as much as a habitable room.
Panel Meeting Action: Reject
Panel Statement: The location and number of switches for the general areas described is a design issue and consideration.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: See my explanation of negative for proposal 2-252.

2-257 Log #1432 NEC-P02 **Final Action: Reject**
(210.70(A)(1))

Submitter: Greg Chontow, Hopatcong, NJ
Recommendation: Revise text to read as follows:
~~At least~~ one wall switch ~~controlled lighting outlet~~ shall be installed at every entrance to every habitable room and bathroom controlling at least one wall switch controlled lighting outlet.
Substantiation: This new wording will allow occupants to enter any room at any location and operate a lighting outlet, therefore, preventing an occupant from entering in the dark.
Panel Meeting Action: Reject
Panel Statement: The location and number of switches for the general areas described is a design issue and consideration.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: See my explanation of negative for proposal 2-252.

2-258 Log #1766 NEC-P02 **Final Action: Reject**
(210.70(A)(1))

Submitter: Paul Kennedy, Town of Andover, MA
Recommendation: Revise as follows:
(1) Habitable rooms. At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom. A wall switch is required at each entry of a habitable room or bathroom.
Substantiation: It is common for kitchens, dining rooms, living rooms, bedrooms, bathrooms, garages, basements to have more than one entry/exit. The literal wording of the code permits any of these rooms with two or more entries/exits to be served by a single pole switch located at one of the entries/exits. Most installers opted to design 3- and 4 way switching systems at these locations, however, some spec-built houses have followed the literal text of the code and provided but one wall switch at one location forcing the future homeowner to traverse a dark room fumbling or tripping to locate a wall switch.
Panel Meeting Action: Reject
Panel Statement: The location and number of switches for the general areas described is a design issue and consideration.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: See my explanation of negative for proposal 2-252.

2-259 Log #2693 NEC-P02 **Final Action: Reject**
(210.70(A)(1))

Submitter: Bradley Butters, City of Reynoldsburg, Ohio
Recommendation: Add sentence at end to read: "Bathroom lighting outlets shall not be GFCI protected."
Substantiation: Much bathroom use occurs with the door closed. If the lights are on a GFCI circuit and that GFCI trips, the person is left in the dark. Personal injury can easily occur if the lights go out while showering, shaving, etc. Most bathroom luminaires are not required to be GFCI protected. There is more safety to be lost from bathroom luminaires being GFCI protected than there is to be gained.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree that a bathroom light should be prohibited from being GFCI protected. GFCIs provide additional protection that can be installed if desired.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-260 Log #2548 NEC-P02 **Final Action: Reject**
(210.70(A)(2)(b))

Submitter: Robert P. McGann, City of Cambridge
Recommendation: Revise text to read as follows:
With grade level access at least one wall switch controlled outlet shall be installed to provide illumination on the interior side of the principal entrances.
Substantiation: Documentation of seniors tripping and breaking hips upon entering.
Panel Meeting Action: Reject
Panel Statement: This is a design issue that is impacted by the arrangement and use of the space in the dwelling.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: See my explanation of negative for proposal 2-252.

2-261 Log #3327 NEC-P02 **Final Action: Reject**
(210.70(A)(2) Exception No. 2)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Designate the existing exception as Exception No. 1 and add a second exception as follows:
Exception No. 2 to (c): Where a stairway connects to an unfinished area with no other entryway, the switch at the unfinished floor level shall be permitted to be omitted. For the purposes of this exception, the term "entryway" does not include a means of egress from an unfinished area.
Substantiation: A three-way switch at the end of a stairway into an unfinished area without an exit has no basis in safety, only design, and as such is beyond the scope of the Code. Previous examples cited by the panel in rejecting this over the years, such as darkrooms or work areas, probably would constitute a connection to finished areas if they were extensive. Transient occupants of such spaces would not be turning the light off and leaving themselves in darkness. It is worthy of note that there is no three-way switch rule for hallways of whatever length, or rooms of whatever size and numbers of entries.
This text avoids the terminology "second exit" and instead uses the term "entryway" which is now used in (c) and which excludes basement bulkheads and other locations that are not defined as full entry locations under the model building codes.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the submitter that the rule should be limited to only finished spaces. The space has a wide variety of uses even when it is unfinished, and the three-way switch requirement should apply in all those instances.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-262 Log #834 NEC-P02 **Final Action: Reject**
(210.70(A)(2)c.)

Submitter: Eugene Swisher, City of Tampa / Rep. IBEW Local 915, IAEI Southcoast Division
Recommendation: Revise text to read as follows:
Where one or more lighting outlet(s) are installed for interior or exterior stairways, there shall be a wall switch at each floor level, ground or grade level and landing level that includes an entry way to contact the lighting outlets where the stairway between floor levels or floor and ground or grade levels has six risers or more.
Substantiation: This will close a loophole that appears to allow the required lighting outlet at outdoor entrances of multi-level dwelling units, to not have control of the lighting outlet from each level or grade.
Panel Meeting Action: Reject
Panel Statement: The submitter's revision would literally require a switch at a set of exterior steps from a driveway leading up to a porch. In addition, on multi-family applications, designers typically avoid installing switches and use other control means for this type of application.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-263 Log #1636 NEC-P02 **Final Action: Reject**
(270.70(A)(2)(c.))

Submitter: L. Keith Lofland, International Association of Electrical Inspectors
Recommendation: Add new text as follows:
(c) Where one or more lighting outlet(s) are installed for interior stairways, there shall be a wall switch at each floor level, and landing level that includes an exterior entryway, to control the lighting outlet(s) where the stairway between floor levels has six risers or more.
Substantiation: The current language in the 2005 NEC would require a wall switch at a stairway landing to control the stairway lighting where the stairway landing simply has a half-door leading into an attic area (attic entryway) from the stairway landing. This switch is not needed at the landing in the above described scenario.

Panel Meeting Action: Reject
Panel Statement: Exterior can be interpreted to mean outside entrance only.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-264 Log #400 NEC-P02 **Final Action: Reject**
(210.70(B))

Submitter: J. Carlos Gonzalez, Greiner Electric
Recommendation: Revise text to read as follows:
Guest Rooms. At least one wall switch-controlled lighting outlet ~~or wall switch controlled receptacle~~ shall be installed <u>within 18 in. of each bed or adjacent nightstand</u> in guest rooms in hotels, motels, or similar occupancies.
Substantiation: I have spent the last several months living in a hotel on a work assignment. The problem that I have found is that the wall switches are positioned on the far ends of the room, not anywhere near the beds. When I get up to turn the light on or off in t he middle of the night, I have to walk across the room in the dark. Being in unfamiliar surroundings, it is very easy to trip or run into a piece of furniture. I feel that this presents a hazard to the guests. Therefore, I believe that there should be a wall switch within reach of the guest beds.
Panel Meeting Action: Reject
Panel Statement: This is a design issue that is impacted by the many configurations and arrangements of the space. The panel notes that the submitter's language would only require that the lighting outlet be installed within 450mm (18 in.) of the bed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In addition to the Committee Statement, there is no way to ascertain where a bed will be located during the life of the guest room. The location of the bed may change year-to-year, from one side of the room to another, especially when the hotel comes under new ownership.

2-265 Log #569 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise as follows:
Other than Dwelling Units: For attics and ~~underfloor~~ <u>under floor</u> spaces containing equipment requiring servicing, ~~such as heating, air conditioning, and refrigeration equipment,~~ at least one lighting outlet containing a switch or controlled by a wall switch shall be installed in such spaces. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing.
FPN: Examples of equipment requiring servicing may include but are not limited to heating, air-conditioning, refrigeration, power supplies and transformers used for signage.

Substantiation: This would eliminate any confusion that this code provision is applicable to all concealed installations of equipment requiring servicing and maintenance and not just heating, air-conditioning, and refrigeration equipment.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The current language is applicable to equipment that requires servicing. Heating, air conditioning and refrigeration equipment are provided as a partial list of examples, but is not an all-inclusive list of utilization equipment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-266 Log #658 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Leon Przybyla, Southern Arizona Chapter IAEI
Recommendation: Revise Section 210.70(C) as follows:
(C) Other Than Dwelling Units. For attics, <u>soffits</u> and underfloor spaces containing equipment requiring servicing, such as heating, air-conditioning, ~~and~~ refrigeration equipment, <u>ballasts, transformers, and electronic power supplies,</u> at least one lighting outlet containing a switch or controlled by a wall switch shall be installed in such spaces.
Substantiation: To facilitate servicing as necessary for 600.21.
Panel Meeting Action: Reject
Panel Statement: "Soffit" is too broad of a term and would require lighting outlets in areas where they were not practical. The submitter has not substantiated applying the requirement to parts of the electrical distribution system outlined in the recommendation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-267 Log #664 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Rick Hollander, City of Tucson-Development Services
Recommendation: Revise Section 210.70(C) as follows:
(C) Other Than Dwelling Units. For attics, <u>soffits</u> and underfloor spaces containing equipment requiring servicing, such as heating, air-conditioning, ~~and~~ refrigeration equipment, <u>ballasts, transformers, and electronic power supplies,</u> at least one lighting outlet containing a switch or controlled by a wall switch shall be installed in such spaces.
Substantiation: To facilitate servicing as necessary for 600.21.
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 2-266.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-268 Log #2671 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Bradley Butters, City of Reynoldsburg, Ohio
Recommendation: Add text to extend the last sentence.
... the equipment requiring sevicing <u>in such a manner as to allow one to read the stickers on the equipment without needing an additional light source.</u>
Substantiation: This proposal offers more specific criteria to the term "at or near". Being able to "read the stickers on the equipment" is clear, concise, and addresses the underlying intent that adequate illumination be provided for service and repair of the equipment.
Panel Meeting Action: Reject
Panel Statement: The submitter's recommendation is subjective and would be impractical given the differing locations of the labeling. The panel notes that a flashlight may be a simple solution to the submitter's issue.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-269 Log #2771 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Bradley Butters, City of Reynoldsburg, Ohio / Rep. City of Reynoldsburg, OH - IAEI
Recommendation: Add new sentence at end of paragraph:
<u>These lighting outlets shall not be GFCI or arc-fault protected.</u>
Substantiation: I feel strongly that an underlying principle of the code should be that a person be able to see to get to the location of various devices in order to investigate and attempt to reset the device, especially in an emergency. This can lead to injury due to trips and falls and running into obstacles along with a time delay in true emergencies due to loss of illumination.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with a prohibition of GFCI or AFCI protection for these outlets. If desired by the design, GFCIs or AFCIs can be utilized and provide an increased level of protection.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-270 Log #2772 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Bradley Butters, City of Reynoldsburg, Ohio / Rep. City of Reynoldsburg, OH - IAEI
Recommendation: Insert additional text:
"... at least one lighting outlet <u>consisting of a permanent luminaire</u> containing a switch or controlled by a wall switch...".
Substantiation: This paragraph could be interpreted loosely as allowing a switched receptacle in this application instead of a permanent luminaire. This proposal would remove any ambiguity.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the submitter. The definition of "lighting outlet" in Article 100 is specific as pertains to the requirement for a direct connection of a lampholder or luminaire.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-271 Log #3467 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
210.70(C) Other Than Dwelling Units. For <u>rooftops,</u> attics and underfloor spaces, etc.
Substantiation: Lighting of the work area around rooftop units is being specified by architects and engineers. The NEC should also address this safety issue.

Panel Meeting Action: Reject
Panel Statement: The panel disagrees that lighting on a rooftop should be mandated. In the majority of cases, daylight would provide the needed lighting.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: This proposal should be accepted. I disagree with the panel statement that most service work is performed at times when daylight would provide the needed lighting. Most service work is performed at night when buildings are not occupied, therefore creating an unsafe condition due to inadequate lighting. Persons working on rooftop equipment should be afforded the same level of safety that is provided with the requirements in section 210.70(C).

2-272 Log #3482 NEC-P02 **Final Action: Reject**
(210.70(C))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
210.70(C) Other Than Dwelling Units. For attics <u>, rooftops</u> and underfloor spaces etc.
Substantiation: This article needs rewording because the Architects and Engineers are most often requiring that a luminaire be installed at the HVAC Units located on the roof. The NEC should contain this requirement also since off-hours service calls are often needed during the dark hours and the servicemen need light here just as much as in an attic or other spaces that contain equipment.
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 2-271.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
KING, D.: See my explanation of negative for proposal 2-271.

2-273 Log #3328 NEC-P02 **Final Action: Reject**
(210.70(D) (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Insert an additional lettered subsection (D) to 210.70 as follows:
(D) GFCI Protection of Lighting Outlets in All Occupancies. The operation of a single GFCI device shall not deenergize all lighting outlets in a given area.
Substantiation: The issue addressed in this proposal is surprisingly common, probably due to the prevalence of the use of 210.11(C)(3) Exception in today's built environment. Using this exception means that only one branch circuit typically enters dwelling unit bathrooms. Although there is no loading issue, if the GFCI trips at night, or if there is no window in the room, the room will be completely dark unless at least one light is wired ahead of the GFCI. This is a safety issue. In addition, commercial occupancies unencumbered by 210.11(C) also use the same wiring pattern because of the diminished expenses associated with it. Since a GFCI protected light typically only occurs in a shower stall, this should not generally result in additional lighting outlets. It simply requires mindfulness on the part of the installer as to what loads are on the load side of the GFCI.
Panel Meeting Action: Reject
Panel Statement: The submitter has not substantiated the recommendation for excluding GFCI protection for lighting outlets in all occupancies. This application, however, is not prohibited and would be a design consideration.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 215 — FEEDERS

2-274 Log #1096 NEC-P02 **Final Action: Reject**
(215.2(A)(1))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete second paragraph.
Substantiation: The proposal in the 2004 ROP resulting in this rule did not provide substantiating data re: occurrences of burned open feeder grounded conductors. A 208/120 volt 3 phase 4-wire feeder supplying a large pump motor, one receptacle, and one lighting outlet in a pump room could utilize a No. 12 or 14 AWG grounded (neutral) conductor prior to this rule. Such a pump motor rated 100 HP 3-phase 208 volts (273 amperes) could have the feeder protected by nontime-delay fuses with a rating 300 percent of the motor FLA plus the lighting and receptacle load of 360 voltamps which is 273 x 300 percent plus 3 amperes, or 822 amperes. If 800 ampere fuses are used for feeder protection, the grounded conductor for a 3 ampere load is required to be 1/0 copper or 3/0 aluminum. However, if a separate 2-wire 120 volt circuit with No. 12 or 14 conductors are installed in the same raceway or enclosure, the present requirement is not applicable. The present requirement does not protect grounded conductors of other circuits which may be installed in the same raceway or enclosure and have overcurrent protection rated less than the overcurrent protection of other conductors. This section is only effective where feeder conductors are in a dedicated raceway or enclosure or all other conductors have the same overcurrent protection rating. If the feeder conductors terminate in an auxiliary gutter and taps are installed to supply fused switches or circuit breakers for the example above is the grounded conductor tap required to be 1/0 or 3/0? It is still a feeder conductor up to the line side of the switch or breaker. A 30 ampere switch or 15 or 20 ampere circuit breaker for the lighting and receptacle is not suitable for such conductors. It is not clear if the tap rules are intended to apply. For Proposals 5-63 (250.24) in the 2004 ROP, the panel stated: "There is no technical substantiation to demonstrate that the grounded conductor sized per 250.24 (2002 NEC) is inadequate". Similar statements were made for Proposal 5-70 and 5-71 for service conductors. Although service conductors may not be installed in raceway with non-service conductors they apparently may be installed with other service conductors (230.7) with grounded conductors (neutrals) sized by requirements different than this section (230.31and 230.42) even though "unprotected." 351.72 doesn't have such a requirement for site feeder grounded (neutral) conductors.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the submitter and notes that the grounded conductor will be a fault return path. The panel also notes that Proposal 5-63 from the 2005 cycle substantiated keeping the rule since 250.24 requires that these conductors not be smaller than a 250.66 conductor.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-275 Log #1322 NEC-P02 **Final Action: Accept in Principle**
(215.2(A)(1))

TCC Action: The Technical Correlating Committee understands that the Panel Action located the new Exception between the last two paragraphs in 215.2(A)(1).
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
215.2 Minimum Rating and Size.
(A) Feeders Not More Than 600 Volts.
(1)General. Feeder conductors shall have an ampacity not less than required to supply the load as calculated in Parts III, IV, and V of Article 220. ~~The minimum feeder-circuit conductor size,~~ <u>Feeder-circuit conductors that are connected to an overcurrent device assembly shall have a minimum allowable ampacity,</u> before the application of any adjustment or correction factors, ~~shall have an allowable ampacity~~ not less than the noncontinuous load plus 125 percent of the continuous load.
Substantiation: Confusion reigns as to under what conditions grounded conductors are subject to the same 125 percent of continuous load sizing requirements as are ungrounded conductors. During the 2005 *Code* cycle this issue was addressed for feeders, but action was deferred. ROC No. 2-145 included a lucid, sound "substantiation" that unfortunately was rejected by CMP 2 at that time. Now is an excellent time to re-evaluate that "substantiation" and adopt its intent.
The basis for the 125 percent requirement stems from the manner in which listed overcurrent devices are tested. During continuous load tests of enclosed overcurrent devices, in order to prevent nuisance tripping, it has been found that it is necessary to limit the current to 80 percent of the device's rating. Conductors are sized, then, (1) at 125 percent of the continuous current in accordance with the allowable ampacity determined from Table 310.16, and (2) per the terminal temperature limitations of 110.14(C).
The reality is that the enclosed overcurrent devices rely on the mass of the conductors to act as heat sinks that dissipate excess thermal energy and thereby avoid unacceptable nuisance tripping. Of course, since overcurrent devices cannot distinguish between ungrounded and grounded conductors, in both cases the conductor sizes must be based on calculations that include an additional 25 percent factor when the load is continuous. On the other hand, there is no reason to add 25 percent to the load of a conductor that is not connected to a device that is not subject to nuisance tripping, such as in the case of a grounded conductor connected a neutral terminal bus.
The end result of this proposal is twofold:
1. The additional 25 percent continuous load requirement applies only to conductors, both ungrounded and grounded, that connect to an overcurrent device (unless, of course, the assembly is listed for operation at 100 percent of its rating).
2. Grounded conductors that carry continuous loads and that connect only to neutral buses, or to devices not subject to nuisance tripping, are not required to have their loads increased by 25 percent.

This proposal accomplishes that goal and, in hand with similar proposals made in two other Articles, brings into conformity the requirements for branch circuits (210.19), feeders (215.2), and services (230.42).

Panel Meeting Action: Accept in Principle

Add a new exception to 215.2(A):

Exception: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100% of the continuous and noncontinuous load.

Panel Statement: The panel has accepted the submitters concept but has added the provision as an exception to the main rule. the concern with the submitters proposed language is that it may be interpreted that the conductors have to terminate directly to an overcurrent device.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-276 Log #1493 NEC-P02 **Final Action: Reject**

(215.2(A)(1))

Submitter: Larry T. Smith, National Electrical Seminars

Recommendation: Revise text to read as follows:

(1) General. Feeder conductors shall have an ampacity not less than required to supply the load as calculated in Parts III, IV, and V of Article 220. The minimum feeder-circuit conductor size, before the application of any adjustment or correction factors, shall have an allowable ampacity not less than the noncontinuous load plus 125 percent of the continuous load <u>in accordance with the temperature limitations of 110.14(C)</u> .

Substantiation: Ignoring the temperature rating of equipment is the most common mistake being made in conductor sizing today. Entirely too many wiremen take no notice of the temperature limitations of 110.14(C) when sizing conductors. They disregard the temperature rating of equipment, and use the 90°C column of Table 310.16 when 90°C rated conductors, such as THHN, are being used. The equipment rating will either be 60° or 75°C, not 90°C.

Observing the temperature rating of the equipment is an integral part of sizing feeder conductors; it should be included as a requirement of 215.2(A)(1).

Panel Meeting Action: Reject

Panel Statement: Section 110.14 (C) applies generally to all installations. Adding a direct reference in this section would only confuse users because a reference is not added in every other section of the NEC impacted by 110.14(C).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-277 Log #2837 NEC-P02 **Final Action: Reject**

(215.2(A)(3), FPN 2)

Submitter: Robert P. McGann, City of Cambridge

Recommendation: Make this Fine Print Note into mandatory text.

Substantiation: This is necessary to properly facilitate the operation of overcurrent protection. We are all looking at ways to reduce the number of electrical fires. This will aid us in achieving that goal.

Panel Meeting Action: Reject

Panel Statement: Acceptable voltage drop is a system design issue that may vary with the application and equipment involved.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-278 Log #1722 NEC-P02 **Final Action: Reject**

(215.3(A)(3), FPN 2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"... and where the maximum total voltage drop on service equipment, feeders, and branch circuits (including outlet devices) to the farthest...".

Substantiation: The present wording is based on nominal voltage minus 5 percent reliably being high enough for reasonable efficiency of operation. If voltage predictable runs lower than that, there may be problems. I have encountered service equipment that added 1 percent or more impedance. Standard VD testers, after all, indicate total drop, not merely drop through feeders and branch circuits.

Panel Meeting Action: Reject

Panel Statement: It is not necessary to define possible combinations of equipment to convey the intent of the FPN.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-279 Log #1556 NEC-P02 **Final Action: Accept**

(215.4)

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 215.4:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

215.4 Feeders with Common Neutral <u>Conductor</u> .

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-11.

2-280 Log #2224 NEC-P02 **Final Action: Reject**

(215.4)

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise as follows:

215.4 Feeders with Common Neutral.

~~(A) Feeders with common Neutral Two or three sets of 3-wire feeders or two sets of 4-wire or 5-wire feeders shall be permitted to utilize a common neutral.~~

~~(B) In Metal Raceway or Enclosure.~~ Where installed in a metal raceway or other metal enclosure, all conductors of all feeders using a common neutral shall be enclosed within the same raceway or other enclosure as required in 300.20.

Substantiation: There is no code violation in using a common neutral so the specific provision to use one is not required.

Panel Meeting Action: Reject

Panel Statement: The panel disagrees with the submitter's substantiation. Section 215.4 (A) is the requirement which limits the number of feeders that may share a common neutral.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-281 Log #1557 NEC-P02 **Final Action: Accept**

(215.4(A))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 215.4(A):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(A) Feeders with Common Neutral <u>Conductor</u> . Two or three sets of 3-wire feeders or two sets of 4-wire or 5-wire feeders shall be permitted to utilize a common neutral <u>conductor</u> .

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-11.

2-282 Log #1558 NEC-P02 **Final Action: Accept**

(215.4(B))

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 215.4(B):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(B) In Metal Raceway or Enclosure. Where installed in a metal raceway or other metal enclosure, all conductors of all feeders using a common neutral conductor shall be enclosed within the same raceway or other enclosure as required in 300.20.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-11.

2-283 Log #524 NEC-P02 **Final Action: Accept**

(215.6)

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider this Proposal and correlate with the action taken on Proposal 5-119. This action will be considered by the panel as a Public Comment.

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read:

215.6 Feeder ~~Conductor~~ Equipment Grounding Conductor ~~Means~~ . Where a feeder supplies branch circuits in which equipment grounding conductors are required, the feeder shall include or provide an equipment grounding conductor ~~a grounding means~~ , in accordance with the provisions of 250.134, to which the equipment grounding conductors of the branch circuits shall be connected.

Exception: Where the feeder to a separate building or structure is installed in accordance with 250.32(B)(2), an equipment grounding conductor shall not be installed.

Substantiation: This proposal is an editorial revision to the section and a new mandatory exception is proposed that will correlate with 250.32(B)(2) which includes provisions for feeders installed to supply separate buildings or structures that are not required or permitted to include an equipment grounding conductor where the grounded conductor is used for grounding purposes.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: I agree with the panel action to accept the addition of the exception to 215.6. I disagree with the panel action to accept the deletion of the existing term "grounding means." The submitter of this proposal has not provided any substantiation to revise the term in the present text in 215.6. See my explanation of negative for proposal 2-284.

2-284 Log #1531 NEC-P02 **Final Action: Accept**

(215.6)

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Revise the title of 215.6 as follows:

215.6 Feeder Equipment Grounding Conductor ~~Grounding Means~~

Substantiation: This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. This change clarifies the present requirement in more prescriptive language. The title is changed to more accurately describe the subject of the text.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: I disagree with the panel action to accept this proposal. Documentation included with this proposal indicates that there is not a clear consensus with all the members of the Task Group on the clarity of the recommended revised text by the Technical Correlating Committee. This proposal should be referred back to the Technical Correlating Committee for further consideration.

2-285 Log #1729 NEC-P02 **Final Action: Reject**

(215.9(A) and (B))

Submitter: Paul S. Hamer, Chevron Texaco Energy Research and Technology Company

Recommendation: Renumber the existing wording of 215.9 and include as (A):

(A) Ground-Fault Circuit-Interrupter Protection for 125-volts, Single-Phase Feeders. Feeders supplying 15- and 20-ampere receptacle branch circuits shall be permitted to be protected by a ground-fault circuit interrupter in lieu of the provisions for such interrupters as specified in 210.8 and 590.6(A).

Add a new section (B):

(B) Ground-Fault Circuit-Interrupter System (GFCIS-3Ph) Protection for Three-Phase Feeders.

(1) Supplying Lighting Circuits. Three-phase feeders that supply lighting branch circuits with an operating voltage of more than 150 volts to ground shall be permitted to be protected by three-phase ground-fault circuit-interrupter systems in lieu of the provisions for such systems as specified in 210.8.

(2) Supplying Other Than Lighting Loads. Three-phase feeders that supply loads other than lighting shall be permitted to be protected by three-phase ground-fault circuit-interrupter systems in lieu of the provisions for such systems as specified in 210.8.

Substantiation: See my companion proposal for 210.8(D). If the proposal for 210.8(D) is accepted, this proposal would allow the alternative of using the three-phase ground-fault circuit-interrupter systems for feeders.

This proposal subdivides the existing 215.9 to accommodate single-phase and three-phase ground-fault protection. The proposed title of "A" is added to differentiate the existing "Ground-Fault Circuit-Interrupter Protection for 125-volts, Single-Phase Feeders" from the newly proposed provisions in "B" for "Ground-Fault Circuit-Interrupter System (GFCIS-3Ph) Protection for Three-Phase Feeders."

Provision (B)(1) is proposed to correspond with the proposal submitted for the proposed new section 210.8(D)(1). Provision (B)(2) is added to indicate an allowed option of fusing the three-phase ground-fault circuit-interrupter systems for loads other than lighting, corresponding to the proposed new 210.8(D)(2).

Panel Meeting Action: Reject

Panel Statement: The panel notes that the system recommended by the proposal is currently not prohibited. See the panel action and statement on Proposal 2-88.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-88.

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-6; 2-88; and 2-285.

2-286 Log #3499 NEC-P02 **Final Action: Accept**
(215.10 Exception No. 2)

Submitter: Jim Pauley, Square D Company

Recommendation: Delete Exception No. 2 of 215.10

~~*Exception No. 2: The provisions of this section shall not apply to fire pumps.*~~

Renumber the remaining exceptions

Substantiation: During the 2005 NEC Cycle, CMP 13 added the provision to prohibit GFPE on fire pumps in 695.6(H). The section reads as follows:

(H) Ground Fault Protection of Equipment. Ground fault protection of equipment shall not be permitted for fire pumps.

Since Chapter 6 can supplement or modify requirements in Chapter 2, there is no need for the exception in 215.10. In fact, the exception adds confusion because code users misinterpret that an exception needs to be in Chapter 2 for Chapter 6 to exempt it.

The deletion is consistent with 90.3 and consistent with the TCC direction to not create redundant rules.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-287 Log #3498 NEC-P02 **Final Action: Accept**
(215.10 Exception No. 3)

Submitter: Jim Pauley, Square D Company

Recommendation: Revise Exception No. 3 as shown below:

Exception No. 3: The provisions of this section shall not apply if ground-fault protection of equipment is provided on the supply side of the feeder <u>and on the load side of any transformer supplying the feeder</u> .

Substantiation: This proposal is intended to clear up some misunderstandings of code users relative to this exception. The intent of the exception is to not require GFPE on a feeder disconnect if that feeder has GFPE protection provided upstream. However, some are misinterpreting that GFPE could be provided on the primary of a transformer to meet this exception. Of course, GFPE on the primary side of a transformer provides no equipment protection to equipment connected to the secondary since the ground-fault on the secondary only returns current to the secondary of the transformer.

The revision would serve to make it clear that any GFPE on the supply side used to exempt the feeder disconnect from GFPE must be on the load side of the transformer supplying the feeder.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-288 Log #2149 NEC-P02 **Final Action: Reject**
(215.12)

Submitter: Roger Hewitt, Puget Sound Electrical Apprenticeship / Rep. IBEW LU #46

Recommendation: Delete existing text from 215.12 and replace with:

<u>Feeder conductors shall be identified in accordance with 310.12 (ALL).</u>

Substantiation: Multiple sections of the NEC must now be consulted to ensure proper conductor identification. Combining all conductor identification requirements in one section in Article 310 is logical.

Panel Meeting Action: Reject

Panel Statement: The purpose of Article 215.12 is to outline the requirements for identifying feeders. The appropriate place for listing these requirements is in the section on feeders.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-18; and 2-288.

2-289 Log #3226 NEC-P02 **Final Action: Reject**
(215.12, FPN)

Submitter: Randall Opperman, Jr., O.S.C.Inc.

Recommendation: Add text to read as follows:

FPN: 1) 240 volt single phase systems shall be identified by red and black marking

2) 240 volt 3 phase systems shall be identified by black, orange, and blue mark

3) 480 volt 3 phase systems shall be identified by brown, orange, and yellow markings

4) 208 volt 3 phase systems shall be identified by black, red and blue markings.

Substantiation: 215.12 does not specify how a branch circuit shall be identified, yet it tells us to identify it. An industry standard for electricians who use the NEC should be adopted by adding a FPN to the article.

Panel Meeting Action: Reject

Panel Statement: The submitter's recommended fine print note contains branch circuit identification requirements which are not appropriate in a fine print note. Further the panel notes that the detail of how to identify a circuit is intentionally not specified to allow flexibility for identifying circuits by methods other than color.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-29; and 2-289.

2-290 Log #671 NEC-P02 **Final Action: Accept**
(215.12(C))

Submitter: Jamie McNamara, Hastings, MN

Recommendation: Revise as follows:

215.12 (C) Ungrounded Conductors . Where the premises wiring system has feeders supplied from more than one nominal voltage system, each ungrounded conductor of a feeder, where accessible, shall be identified by <u>phase and</u> system.

Substantiation: To Harmonize with 210.5 (C) and helps installers and maintenance personnel identify what phase and system they will be services or working on and the hazards encountered.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-19; 2-22; 2-24; 2-290; and 2-292.

2-291 Log #2682 NEC-P02 **Final Action: Accept in Part**
(215.12(C))

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Revise text of section as follows:

215.12 Identification for Feeders.

(C) Ungrounded Conductors. Where the premises wiring system has feeders supplied from more than one nominal voltage system, each ungrounded conductor of a feeder, ~~where accessible~~ , shall be identified by system <u>at all termination, connection and splice points</u> . The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means. <u>The means of identification shall be documented in a manner that is readily available or</u> ~~and~~ shall be permanently posted at each feeder panelboard or similar feeder distribution equipment. <u>In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the installation, a cable and conductor numbering system shall be permitted to meet this requirement.</u>

Substantiation: The current wording would require marking of the conductors at every conduit fitting and pull box or any other location where the branch circuit is accessible. The locations where the branch circuit is terminated, connected or spliced are the critical locations where the marking is needed. The revised wording would account for branch circuits installed using cables and branch circuits installed using single conductors in raceways. Many industrial facilities already have rigorous comprehensive cable and conductor labeling/

numbering systems. These systems meet already intent of the requirement and should be allowed. Posting of the numbering system on the equipment is impractical and would be confusing to the people in the field in these kinds of establishments. These labeling/numbering systems are documented on drawings. In these facilities the drawings are used to gain understanding of the installations and how modifications can be made.

Panel Meeting Action: Accept in Part

1. Accept the submitters revision to the first sentence that deletes the words "where accessible" and adds the words "at all termination, connection and splice points".

2. Accept the submitters revision to the second sentence so that the text reads "The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved
means. The means of identification shall be documented in a manner that is readily available or shall be permanently posted at each feeder panelboard or similar feeder distribution equipment."

3. Reject the new last sentence proposed by the submitter.

Panel Statement: The panel has accepted the revision to require the identification only at termination, connection and splice points and notes that the acceptance of 2-290 and 2-292, will add the words "phase and" into the existing sentence.

The panel agrees that the identification should be permitted to be readily available and has accepted the revision as proposed by the submitter. The panel rejects the new last sentence because the identification proposed would already be permitted by the current text as an "approved means". It is not the objective of the panel to detail every possible identification scenario.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

KING, D.: See my explanation of negative vote for Proposal 2-23.

WEBER, R.: I support the action of the panel to accept in part as indicated but do not agree with the acceptance of an alternate method for feeder identification as panels or distribution equipment. By incorporating the text thus allowing **"** documentation in a manner that is readily available <u>or</u> shall be permanently posted" creates a problem. From the inspection community, when the identification of the feeder conductors is indicated by system, it needs to be permanently posted at each panel board or distribution equipment. The proposed change could incorporate a file located somewhere to meet the intent of the language, which can be misplaced or lost and not available at a critical time frame when it is most needed. To be consistent with the proposed change in Proposal 2-24, the term "phase and" by system should be added to the end of the first sentence of the section.

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-23; and 2-291.

2-292 Log #2736 NEC-P02 **Final Action: Accept**
(215.12(C))

Submitter: Jim Pauley, Square D Company

Recommendation: Revise text to read as follows:

(C) Ungrounded Conductors. Where the premises wiring system has feeders supplied from more than one nominal voltage system, each ungrounded conductor of a feeder, where accessible, shall be identified by <u>phase and</u> system. The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted at each feeder panelboard or similar feeder distribution equipment.

Substantiation: The objective of this change is for CMP 2 to clarify whether or not the ungrounded conductors are expected to be identified for just the system or whether the expectation is to have the ID provide both phase and system identification. Under the present requirement, all of the ungrounded conductors of one system could carry the same identification provided it is distinguished from the ungrounded conductors of the other system.

If accepted, the new text will clarify that the expectation is to be able to not only distinguish between the different systems, but between the different phases of the system as well.

A companion proposal has been made to Article 210 for branch circuits.

Panel Meeting Action: Accept

Panel Statement: The panel accepts only the addition of the words "phase and".

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-19; 2-22; 2-24; 2-290; and 2-292.

2-293 Log #2544 NEC-P02 **Final Action: Accept in Principle**
(215.12(C) Exception (New))

Submitter: Timothy D. Curry, Curry Electric, Inc.

Recommendation: Add this language after the section:

<u>Exception: Conductors larger than 6 AWG shall not be required to be marked or identified in conduit bodies that contain no splices or unused hubs.</u>

Substantiation: The definition of "accessible" would include these conduit bodies. It is nearly impossible to install the markings, nor does it serve a purpose to require them in a conduit body where there is no realistic chance that anyone is going to try to splice or tap into the circuit. 250.119(A)(1) Exception uses same logic.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-291.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-30; and 2-293.

2-294 Log #924 NEC-P02 **Final Action: Reject**
(215.12(C), Exceptions Nos. 1, 2, & 3 (New))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise first sentence:

Where the premises wiring system has feeders supplied ~~from more than one nominal voltage~~ system <u>s with different characteristics such as voltages, frequencies, phases, or supplied from different services or separately derived systems,</u> each ungrounded conductor of a feeder, where accessible, shall be identified by system.

<u>Exception No. 1: Conductors for emergency systems.</u>

<u>Exception No. 2: Conductors in busways.</u>

<u>Exception No. 3: Where the Authority Having Jurisdiction determines that a system is sufficiently limited or separated from other systems identification shall not be required.</u>

Substantiation: Different voltages should not be the only criterion for identification. Systems may be supplied from different services, different transformer vaults, local site transformers, batteries, rectifiers, generators, etc. with voltages no different than other systems, where the potential hazard of misconnection is no less. Exception No. 1 is proposed because Article 700 requires identification for emergency systems. It is impractical to identify busway conductors at every plug-in opening and connecting other system conductors to a busway is unlikely. Exception No. 3 provides some relief as for example a large industrial plant has multiple services or transformer vault, etc. and those systems supply limited or designated areas of the premises.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided substantiation to require identification of feeders other than for system and voltage.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-20; and 2-294

ARTICLE 220 — BRANCH-CIRCUIT, FEEDER, SERVICE CALCULATIONS

2-295 Log #1323 NEC-P02 **Final Action: Reject**
(220.3)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows

Calculation	Article	Section (or Part)
Storage-Type Water Heaters	422	422.11(E) , 422.13

Substantiation: The 2005 *Code* accepted a change to 422.13 that requires a fixed storage-type water heater with a capacity of 450 L (120 gal) or less to be considered a continuous load. The change impacts load calculations for branch circuits, feeders, and services. This proposal adds an additional load calculation reference to Table 220.3 to alert *Code* users to that fact.
Panel Meeting Action: Reject
Panel Statement: Loads that are continuous impact the sizing of feeder and service conductors and overcurrent protective devices in accordance with Articles 215 and 230.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-296 Log #477 NEC-P02 **Final Action: Reject**
(220.3(10)(1) and (2))

Submitter: Joseph Rossi, Township of Clinton
Recommendation: Revise text to read:
All receptacles shall be calculated at 180 volt-amperes.
Substantiation: On one of my inspections for a final of a new house, I noticed there were six outlets outside, so I tripped one receptacle and started counting how many did not work, there were a total of 15 outlets that did not work, so I gave the contractor a red sticker and wrote down 15 × 120 = 1800, divide that by 180VA gives you a total of 10 receptacles. When I got back to the office my C.O. said, “You can’t do that, you don’t calculate dwelling units with 180VA, you use 3VA per square foot.” I responded with “Since when is the outside of a house and a garage considered living space?” We then started our debate about calculations. I wrote to the DCA of New Jersey and talked to many of my fellow inspectors about this issue, all tell me to use 3VA/square foot. After a long battle, I finally ceded when my instructor Ben Shedlock said to follow the Code. Mostly everyone I talk to agrees that it would be a poor design to have more than 10 receptacles on a 15-amp breaker, but you cannot do your calculations like that. This is a passion issue for me so please give it some attention.
Panel Meeting Action: Reject
Panel Statement: CMP-2 has addressed this issue many times. The load calculation of 3VA/sqft for dwelling units adequately covers the load calculations for receptacles. Since the Code requires that the receptacles be installed in specific locations and specific spacings in dwellings, it is not intended to limit the number of receptacles on a branch circuit. The panel also notes that 220.14(J) is clear that the receptacle outlets for outdoors and garages are included in calculations.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-297 Log #1149 NEC-P02 **Final Action: Reject**
(220.5)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise heading:
~~SIZE~~ AMPACITY of CONDUCTORS 600 VOLTS, NOMINAL or LESS
Substantiation: Edit. The text relates to AMPACITY; SIZE DOESN’T NECESSARILY RELATE TO AMPACITY COVERING, CONDUCTOR MATERIAL, NUMBER OF CONDUCTORS CAN AFFECT AMPACITY.
Panel Meeting Action: Reject
Panel Statement: Section 220.5 is titled “Calculations” and not “Size of Conductors.”
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-298 Log #3261 NEC-P02 **Final Action: Reject**
(220.5(B))

Submitter: Derek Burk, Frankenmuth, MI
Recommendation: Add text to read as follows:
...permitted to be dropped. All other fractions shall be rounded up to the nearest whole integer.
Substantiation: The code gives instructions for what is to be done with fractions less than.5, but lacks explanation of what to do with other fractions.
Panel Meeting Action: Reject
Panel Statement: The submitter’s substantiation does not provide evidence of a safety concern using the current calculation method. In addition, the calculation method proposed is not prohibited by the code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-299 Log #3622 NEC-P02 **Final Action: Reject**
(220.5(B))

Submitter: Richard W. Becker, Engineered Electrical Systems, Inc. / Rep. IEEE
Recommendation: Revise to read:
“Where calculations result in a fraction of an ampere, the result shall be permitted to be rounded to the nearest whole number.”
Substantiation: The present wording permits a fractional amp less than 0.5 to be dropped but fractions 0.5 through 0.9 must be kept. “Rounding” the smaller fraction but not the larger results in an understatement of the actual amperage.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-298.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
BECKER, R.: This proposal should be accepted. The purpose of the proposal is to correct the error in mathematical/engineering terminology.

2-300 Log #3613 NEC-P02 **Final Action: Reject**
(220.10)

Submitter: Joseph A. Hertel, State of Wisconsin
Recommendation: Substitute the following wording for NEC 220.10:
Branch-circuit loads shall be calculated as shown in NEC 220.12, 220.14 and 220.16 or under the supervision of a professional engineer, architect or designer of electrical systems, circuit load calculations may use a lower unit load than identified in Table 220.12 when energy codes restrict lighting loads to an amount lower than the table values.
Substantiation: Jurisdictions are mandated to adopt energy codes than have unit loads significantly lower than the Table 220.12 values. The increasing energy efficiency of illumination products has not been reflected in the values used for sizing branch circuit loads. While this creates a factor of safety an engineering professional should be able to provide an appropriate size and thereby reduce the installed cost.
Panel Meeting Action: Reject
Panel Statement: The current requirements given in 220.10 are not in conflict with the local energy codes. The calculation methods provided in this article provide a means to determine adequate service and feeder capacities but do not require that this entire capacity be connected.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-301 Log #3117 NEC-P02 **Final Action: Reject**
(Table 220.12)

Submitter: James M. Imlah, City of Hillsboro Building Department
Recommendation: Revise text as follows:
220.12 Lighting Load for Specified Occupancies
A unit load of not less than that specified in Table 220.12 for occupancies specified therein shall constitute the minimum lighting load. The floor area for each floor shall be calculated from the outside dimensions of the building, dwelling unit, or other area involved. For dwelling units, the calculated floor area shall not include open porches, garages, or unused or unfinished spaces not adaptable for future use.

Table 220.12 General Lighting Loads by Occupancy

Type of Occupancy	Unit Load	
	Volt-Amperes per Square Meter	Volt-Amperes per Square Foot
Armories and auditoriums	11	1
Banks	39 [b]	3 1/2 [b]
Barber shops and beauty parlors	33	3
Churches	11	1
Clubs	22	2
Court rooms	22	2
Dwelling units [a]	33	3
Garages-commercial (storage)	6	1/2
~~Hospitals~~ (Patient Care Area)	22	2
Hotels and motels, including apartment houses without provision for cooking by tenants [a]	22	2
Industrial commercial (loft) buildings	22	2
Lodge rooms	17	1 1/2
Office buildings	39 [b]	3 1/2 [b]
Restaurants	22	2
Schools	33	3
Stores	33	3
Warehouses (storage)	3	1/4
In any of the preceding occupancies except one-family dwellings and individual dwelling units of two-family and multifamily dwellings:		
Assembly halls and auditoriums	11	1
Halls, corridors, closets, stairways	6	1/2
Storage spaces	3	1/4

[a] See 220.14(J).
[b] See 220.14(K).

FPN: The unit values herein are based on minimum load conditions and 100 percent power factor and may not provide sufficient capacity for the installation contemplated. General lighting loads determined by 220.12 are in fact minimum lighting loads, and there are no exceptions to these requirements. Therefore, energy saving-type calculations are not permitted to be used to determine the minimum calculated lighting load if they produce loads less than the load calculated according to 220.12. On the other hand, energy saving-type calculations can be a useful tool to reduce the connected lighting load and actual power consumption.

Substantiation: "Hospital" is a portion of a building for the care of 4 or more inpatients. More medical facilities and procedures are being performed outside of the "hospital" environment. There is outpatient care being provided in Oregon by nurse practitioners performing medical exams in local pharmacies. It is imperative this change has to clarify an exam area as a "Patient Care Area" whereever this care is being provided. The reference to hospital does not provide clarity as to the rooms or areas under consideration for minimum lighting and could be overly restrictive due to the expansion of health care facilities outside of the hospital only location. A majority of individuals seeking medical attention are finding the inpatient/outpatient facilities located within their work location or the mall/shopping center down the street. Minimum lighting is a necessity when a person is seeking care in a patient exam room or procedure area. The definition of "Patient Care Area" will provide a clearer understanding of what specific areas shall have a minimum lighting for the care of patients using the definition located in 517.2. The use of "patient care area" provides a clear reference to what rooms would be required to meet the minimum code lighting loads by occupancy, Table 220.12.

Acceptance of this proposal will request the relocation of the definition "patient care area" to article 100 general definitions because of the usage of "patient care area" use in more than one article as per the NFPA style manual.

Panel Meeting Action: Reject

Panel Statement: A patient care area is a portion of a larger occupancy that is currently covered. The quality of lighting in patient care areas is not addressed by the NEC, rather it is a design issue. The FPN proposed by the submitter is not appropriate because it contains requirements. In addition, the panel notes the text in 220.12 already states that the minimum lighting load requirements are designated in Table 220.12.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: It should be noted that the calculations required by the NEC for determining branch circuit load calculations are not directly related to illumination levels (foot candles / Lux) of the room or space, or the minimum lighting necessary to perform certain tasks.

2-302 Log #105 NEC-P02 **Final Action: Reject**
(220.12(B))

Submitter: Patrick Boughan, Clifford, MI

Recommendation: Change the track lighting load requirement from 150 volt-amperes per 600 mm to 250 volt-amperes per meter. The section will then read as follows:

"... an additional load of ~~150~~ 250 volt-amperes shall be included for every meter ~~600 mm~~ (~~2~~ 3 ft) of lighting track or major fraction thereof."

Substantiation: It's about time we start getting serious about conversion to SI units. State this load requirement based upon a standard SI unit and not just a conversion from the previously used customary unit of 2 ft. The actual calculation will change slightly in some cases, but the change will not be significant.

Panel Meeting Action: Reject

Panel Statement: The submitter's substantiation for changing the load value simply because of the SI units, is not sufficient to justify the change.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-303 Log #1324 NEC-P02 **Final Action: Accept**
(220.14(K))

TCC Action: The Technical Correlating Committee understands that the Panel Action was to accept the term "calculated" only, and the remainder of 220.14(K) is unchanged.

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise as follows:

Banks and office buildings. In banks or office buildings, the receptacle loads shall be calculated to be the higher of (1) or (2):

(1) The ~~computed~~ calculated load from 220.14

11 volt-amperes/m 2 or 1 volt-ampere/ft 2 .

Substantiation: This change is proposed to create uniformity with the rest of article 220, after the 2005 NEC decision to replace the word "computed" with "calculated."

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-304 Log #874 NEC-P02 **Final Action: Accept**
(220.14(K)(1))

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Change the term "computed" to "calculated" in (1) to read as follows: "The ~~computed~~ calculated load from 220.14(I)."

Substantiation: This was an apparent oversight in the 2005 rewrite of this section.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-305 Log #1896 NEC-P02 **Final Action: Accept**
(220.14(K)(1))

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Recommendation: In 220.14(K)(1), change "computed" to "calculated" to read as follows:

(K) Banks and Office Buildings. In banks or office buildings, the receptacle loads shall be calculated to be the larger of (1) or (2):

(1) The ~~computed~~ calculated load from 220.14

(2) 11 volt-amperes/m 2 or 1 volt-ampere/ft 2 .

Substantiation: There was a global change accomplished for the 2005 NEC where all of the terms "computed" were changed to the term "calculated." Since the remainder of 220.14 refers to calculations, this subsection should also use the term "calculated" for consistency.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-306 Log #146 NEC-P02 **Final Action: Reject**
(220.22)

Submitter: Ernest Harju, MJ Electric

Recommendation: There's no minimum neutral size for feeders thus a 400 amp load with a 50 amp neutral load only requires a neutral to carry load required. Should be a minimum neutral size.

Substantiation: If you had a 400 amp feeder 3-500 mcm and a 60 amp neutral load the neutral would only be required to be sized for 60 amp not any future loads. In other words 3 - 500s and A # 4 would be ok?

Panel Meeting Action: Reject

Panel Statement: This proposal does not comply with section 4.3.3(C) of the NFPA Regulations Governing Committee Projects, because the wording to be added, revised (and how revised), or deleted is not specified in the recommendation. The submitter is directed to 215.2(A)(1) which specifies the minimum size of a feeder grounded conductor.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-307 Log #3614 NEC-P02 **Final Action: Reject**
(220.40)

Submitter: Joseph A. Hertel, State of Wisconsin

Recommendation: Add an Exception in addition to the requirements of NEC 220.40.

Exception: Under the supervision of a professional engineer, architect or designer of electrical systems, the feeder or service size may be computed using diversity factors or historical data of a similar type of building, other than one- and two-family dwellings.

Substantiation: The calculated service size for a building does not reflect the energy efficient electrical lighting that is being utilized. Traditionally the service or feeder for a building has provided a safty factor that is immense. A professional should be capable of providing by calculation, a service or feeder size that will adequately meet the building as well as the energy code needs. The NEC has not changed to reflect the restrictions placed by energy codes.

Panel Meeting Action: Reject

Panel Statement: The panel disagrees with reducing the minimum load calculations required for feeders and services using energy codes as a basis. The current requirements given in 220.40 are not in conflict with the energy codes. The calculation methods provided in this article provide a means to determine adequate service and feeder capacities but do not require that this entire capacity be connected. In addition, although the energy codes specify loading for general lighting, it is supplemented with task lighting as necessary to accommodate the occupancy. The VA/sqft calculations already accommodate task lighting.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-308 Log #2101 NEC-P02 **Final Action: Reject**
(220.42)

Submitter: Jon Farren, Farren Engineering, Inc.
Recommendation: Revise text to read as follows:
220.42 General Lighting. The demand factors specified in Table 220.42 shall apply to that portion of the total branch-circuit load calculated for general illumination. They shall not be applied in determining the ~~number~~ quantity of branch circuits for general illumination.
Substantiation: The term "quantity" refers to "total amount of", which is the intent of this code section.
Although the term "number" is sometimes used to indicate a quantity, it does not always specify the "total" quantity. The word "number" can also be used to designate a specific object, such as: "circuit number 3, in a 42 circuit panelboard", where 3 is the number and 42 is the quantity or "total amount of".
The word "number" has multiple meanings, the word "quantity" is more specifically related to "total amount of", which is the intent of this code section.
*Also refer to proposal for same word change in 220.11 and 230.2.
Panel Meeting Action: Reject
Panel Statement: The use and meaning of the term "number" is clear in the context used to cover this requirement. Changing "number" to "quantity" does not add any clarity.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-309 Log #1671 NEC-P02 **Final Action: Reject**
(220.43(B))

Submitter: Aleah Thompson, Lightolier
Recommendation: Revise text to read as follows:
220.43(B)
For track lighting in other than dwelling units or guest rooms of hotels or motels, an additional load of 150 volt-amperes shall be included for every 2 ft (600 mm) of lighting track or fraction thereof. Where multi-circuit track is installed, the load shall be considered to be divided equally between the track circuits. The 150 VA rating per 2 ft of track is for load calculations of feeders and services only. It is not intended to limit the number of feet of track on a single branch circuit nor is it intended to limit the number of fixtures on an individual track.
Substantiation: This is a companion proposal to one made to 410.101(B).
During the 1996 NEC code writing cycle, Code Making Panel 18 found it appropriate to add a FPN to clarify that the track lighting load value of 150VA for every 2 ft was intended solely for purposes of load calculation.
During the 1999 code cycle, the track lighting load value was moved from 410-102 to 220.43(B) in an effort to further clarify that the electrical load per length value applied during load calculation and did not limit the length of track that can be run or the number of fixtures allowed. At that time, the FPN specifically stating this was removed.
Unfortunately, the relocation of the track lighting load value 220.43(B) has not prevented continued misinterpretation of the code. Many code users, including Authorities Having Jurisdiction as well as lighting professionals, continue to misinterpret the language in 220.43(B) as limiting the length of track that can be run or the number of fixtures allowed.
The addition of the proposed language to 410.101(B) and 220.43(B) would prevent any further misinterpretation thereby greatly improving the usability of the code.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The placement of this requirement in Part III "Feeders and Service Load Calculations" makes it clear that the rule is not intended to specify branch circuit requirements for track lighting. The panel does not agree with adding statements about what is not intended by a rule when the rule itself is clear.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-310 Log #2873 NEC-P02 **Final Action: Reject**
(220.43(B))

Submitter: Steve Botos, M Retail Engineering Inc.
Recommendation: Add text to read as follows:
...an additional load of 150 VA shall be included for every 600 mm (2 ft) of lighting track or fraction thereof , minus lighting track load (i.e. track heads) connected on branch circuits.
Substantiation: The additional wording will help clear up confusion encountered when dealing with various building departments who sometimes interpret the code to mean 150W/2 ft PLUS whatever track load you have connected on panels branch circuits.
Panel Meeting Action: Reject
Panel Statement: The present wording is clear that the track lighting contribution to a feeder and service Load is determined by the length of the track only.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-311 Log #3175 NEC-P02 **Final Action: Reject**
(220.43(B))

Submitter: Michael S. O'Boyle, Lightolier Division of Genlyte Thomas Group
Recommendation: Revise text to read:
(B) Track Lighting. For track lighting in other than dwelling units or guest rooms or guest suites of hotels or motels, an additional load of 150 volt-amperes shall be included for every 600 mm (2 ft) of lighting track or fraction thereof. Where multicircuit track is installed, the load shall be considered to be divided equally between the track circuits. Where the lighting track is provided with an integral current limiting device, the load shall be calculated based on the maximum volt-ampere rating of the equipment.
Substantiation: Energy codes often require that lighting track be provided with an integral current limiting device. There are Listed track lighting devices, containing supplemental protection, that are used to meet these requirements. When such equipment is provided, the electrical load is controlled by the device and is independent of the linear length of track provided. It is appropriate to use this known value to calculate feeder and service load.
Panel Meeting Action: Reject
Panel Statement: All track lighting is connected to a device that limits current whether supplemental or via the branch circuit protective device. The panel is open to substantiation that provides an alternative to the 150 VA calculation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-312 Log #98 NEC-P02 **Final Action: Reject**
(220.50)

Submitter: Jacob Zervan, Chesaning, MI
Recommendation: Add a new last sentence to the section as follows:
The nameplate ampere or kVA rating shall be used for dwelling load calculations.
Substantiation: For the optional calculation, it is permitted to take the nameplate rating of motors at 100 percent and it is not required to take the largest motor at 125 percent. This same rule should apply to the demand load calculaton of Part III. Inspectors and contractors alike are in question on this issue.
Panel Meeting Action: Reject
Panel Statement: The optional calculations address specific occupancies and installations including dwelling units. The submitter has not provided substantiation that calculating the motor contribution to feeder and service loads at 100% of nameplate is adequate in all instances.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-313 Log #3122 NEC-P02 **Final Action: Reject**
(220.50)

Submitter: Jeremy Enders, East Lansing, MI
Recommendation: Revise the section to clarify the procedure for including motor load in a service calculation to read as follows:
220.50 Motors. Motor loads shall be calculated using the current as determined in accordance with 430.24, 430.25, and 430.26 and with 440.6 for hermetic refrigerant motor compressors. Where the calculated load is to be in volt-amperes, the motor current shall be multiplied by the nominal circuit voltage for single-phase and direct current motors, and by the nominal circuit voltage and 1.73 for three-phase motors.
Substantiation: Personnel trying to learn how to include motor load into a service calculation get confused by this section which leads to Article 430 or Article 440 for the sizing of conductors. Those references simply tell how to determine the motor load current. That needs to be made clear in 220.50 and an additional sentence needs to be added to explain what is to be done with that motor current with respect to determining the load in volt-amperes on a feeder or set of service conductors.
Panel Meeting Action: Reject
Panel Statement: The current 220.50 text is clear in its reference to the calculation methods of Article 430 and 440. The submitter's last sentence is basic electrical theory and better suited to textbooks.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-314 Log #1042 NEC-P02 **Final Action: Reject**
(220.51)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change 100 percent to 125 percent in the text and exception.
Substantiation: 424.3(B) states electric space heating loads are continuous, and requires conductor ampacity not less than 125 percent of the load. 215.2(A)(1) requires feeder ampacity not less than 125 percent of continuous load. Since load may determine minimum ampacity of conductors, a calculated 100 percent can result in conductor ampacity less than 125 percent.

Panel Meeting Action: Reject
Panel Statement: Section 220.51 is written for the purposes of determining a load contribution from electric space heaters used in determining the overall feeder and service load. It is not intended to specify the conductor size of the branch circuit feeding an electric space heater. The submitter has not substantiated that these loads be added into the feeder and service calculations at 125%.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-315 Log #1123 NEC-P02 **Final Action: Reject**
(220.51)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "100 percent" to percent "125" in the text and exception.
Substantiation: Electric space heating loads are continuous loads. Calculations for sizing equipment, conductors, and overcurrent devices are commonly done by calculating continuous loads at 125 percent. If calculated at 100 percent that is the value for the feeder and service per 220.40, and overcurrent devices. Feeders are required to have an ampacity not less than 125 percent of continuous load per 215.2(A), which also applies to service conductors per 230.42. The minimum ampacity of branch circuit conductors calculated at 100 percent as indicated by this section differs from 210.19(A)(1) for continuous loads. 424.3(B) requires conductor ampacity not less than 125 percent. Different requirements may confuse Code users.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree that heating loads should be added into the load calculations at 125%. The 125% sizing applies to the conductors and overcurrent devices. See panel action and statement on Proposal 2-314.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-316 Log #1297 NEC-P02 **Final Action: Reject**
(220.51)

Submitter: Mark Smythe, Smythe Electric Inc./Minnesota State Contract Electrical Inspector
Recommendation: Revise text to read:
Article 220.51 Fixed Electric Space Heating loads shall be calculated at ~~(100)~~ (125) percent of the total connected load. ~~(However in no case shall a feeder or service load current rating be less than the rating of the largest branch circuit supplied.)~~
~~(Exception:)~~ (Exception No. 1)
(Exception No. 2: Where the Service Disconnect Overcurrent Device is listed for operation of 100 percent of its rating, the ampere rating of the overcurrent device shall not be less than the load served.)
Substantiation: A. Statement of Problem,
1. Electric Heating Panels Service Calculations in Northern Minnesota,
a. A large percentage of dwelling units have Dual Fuel and/or Off-Peak systems installed, with fixed electrical space heating installed as the primary heat source.
b. 220.51 allows Fixed Electric Space Heating to be calculated at 100 percent for feeders and services. This would seem to allow 200 amps of actual load on a 200 amp main breaker panel.
c. The UL General Information Directory, (The White Book), under the listing of "Circuit Breakers, Molded-Case and Circuit Breaker Enclosures" states; "Unless otherwise marked, circuit breakers should not be loaded to exceed 80 percent of their current rating, where in normal operation the load will continue for three hours or more." Typically, electric space heating equipment in this cold climate would operate uninterrupted, for more than 3 hours.
d. Referring to 424.3(B), Branch Circuit Sizing; Fixed Electric Space Heating shall be considered a continuous load. Many references in the NEC state that continuous loads (operating 3 hours or more), shall be calculated at 125 percent.
e. There are numerous Electrical Thermal Storage Units being installed in my inspection area with total ampere ratings of, 162 amps, 167 amps, and 197 amps, respectively. Sizing the service entrance conductors and service equipment at 100 percent, as permitted by 220.51, would allow these models to be fed from a standard 200 amp main breaker panel. Many installers would also feed a water heater or dryer from this panel, as the calculated load would still remain under 200 amps, depending on the load of the fixed electric heater.
f. The second sentence of 220.51 states that in no case shall the feeder or service load current rating be less than the largest branch circuit supplied. Sizing the branch circuit feeding the heaters at 125 percent, as required by 424.3(B), would require a larger service for all three of these popular heaters, regardless of whether any additional loads were fed from this 200 amp, main breaker panel.
B. Substantiation for Proposal to change 220.51.
1. Eliminate the confusion in the field by homeowners and contractors when doing service calculations for panels feeding fixed electric space heating. They would not have to refer to 424.3(B) when doing the service calculation for these systems.
2. The last sentence of 220.51 would be redundant and could be eliminated. If the feeders and service calculations were clearly defined to be calculated at 125 percent of the entire electric space heating load, the service and feeders would always be larger than the largest branch circuit fed from the panel. This would clarify what seems to have become a confusing article in the current NEC.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-315.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-317 Log #499 NEC-P02 **Final Action: Reject**
(220.52)

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Delete "dwelling units" from Table 220.42; Delete 220.52(A) and (B). Delete 220.53; Delete 220.54; Delete 220.55; Relocate 220.82 to 220.52 and rewrite as follows:
220.52 Dwelling Units.
(A) Feeder and Service Load. The calculated load shall be the result of adding the loads from 220.52(B) and (C). The neutral load shall be determined by 220.61.
(B) General Loads. The general calculated load shall be not less than 100 percent of the first 10 kVA plus 40 percent of the remainder of the following loads:
(1) A general lighting load as calculated by Table 220.12 and specified in Section 220.14(J).
(2) 1500 volt-amperes for each 2-wire, 20-ampere small appliance branch circuit and each laundry circuit as specified in 210.11(C)(1) and (2).
(3) The nameplate rating of all appliances that are fastened in place, permanently connected, or located to be on a specific circuit, ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and water heaters.
(4) The nameplate ampere or kVA rating of all motors and all low-power-factor loads.
(C) Keep the same.
Substantiation: The purpose of the NEC is to provide the minimum standards for a safe installation. 90.1(C) states that the code is not a design specification. The codes allowance for two different methods for calculating a dwelling service does not meet the purpose or intent of the code. Submitted data has indicated that the standard method for calculating a dwelling service is too conservative for today's high efficiency appliances and equipment used in typical homes. Applying a separate demand factor for general lighting, appliances, and cooking equipment is excessively complicated and unnecessary considering the optional method has been proven to be as effective and adequate with one overall demand applied to all loads added together. This change in no way presents a hazard or decreases any requirements already existing in the NEC. This change will add to the code's consistency and clarity when making service and feeder calculations for dwellings.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with replacing the standard calculation. Either method is permitted provided the parameters outlined in 220.82(A) can be met.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-318 Log #472 NEC-P02 **Final Action: Reject**
(220.52(A))

Submitter: Brian Magilley, Current Electric
Recommendation: Add new text to read:
In each dwelling unit, the load shall be calculated at 1500 volt-amperes for each 2-wire small-appliance branch circuit required by 210.11(C)(1). If more than two small appliance branch circuits are provided then no additional load shall be required.
Substantiation: Adding this sentence will prevent the error people make by adding 1500 volt-amperes for each small appliance branch circuit provided. An example is if you provide three small appliance branch circuits then you calculate the load at 3000 VA and not 4500 VA.
Panel Meeting Action: Reject
Panel Statement: The submitter's substantiation is incorrect in that the 1500VA must be added for each small appliance branch circuit that is installed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-319 Log #606 NEC-P02 **Final Action: Accept in Principle**
(220.52(A))

Submitter: Joseph Michael Whitt, JW Electric
Recommendation: Revise text to read:
Small Appliance Circuit Load. In each dwelling unit, the load shall be calculated at 1500 volt-amperes for each 2-wire small-appliance branch circuit ~~required~~ installed by 210.11(C)(1).
Substantiation: As worded, it could be misunderstood that only two circuits are to be used in the service or feeder calculation due to the fact that 210.11(C)(1) could lead one to believe that only two circuits are required by

the wording “two or more”. By changing the word “required” to “installed”, it would make it clear that any and all circuits being installed as outlined by 210.11(C)(1) would be required to be included in the service or feeder calculation.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Revise the words in the first sentence of 220.52(A) “required by 210.11(C)(1)” to “as covered by 210.11(C)(1)”.

Panel Statement: The panel has revised the text to remove the words “required” and simply reference the coverage of the provision in 210.11(C)(1).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-320 Log #605 NEC-P02 **Final Action: Accept in Principle**

(220.52(B))

Submitter: Joseph Michael Whitt, JW Electric

Recommendation: Revise text to read:

Laundry Circuit Load. A load of not less than 1500 volt-amperes shall be included for each 2-wire laundry branch circuit installed as ~~required~~ <u>installed</u> by 210.11(C)(2).

Substantiation: As worded, it could be misunderstood that only one circuit is to be used in the service or feeder calculation due to the fact that 210.11(C)(2) could lead one to believe that only one circuit is required by the wording “at least one additional”. By changing the word “required”to “installed”, it would make it clear that any and all circuits being installed as outlined by 210.11(C)(2) would be required to be included in the service or feeder calculation.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Revise the words in the first sentence of 220.52(B) “required by 210.11(C)(2)” to “as covered by 210.11(C)(2)”.

Panel Statement: The panel has revised the text to remove the words “required” and simply reference the coverage of the provision in 210.11(C)(2).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-321 Log #111 NEC-P02 **Final Action: Reject**

(220.52(C))

Submitter: Mark Wolschleger, Harbor Beach, MI

Recommendation: Include 1500 VA in a dwelling service or feeder calculation for the loads in the bathroom. The new paragraph (C) will read as follows:

(C) Bathroom Loads: A load of not less than 1500 VA shall be included for one bathroom circuit. This load shall be permitted to be included with the general lighting load and subjected to the demand factors provided in Table 220.42.

See companion proposals for 220.82(B)(2); 220.83(A)(2); 220.83(B)(2); and 220.84(C)(2).

Substantiation: The number and rating of portable electrically operated appliances in the home has increased rapidly over the past few years yet the method used to calculate the minimum demand load for dwellings has not changed. A 100 ampere rated service is permitted for some dwelling units where a higher rated service should be installed. Including 1500 VA in the calculation for one bathroom receptacle circuit at this time is appropriate and will help to reduce the number of undersized services in dwellings.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated that the loading for the bathroom receptacle circuit is not sufficiently covered by the current VA/sqft calculations.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: In all, see Panel Action on related Proposals: 2-321; 2-339; 2-345; 2-347; and 2-350.

2-322 Log #2286 NEC-P02 **Final Action: Reject**

(220.52(C) (New))

Submitter: Andre Michalik, AMI Electric Co. / Rep. ABCD Academy-Instructor

Recommendation: Add a new 220.52(C) to read:

(C) Fastened in Place Kitchen and Bathroom Appliances. A nameplate rating load of kitchen appliances and bathroom appliances, fastened in place, used sporadically for short time as garbage disposal, garbage compactor, hot water dispenser, dishwasher, microwave oven, hydromassage tub, etc. shall be permitted to be included with the general lighting load and subjected to the demand factor provided in Table 220.42.

Substantiation: The appliances stated in proposal are used for a very short time and some of them really add for service or feeder far smaller load than 75 percent allowed in 220.53.

It is obvious, that laundry load, permitted to be included with general lighting load, add more to the service (or feeder) than dishwasher, as well as coffee maker, toaster or mixer connected to the kitchen circuit and also subjected to the “lighting demand factor” add more load to the service than garbage disposal, compactor or hot water dispenser at sink, which are used for shorter time. It is unlikely to use simultaneously most of the mentioned above appliances.

Now, as in NEC 2005, the above-mentioned appliances fallen under “75 percent demand” tremendously and unrealistically increases minimum service (or feeder) ampacity, especially for multifamily dwelling, causing waste of electrical equipment and materials (as copper wires). Proposed demand factor (35 percent or 25 percent) shall be good enough to secure power for some of nameplate rating of the mentioned above appliances.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree with the addition of “kitchen and bathroom appliances fastened in place” being included in the current VA/sq ft calculations. There is no additional loading for a bathroom required in the current text.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-323 Log #123 NEC-P02 **Final Action: Accept in Principle**

(Table 220.54)

Submitter: Joseph Penachio, Joe Penachio Electrician

Recommendation: Revise as follows:

~~12-22 % = 47 - (number of dryer - 11)~~

<u>12-23 47% - 1% for each dryer exceeding 11</u>

~~23 35%~~

~~24 - 42 % = 35% - [0.5 x (number of dryers - 23)]~~

24 - 42 <u>35% - 0.5% for each dryer exceeding 23</u>

Table 220.54 Demand Factor for Household Electric Clothes Dryers

Number of Dryers	Demand Factor (Percent)
1-4	100%
5	85%
6	75%
7	65%
8	60%
9	55%
10	50%
11	47%
~~12 – 22~~	~~% = 47 – (number of dryer – 11)~~
<u>12-23</u>	<u>47% - 1% for each dryer exceeding 11</u>
~~23~~	~~35%~~
~~24 - 42~~	~~% - 35% [0.5 x (number of dryers – 23)]~~
<u>24 – 42</u>	<u>35% - 0.5% for each dryer exceeding 23</u>
43 and over	25%

Substantiation: As an electrical instructor who teaches the masters program, I have experienced that most students are confused and have difficulty understanding how to calculate 12 to 42 dryers as it is written in the code. Expressing 47% minus 1% for each dryer exceeding 11 and expressing 35% minus a half percent of each dryer exceeding 23 is much easier to understand. Also, it conforms to the new user friendly format.

Panel Meeting Action: Accept in Principle

Revise the recommended text to read:

<u>12-23 47% minus 1% for each dryer exceeding 11</u>

24 - 42 <u>35% minus 0.5% for each dryer exceeding 23</u>

Panel Statement: The panel has revised the recommended text for clarity.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

BROWN, L.: (Note to TCC: Change “-” (minus sign) to the word “minus” in all tables, etc.)

2-324 Log #1168 NEC-P02 **Final Action: Reject**

(220.54)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

ELECTRIC CLOTHES DRYERS ~~DWELLING UNITS~~ . The load for ~~household~~ <u>208-volt and 240-volt</u> electric clothes dryers ~~in a dwelling unit~~ shall be either 5000 watts (volt-amperes) or the nameplate rating, whichever is larger, for each dryer served. The use of the demand factors in Table 220.54 shall be permitted <u>for such household electric clothes dryers</u> . (remainder unchanged).

Substantiation: Edit. The present wording does not cover ratings for commercial facilities or common laundry areas in a multifamily dwelling. The dryers should be specified as 208 or 240-volt connected.

Panel Meeting Action: Reject

Panel Statement: Electric Clothes Dryers in other than dwelling units would be calculated at nameplate value. The submitter has not substantiated applying the demand table to dryers in other than dwelling unit installations.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-325 Log #1332 NEC-P02 **Final Action: Accept**
(220.54)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add clarification sentence
220.54 Electric Clothes Dryers — Dwelling Unit(s).
The load for household electric clothes dryers in a dwelling unit(s) shall be either 5000 watts (volt-amperes) or the nameplate rating, whichever is larger, for each dryer served. The use of the demand factors in Table 220.54 shall be permitted. Where two or more single-phase dryers are supplied by a 3-phase, 4-wire feeder or service, the total load shall be calculated on the basis of twice the maximum number connected between any two phases. Kilovolt-amperes (kVA) shall be considered equivalent to kilowatts (kW) for loads calculated under this section.
Substantiation: This proposal is intended to provide similar Code language between 220.54 and 220.55. Because both of these types of equipment are commonly rated in kVA, they should both have similar language.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-326 Log #2153 NEC-P02 **Final Action: Accept**
(Table 220.55)

Submitter: Brian Dolan, IBEW/NECA Technical Institute
Recommendation: Revise text to read:
(3 1/2 ~~to~~ through 8 3/4 kW rating)
Substantiation: This change would clarify the intent that 8 3/4 kW is included in the wording. The new wording would be consistent with the wording in Note 3 to Table 220.55.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: (Note to TCC: This should be done to all tables in the NEC.)

2-327 Log #831 NEC-P02 **Final Action: Reject**
(Table 220.55(C))

Submitter: James Weimer, Eastern Idaho Electrical JATC
Recommendation: Revise text to read as follows:
Maximum Demand (KW) (See Notes)
~~(Not over 12 kW Rating)~~
(8 3/4 Kw through 12 Kw Rating)
Substantiation: When calculating range demands, there is confusion if a 8 3/4 range belongs in Column B or C. We maintain that a 8 3/4 range should be included in Column C.
Panel Meeting Action: Reject
Panel Statement: The panel confirms that 8 3/4 kW ranges are included in Column B. See panel action on Proposal 2-326. The panel notes that Column C applies to all ranges not over 12 kW.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-328 Log #3356 NEC-P02 **Final Action: Reject**
(220.56)

Submitter: Les Tanzer, City of Phoenix
Recommendation: Revise text to read:
220.56 Kitchen Equipment - Other Than Dwelling Unit(s). It shall be permissible to calculate the load for commercial electric cooking equipment, dishwasher booster heaters, water heaters and other kitchen equipment in accordance with Table 220.56. These demand factors shall be applied to all equipment , with resistive loads, that has either thermostatic control or intermittent use as kitchen equipment. These demand factors shall not apply to motor loads, such as refrigerators, freezers, ice-making equipment, or mixers, as well as space heating, ventilating or air conditioning equipment.
Substantiation: There appears some uncertainty as to the kitchen equipment meant to be allowed to be calculated in Table 220.56. If this is misapplied, this can cause a panel or possibly a service to become overloaded. This is intended to clarify that the Table only applies to cooking equipment and not to any and every piece of equipment used in a kitchen. In the past, this has been applied to walk-in refrigerators freezers as well as beverage dispensers and coffee makers. This many items taken at 100 percent rather than 65 percent may adversely effect final load totals for equipment.
Panel Meeting Action: Reject
Panel Statement: This provision is intended to apply to the types of equipment the submitter is trying to limit.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-329 Log #1325 NEC-P02 **Final Action: Reject**
(220.59 (New))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Create new section, 220.59
220.59 Air Conditioning Equipment
Air conditioning loads shall be calculated at 100 percent of the total connected load. However, in no case shall a feeder or service load current rating be less than the rating of the largest branch circuit supplied.
As an alternative to creating a new section, 220.51 could be modified as follows:
220.51 Fixed Electric Space Heating and Air Conditioning Equipment .
Fixed electric space heating and air conditioning loads shall be calculated at 100 percent of the total connected load. However, in no case shall a feeder or service load current rating be less than the rating of the largest branch circuit supplied.
Substantiation: This section is intended to clarify whether the A/C is to be calculated at 100% or 125%. The proposed language is similar to that found in Section 220.51 of the existing *Code* .
Panel Meeting Action: Reject
Panel Statement: Section 220.50 for motor loads already covers the air conditioning requirements by its reference to Article 440.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-330 Log #971 NEC-P02 **Final Action: Reject**
(220.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add “branch circuit” between “a” and “feeder.”
Substantiation: Edit. Branch circuits may supply loads where a selector switch prevents simultaneous operation. 422.12 Exception No. 2 permits air conditioning equipment and central heating equipment on the same branch circuit.
Panel Meeting Action: Reject
Panel Statement: Section 220.60 is applicable to feeders and services, not branch circuits. As such, the revision is not appropriate.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-331 Log #1163 NEC-P02 **Final Action: Reject**
(220.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change “at one time” to “at the same time”.
Substantiation: “One time” is not really the same as “same time”.
Panel Meeting Action: Reject
Panel Statement: The existing text in 220.60 is clear as written. The submitter’s proposal does not add any additional clarity.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: Changing the wording as suggested by the Submitter would completely change the application of this provision.

2-332 Log #1559 NEC-P02 **Final Action: Accept**
(220.61(A))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 220.61(A):
Change “neutral” to “neutral conductor.”
The revised text would appear as follows:
(A) Basic Calculation. The feeder or service neutral load shall be the maximum unbalance of the load determined by this article. The maximum unbalanced load shall be the maximum net calculated load between the neutral conductor and any one ungrounded conductor.
Substantiation: This proposal was developed by the TCC Task Group on the definition of “Neutral Conductor.” Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-11.

2-333 Log #3306 NEC-P02 **Final Action: Reject**
(220.61(A))

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Add text to read as follows:

220.61 Feeder or Service Neutral Load.

(A) Basic Calculation. The feeder or service neutral load shall be the maximum unbalance of the load determined by this article. The maximum unbalanced load shall be the maximum net calculated load between the neutral and any one ungrounded conductor <u>of multiwire branch circuit(s) utilizing the neutral. Circuits not utilizing a neutral (line-line) shall not be required to be included in these calculations.</u>

Substantiation: As worded, 220.61 does not exclude line-line loads from the calculation of neutrals. The word "neutral" is not defined in the National Electrical Code contributing to the lack of clarity in this article. Numerous AHJs take from this article that the neutral must be sized to match the physical size of the largest ungrounded conductor at a service or in a feeder.

Panel Meeting Action: Reject
Panel Statement: The existing text is clear relative to the calculations for feeders. The panel notes that "neutral conductor" is being defined through the work of an NEC TCC task group. Finally, 215.2 (A)(1) defines the minimum size requirements for the ungrounded conductor associated with a feeder or service.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-334 Log #1560 NEC-P02 **Final Action: Accept**
(220.61(A) Exception)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 220.61(A) Exception:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

Exception: For 3-wire, 2-phase or 5-wire, 2-phase systems, the maximum unbalanced load shall be the maximum net calculated load between the neutral <u>conductor</u> and any one ungrounded conductor multiplied by 140 percent.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-11.

2-335 Log #1435 NEC-P02 **Final Action: Reject**
(220.61(C), FPN 3)

Submitter: Wayne H. Robinson, Prince George County Government
Recommendation: Add new text as follows:

<u>FPN No. 3: When determining the neutral load from the basic calculation, continuous rated loads shall be calculated at 125 percent of the noncontinuous net computed load.</u>

Substantiation: To clarify calculating a single phase 3 wire 120/240 volt neutral conductor size or demand load.

It's not clear whether 125 percent should be applied to the neutral load for continuous single phase 3 wire 120/240 loads. 220.61(A) Basic Calculation, second sentence references "The maximum unbalanced load shall be the net calculated load between the neutral and any one ungrounded conductor". Text materials from Code experts calculate the neutral demand in both fashions, either at 125 or 100 percent. I am from the school that single phase 3 wire loads are not required to be calculated at 125 percent because the neutral only carries the unbalanced current as stated in 310.15(B)(4). Hopefully, you can see the dilemma. To resolve the issue, the fine print note would clarify that all continuous neutral loads shall be calculated at 125 percent ending any misconceptions.

Two rules of thought: A store has 120/240 volt single phase service with 10000 VA of continuous lighting load and 6000 VA of receptacle load. What is the total calcualted neutral load?

(Table shown below)

In conclusion it plays havoc with testing. UL White Book (KDER) recommends that "If there is a need for such a conductor a grouning bushing should be used."

NOTE: KDER "covers bonding devices, ground clamps, grounding and boning bushings and locknuts, ground rods, armor grounding wire, protector grounding wire, grounding wedges, ground clips for securing the ground wire to an outlet box, water meter shunts, and similar equipment". Applying all the stanards and knowledge one can teach and apply these applications, it would be helpful and added safety for boning the electrode to enclosures.

Panel Meeting Action: Reject
Panel Statement: Article 220 addresses the calculation and considerations for determining loads. Neutral conductor sizing is addressed in Articles 210 and 215. In addition, the submitter's proposed fine print note is inappropriate because it contains a specific requirement.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-336 Log #1561 NEC-P02 **Final Action: Accept**
(220.61(C)(1))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 220.61(C)(1):

Change "neutral" to "neutral conductor." Also, change "wires" to "conductors."

The revised text would appear as follows:

(1) Any portion of a 3-wire circuit consisting of 2-phase <u>conductors</u> ~~wires~~ and the neutral <u>conductor</u> of a 4-wire, 3-phase, wye-connected system.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

(Proposal 2-335 (Log #1435))

General Load	Neutral Load #1	Neutral Load #2
10000 VA x 1.25 = 12500 VA	10000 x 1.25 = 12500	10000 x 100% = 10000
6000 VA x 1.00 = <u>6000 VA</u>	6000 x 1.25 = <u>6000</u>	6000 x 100% = <u>6000</u>
18500 VA	18500 VA	16000 VA

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Also, the word "wire" should be replaced by "conductor" for consistency.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-11.

2-337 Log #1562 NEC-P02 **Final Action: Accept**

(220.61(C)(2), FPN 2)

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 220.61(C)(2) FPN No. 2:

Change "neutral" to "neutral-conductor."

The revised text would appear as follows:

FPN No. 2: A 3-phase, 4-wire, wye-connected power system used to supply power to nonlinear loads may necessitate that the power system design allow for the possibility of high harmonic neutral- conductor currents.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KING, D.: See my explanation of negative for proposal 2-11.

2-338 Log #1165 NEC-P02 **Final Action: Accept in Principle in Part**

(220.82(B) and (C))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

(B)(2): ~~1500~~ 3000 volt-amperes for ~~each 2-wire~~ the small appliance branch circuit and 1500 volt-amperes for each laundry branch circuit specified in 210.11(C) ~~220.52~~ .

Delete present (B)(3) and (4) and substitute:

(B)(3) The nameplate rating of electric ranges, exhaust hoods, wall-mounted ovens, counter-mounted cooking units, 208-volt and 240-volt clothes dryers, dishwashers, food waste disposers, and storage water heaters. If water heater elements are interlocked so that all elements cannot be energized at the same time, it shall be permitted to calculate only the highest rated element.

(B)(4) The nameplate rating of electrical utilization equipment with or without an integral motor, not covered by (B)(2)(3) and (C), that is permanently connected, fastened in place, or connected to a dedicated circuit.

(B)(5) The current rating required by 430.6(B) for separate motors.

Revise (C)(1): ~~100 percent of the nameplate ratings of the air-conditioning and cooling.~~ The rated load current or the branch circuit selection current, whichever is greater for hermetic refrigerant motor compressors .

Delete (C)(2)

(C)(3) ~~100~~ 125 percent of the nameplate ratings of electric thermal storage...(remainder unchanged).

(C)(4) ~~100 percent of the nameplate ratings of the heat pump compressor and~~ 65 percent of the susupplemental electric heating...(remainder unchanged).

Substantiation: The requirement for 1500 volt-amperes for each small appliance branch circuit tends to discourage installation of more than two circuits. Added circuits provide diversity and reliability without actually increasing load. Apparent intent is not to require additional load for the circuit permitted by 210.52(B)(1) Ex. No. 2. Where more than the minimum required number of circuits is installed for a va/sq ft load no additional load calculation is required. The requirement to provide small appliance and laundry branch circuits is in 210.11(C), not 220.52, and two wire circuits are not required; a multiwire circuit may be used. Appliances of (B) should be specified as electric since gas types may utilize a small appliance branch circuit per 210.52(B)(2) Exception No. 2. Clothes dryers should be designated as 208 or 240-volt, as some operate on 120-volt and are covered by the laundry circuit load. In (B)4.) "all" motors literally includes those integral to appliances such as clothes washers and dryers which are already accounted for. Low-power factor is not defined; what value is "low"? Present wording does not exempt a redundant calculation already covered by (B)(2) and (3). In (C), hermetic type equipment should be specified as gas type and evaporative coolers are covered by the proposed (B)(4). 220.18(A) indicates Articles 430 and 440 apply where motors or air conditioning equipment are the only circuit load. Conductors, overcurrent devices and services are determined by the 125 percent requirement for temporary motor overload conditions and continuous heating load, and the present 100 percent may be misleading, as this articles does not modify Articles 424, 430 and 440.

Panel Meeting Action: Accept in Principle in Part

Revise 220.82(B)(2) of the existing code to read:

(2) 1500 volt-amperes for each 2-wire, 20 ampere small-appliance branch circuit and each laundry branch circuit covered in 210.11(C)(1) and (2).

Revise 220.82(B)(4) to read:

(4) The nameplate ampere or kVA rating of all permanently connected motors not included in (3).

Reject the remaining changes and concepts of the submitter's recommendation.

Panel Statement: The panel does not accept eliminating 1500VA for each small appliance branch circuit. The requirement is to calculate 1500VA for each small appliance branch circuit. The submitter has not substantiated adding on 3000VA.

2) The panel does not accept deleting "2-wire" since multi-wire branch circuits are considered individual circuits in accordance with 210.4.

3) The panel has accepted revising the reference from 220.52 to 210.11(C).

4) The panel does not accept the revisions to (B)(3) because it is not necessary to attempt to list all of the additional equipment. The water heater rating is taken into account by its nameplate rating.

5) The panel has accepted in principle the revision to (B)(4) and has deleted the reference to "low power factor loads" and added wording to make it clear that motors already covered in item (3) are not included.

6) The panel does not accept the revision to (C)(1) since the current wording properly conveys that the nameplate of the AC or cooling system is the reference. Changing the text to "hermetic refrigerant motor compressors" is more confusing to the user.

7) The panel does not accept the revision to 125% for thermal storage. Load calculation and the requirement for overcurrent device and conductor sizing are separate issues.

8) The panel does not accept the revision to (C)(4) because the submitter provided no substantiation to make the change.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-339 Log #112 NEC-P02 **Final Action: Reject**

(220.82(B)(2))

Submitter: Mark Wolschleger, Harbor Beach, MI

Recommendation: Include 1500 VA in a dwelling service or feeder calculation for the loads in the bathroom. The new paragraph (B)(2) will read as follows:

"(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit, ~~and~~ each laundry branch circuit, and one bathroom receptacle branch circuit specified in 220.52."

See companion proposals for 220.52(C); 220.83(A)(2); 220.83(B)(2); and 220.84(C)(2).

Substantiation: The number and rating of portable electrically operated appliances in the home has increased rapidly over the past few years yet the method used to calculate the minimum demand load for dwellings has not changed. A 100 ampere rated service is permitted for some dwelling units where a higher rated service should be installed. Including 1500 VA in the calculation for one bathroom receptacle circuit at this time is appropriate and will help to reduce the number of undersized services in dwellings.

Panel Meeting Action: Reject
Panel Statement: There is no additional load calculation for the bathroom circuit. The load for the bathroom is included in the VA/sqft requirements for the general load calculation. The panel disagrees that not including 1500VA for the bathroom load leads to "undersized services in dwellings".
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-321; 2-339; 2-345; 2-347; and 2-350.

2-340 Log #3249 NEC-P02 **Final Action: Accept in Principle**
(220.82(B)(3))

Submitter: David Filipiak, Sky Electric, Inc.
Recommendation: Revise text to read as follows:
~~...located to be on a specific circuit, ranges, wall mounted ovens...~~
...Located to be on a specific circuit, <u>including ranges,</u> wall-mounted ovens...
Substantiation: The text, as currently written, does not follow standard grammatical format and is confusing to the reader.
Panel Meeting Action: Accept in Principle
Revise 220.82(B)(3) of the existing code to read:
(3) The nameplate rating of:
a. All appliances that are fastened in place, permanently connected, or located to be on a specific circuit.
b. Ranges, wall-mounted ovens, counter-mounted cooking units.
c. Clothes dryers that are not connected to the laundry branch circuit specified in (2).
d. Water heaters
Panel Statement: The panel has revised the language to break up the sentence into a list that will make it clear to the user what is included. The reference to "clothes dryers" was expanded to make it clear that a gas dryer connected to the laundry branch circuit requires no additional calculation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-340; 2-344; 2-349; and 2-351.

2-341 Log #3372 NEC-P02 **Final Action: Accept in Principle**
(220.82(B)(3))

Submitter: Rob Hogan, E. Lansing, MI
Recommendation: Revise text to read:
The nameplate rating of all appliances that are fastened in place, permanently connected, or located to be on a specific circuit <u>including</u> ranges, wall, mounted ovens, counter mounted cooking units, clothes dryers, and water heaters.
Substantiation: Run-on sentence, revise for clarity.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-340.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-342 Log #3123 NEC-P02 **Final Action: Reject**
(220.82(B)(4))

Submitter: Jeremy Enders, East Lansing, MI
Recommendation: Specify how motor load is to be determined and converted from amperes to kVA by revising paragraph (4) as follows:
(4) The nameplate ampere or kVA rating of all motors and of all low-power factors loads <u>in accordance with 220.50</u> .
Substantiation: Typical motors are not rated in kVA and the value must be calculated based on the motor full-load current. The method of determining the motor full-load current is not specified, leaving the decision to a difference of interpretation.
Panel Meeting Action: Reject
Panel Statement: A reference to 220.50 is not needed. The current text is clear that the nameplate rating of the motor is used. The full load current would come from the nameplate.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-343 Log #1897 NEC-P02 **Final Action: Accept in Principle**
(220.82(C)(2))

TCC Action: The Technical Correlating Committee understands that the Panel Action accepts the submitter's recommendation as well as renumbering the items in the existing text.
Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: In 220.82(C)(2), delete the word "heating" and replace it with the words "heat pump" and change the word "a" to "the" to read as follows:
220.82 Dwelling Unit.
(C) Heating and Air-Conditioning Load. The largest of the following six selections (load in kVA) shall be included:
(2) 100 percent of the nameplate rating(s) of the ~~heating~~ <u>heat pump</u> when ~~a~~ <u>the</u> heat pump is used without any supplemental electric heating.
Substantiation: Since the heat pump compressor and related accessories are being used to generate the heat without the use of supplemental electric heating strips, the nameplate rating of the heat pump would be used for the general load. The text as used in the 2005 NEC indicates the use of the heating load on the nameplate when, in fact, there would be no specific heating load for this air conditioner. Changing the existing text to the proposed new text, as suggested in the proposal, will provide the user of this optional calculation method with the proper location of the data necessary for the calculation.
Panel Meeting Action: Accept in Principle
Move existing (3) to become (6) and renumber existing (4), (5), (6) to become (3), (4), (5).
Panel Statement: The panel has reordered the items to place the heat pump requirements sequentially.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-344 Log #1166 NEC-P02 **Final Action: Accept in Principle in Part**
(220.83(A) and (B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise (A)(2):
~~1500~~ <u>3000</u> volt-amperes for ~~each 2-wire~~ <u>the</u> small appliance branch circuits specified in <u>210.11(C)</u> ~~220.52.~~
Delete present (A)(3) and (A)(4) and substitute:
(A)(3) The nameplate rating of electric ranges, exhaust hoods, wall-mounted ovens, counter-mounted cooking units, 208-volt and 240-volt clothes dryers, dishwashers, food waste disposers, and storage water heaters. If water heaters are interlocked so that all elements cannot be energized at the same time it shall be permitted to calculate only the highest rated element.
(A)(4) The nameplate rating of electrical utilization equipment with or without an integral motor, not covered by (A)(2), (A)(3) or (B).
(A)(5) The current rating required by 430.6 for separate motors.
Delete the last sentence of (B) and substitute:
The smaller of the air conditioning or fixed electric space heating load shall be permitted to be excluded from the calculations
Revise formula chart:

LOAD	PERCENT OF LOAD
<u>Hermetic type air</u> conditioning equipment	125 percent of either the rated load Current or branch circuit selection Current whichever is greater
Central electric space heating	~~100~~ <u>125</u>
Less than four-separately controlled Electric space heating units	~~100~~ <u>125</u>

Delete (B)(1,)(2), (3), an (4) and substitute: The loads specified in 220.83(A).
Substantiation: The requirement for 1500 voltamperes for each small appliance branch circuit tends to discourage installation of more than two circuits. Additional circuits provide reliability and diversity without actually increasing load. Apparent intent is not to require additional load for the circuit permitted by 210.52(B)(1) Exception No. 2. If more than the minimum number of circuits is installed for a va/sq ft load no additional load calculation is required. The requirement to provide small appliance and laundry branch circuits is in 210.11(C) not 220.52, and 2-wire circuits are not specified. A multiwire circuit may be used. Appliances of (A)(3) should be specified as electric since gas types may utilize a small appliance branch circuit per 210.52(B)(2), Exception No. 2.
Panel Meeting Action: Accept in Principle in Part
Revise 220.83(A)(2) and 220.83(B)(2) of the present code using the following text in both locations:
(2) 1500 volt-amperes for each 2-wire, 20 ampere small-appliance branch circuit and each laundry branch circuit covered in 210.11(C)(1) and (2).
Replace 220.83(A)(3) and (4) and 220.83(B)(3) and (4) of the current code using the following text in both locations:
(3) The nameplate rating of:
a. All appliances that are fastened in place, permanently connected, or located to be on a specific circuit.
b. Ranges, wall-mounted ovens, counter-mounted cooking units.
c. Clothes dryers that are not connected to the laundry branch circuit specified in (2).
d. Water heaters.
Reject the remaining submitter revisions.

Panel Statement: 1) The panel does not accept eliminating the 1500VA requirement. The submitter has not substantiated adding only 3000VA.
2) The panel does not accept deleting "2-wire" since multi-wire branch circuits are considered individual circuits in accordance with 210.4.
3) The panel does not accept the revision to (A)(3) because it is not necessary to attempt to list all of the additional equipment. The water heater rating is taken into account by its nameplate rating.
4) The panel has accepted revising the reference from 220.52 to 210.11(C).
5) The panel has revised 220.83(A)(3) and (4) and 220.83 (B)(3) and (4) to be consistent and use the same language as 220.82 in the panel action on Proposal 2-340. The panel has accepted the submitter's concept of specifying that clothes dryers not included on the laundry circuit are to be added in the other appliance loads.
6) The panel does not accept the revisions to the table in 220.83(B) because the electric space heating load is intended to be calculated at 100%. Conductor and overcurrent device sizing are handled in Articles 210 and 215. The addition of "hermetic type air" to the table does not add any clarity.
7) The panel does not accept the revision to 125% for thermal storage. Load calculation and the requirement for overcurrent device and conductor sizing are separate issues.
8) The panel does not accept the revision to (C)(4) because the submitter provided no substantiation to make the change.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-340; 2-344; 2-349; and 2-351.

2-345 Log #113 NEC-P02 **Final Action: Reject**
(220.83(A)(2))

Submitter: Mark Wolschleger, Harbor Beach, MI
Recommendation: Include 1500 VA in a dwelling service or feeder calculation for the loads in the bathroom. The new paragraph (A)(2) will read as follows:
"(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit, ~~and~~ each laundry branch circuit, <u>and one bathroom receptacle branch circuit</u> specified in 220.52."
See companion proposals for 220.52(C); 220.82(B)(2); 220.83(B)(2); and 220.84(C)(2).
Substantiation: The number and rating of portable electrically operated appliances in the home has increased rapidly over the past few years yet the method used to calculate the minimum demand load for dwellings has not changed. A 100 ampere rated service is permitted for some dwelling units where a higher rated service should be installed. Including 1500 VA in the calculation for one bathroom receptacle circuit at this time is appropriate and will help to reduce the number of undersized services in dwellings.
Panel Meeting Action: Reject
Panel Statement: There is no additional load calculation for the bathroom circuit. The load for the bathroom is included in the VA/sqft requirements for the general load calculation. The panel disagrees that not including 1500VA for the bathroom load leads to "undersized services in dwellings". See the panel action on Proposal 2-339.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-321; 2-339; 2-345; 2-347; and 2-350.

2-346 Log #975 NEC-P02 **Final Action: Reject**
(220.83(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence:
" <u>It shall be permitted to calculate only</u> the larger ~~connected~~ load of air-conditioning or <u>fixed</u> space heating ~~but not both shall be used.~~
~~Revise chart:~~
LOAD PERCENT OF LOAD
Air-conditioning equipment ~~100~~ Not less than the ampacity values specified in 440.32
and 440.33
Central electric space heating ~~100~~ <u>125</u>
less than four separately controlled fixed ~~100~~ <u>125</u>
Electric space heating units
Substantiation: The text of (B) requires omission of the smaller load which should be permitted but not required. The requirements of Article 440 require ampacities greater than 100 percent of actual load. Electric space heating is continuous load. Ampacities of conductors are based on 125 percent of continuous loads.
Panel Meeting Action: Reject
Panel Statement: The current language is clear and the submitter's revision does not add any clarity. Electric space heating is added at 100% for load calculation purposes. Continuous loads do not increase the amount of load on the circuit.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-347 Log #114 NEC-P02 **Final Action: Reject**
(220.83(B)(2))

Submitter: Mark Wolschleger, Harbor Beach, MI
Recommendation: Include 1500 VA in a dwelling service or feeder calculation for the loads in the bathroom. The new paragraph (B)(2) will read as follows:
"(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit, ~~and~~ each laundry branch circuit, <u>and one bathroom receptacle branch circuit</u> specified in 220.52."
See companion proposals for 220.52(C); 220.82(B)(2); 220.83(A)(2); and 220.84(C)(2).
Substantiation: The number and rating of portable electrically operated appliances in the home has increased rapidly over the past few years yet the method used to calculate the minimum demand load for dwellings has not changed. A 100 ampere rated service is permitted for some dwelling units where a higher rated service should be installed. Including 1500 VA in the calculation for one bathroom receptacle circuit at this time is appropriate and will help to reduce the number of undersized services in dwellings.
Panel Meeting Action: Reject
Panel Statement: There is no additional load calculation for the bathroom circuit. The load for the bathroom is included in the VA/sqft requirements for the general load calculation. The panel disagrees that not including 1500VA for the bathroom load leads to "undersized services in dwellings".
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-321; 2-339; 2-345; 2-347; and 2-350.

2-348 Log #3156 NEC-P02 **Final Action: Accept in Principle**
(Table 220.84)

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Insert lines into table as shown below:

Table 220.84 Optional Calculations — Demand Factors for Three or More Multifamily Dwelling Units

Number of Dwelling Units	Demand Factor (Percent)
3–5	45
6–7	44
8–10	43
11	
12–13	41
14–15	40
16–17	39
18–20	38
21	37
22–23	36
24–25	35
26–27	34
28–30	33
31	32
32–33	31
34–36	30
37–38	29
39–42	28
43–45	27
46–50	26
51–55	25
56–61	24
62 and over	23

Substantiation: Inserting these lines will make the Table easier to use, more "user friendly", and perhaps reduce the possibility of user error.
Panel Meeting Action: Accept in Principle
Panel Statement: The submitter omitted the demand factor for 11 dwellings in his proposal. The panel accepts the concept of adding the lines.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-349 Log #947 NEC-P02 **Final Action: Accept in Principle in Part**
(220.84(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
(2) ~~1500~~ <u>3000</u> volt-amperes for ~~each~~ <u>the</u> 2- ~~wire~~ small appliance branch circuits and <u>1500 volt amperes for</u> the laundry circuit specified in <u>210.11(C)</u> ~~220.52~~ .
Delete present (2), (3), and (4) and substitute:

The nameplate rating of electric ranges, exhaust hoods, wall mounted ovens, counter-mounted cooking units, 208-volt and 240-volt clothes dryers, dishwashers, food waste disposers, and storage water heaters. If water heaters are interlocked so that all elements cannot be energized at the same time it shall be permitted to calculate only the highest rated element. (4) The nameplate rating of electrical utilization equipment with or without an integral motor, not covered by (C)(2), (C)(3), (C)(4), or (C)(5). The current rating required by 430.6 for separate motors.
Revise (5): The larger of the air-conditioning load or the fixed electric space heating load.
Substantiation: The requirement for 1500 volt-amperes for each small appliance circuit tends to discourage installation of more than two circuits. Additional circuits provide diversity and reliability without actually increasing load. Apparent intent is not to require additional load calculation for the circuit permitted by 210.52(B)(1) Exception No. 2. Where more than the minimum number of circuits is installed for a va/sq ft calculated load, no additional load calculation is required. The requirement to provide small appliance and laundry circuits is in 210.11(C) not 220.52, and 2-wire circuits are not specified; a multiwire circuit may be installed. Appliances of (C) should be specified as electric, since gas types may utilize a small appliance circuit per 210.52(B)(2) Exception No. 2. Low power factor is not defined, what values are to be considered low?
Panel Meeting Action: Accept in Principle in Part
Revise 220.84(C)(2) of the present code to read as follows:
(2) 1500 volt-amperes for each 2 wire, 20 ampere small-appliance branch circuit and each laundry branch circuit covered in 210.11(C)(1) and (2).
Replace 220.84(C)(3) of the current code with the following text:
(3) The nameplate rating of:
a. All appliances that are fastened in place, permanently connected, or located to be on a specific circuit.
b. Ranges, wall-mounted ovens, counter-mounted cooking units.
c. Clothes dryers that are not connected to the laundry branch circuit specified in (2).
d. Water heaters.
Replace 220.84(C)(4) of the current code with the following text:
(4) The nameplate ampere or kVA rating of all permanently connected motors not included in (3).
Accept the submitters revision to (C)(5).
Reject the submitters recommendation to delete (2), (3) and (4) and the new language proposed.
Panel Statement: The panel has accepted the revisions to item (2) to be consistent with the revisions taken in 220.82 and 220.83.
The panel has revised item (3) to be consistent with the revisions made in Proposals 2-340 and 2-344. The panel has deleted the reference in the current code to "space heaters", because these items would either be fixed electric space heating that are already covered in (5) or they would be appliances as already covered in new item (3)a. The panel has also deleted the sentence in item (3) regarding water heater elements because the requirement is to add the nameplate rating and the deleted sentence also required adding the nameplate rating.
The panel has revised item (4) to be consistent with the revisions in Proposals 2-338 and 2-344.
The panel did not accept the submitter's revisions to items (3) and (4) because it is not necessary to attempt to list all of the additional equipment. The water heater rating is taken into account by its nameplate rating.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-340; 2-344; 2-349; and 2-351.

2-350 Log #115 NEC-P02 **Final Action: Reject**
(220.84(C)(2))

Submitter: Mark Wolschleger, Harbor Beach, MI
Recommendation: Include 1500 VA in a dwelling service or feeder calculation for the loads in the bathroom. The new paragraph (C)(2) will read as follows:
"(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit, ~~and~~ each laundry branch circuit, and one bathroom receptacle branch circuit specified in 220.52."
See companion proposals for 220.52(C); 220.82(B)(2); 220.83(A)(2); and 220.83(B)(2).
Substantiation: The number and rating of portable electrically operated appliances in the home has increased rapidly over the past few years yet the method used to calculate the minimum demand load for dwellings has not changed. A 100 ampere rated service is permitted for some dwelling units where a higher rated service should be installed. Including 1500 VA in the calculation for one bathroom receptacle circuit at this time is appropriate and will help to reduce the number of undersized services in dwellings.
Panel Meeting Action: Reject
Panel Statement: There is no additional load calculation for the bathroom circuit. The load for the bathroom is included in the VA/sqft requirements for the general load calculation. The panel disagrees that not including 1500VA for the bathroom load leads to "undersized services in dwellings".
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-321; 2-339; 2-345; 2-347; and 2-350.

2-351 Log #3252 NEC-P02 **Final Action: Accept in Principle**
(220.84(C)(3))

Submitter: David Filipiak, Sky Electric, Inc.
Recommendation: Revise text to read as follows:
...located to be on a specific circuit, ranges, wall-mounted ovens...
...located to be on a specific circuit, including ranges, wall-mounted ovens...
Substantiation: The text, as currently written, does not follow standard grammatical format and is confusing to the reader.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 2-349.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
BROWN, L.: In all, see Panel Action on related Proposals: 2-340; 2-344; 2-349; and 2-351.

2-352 Log #2784 NEC-P02 **Final Action: Reject**
(220.84(C)(3) & Table 220.84)

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.
Recommendation: Revise as follows:
220.84 Multifamily Dwelling.
(A) Feeder or Service Load. It shall be permissible to calculate the load of a feeder or service that supplies three or more dwelling units of a multifamily dwelling in accordance with Table 220.84 instead of Part III of this article if all the following conditions are met:
(1) No dwelling unit is supplied by more than one feeder.
(2) Each dwelling unit is equipped with electric cooking equipment.
Exception: When the calculated load for multifamily dwellings without electric cooking in Part III of this article exceeds that calculated under Part IV for the identical load plus electric cooking (based on 8 kW per unit), the lesser of the two loads shall be permitted to be used.
(3) Each dwelling unit is equipped with either electric space heating or air conditioning, or both. Feeders and service conductors whose calculated load is determined by this optional calculation shall be permitted to have the neutral load determined by 220.61.
(B) House Loads. House loads shall be calculated in accordance with Part III of this article and shall be in addition to the dwelling unit loads calculated in accordance with Table 220.84.

Table 220.84 Optional Calculations — Demand Factors for Three or More Multifamily Dwelling Units

Number of Dwelling Units	Demand Factor (Percent)
3 – 5	45
6 – 7	44
8 – 10	43
11	42
12 – 13	41
14 – 15	40
16 – 17	39
18 – 20	38
21	37
22 – 23	36
24 – 25	35
26 – 27	34
28 – 30	33
31	32
32 – 33	31
34 – 36	30
37 – 38	29
39 – 42	28
43 – 45	27
46 – 50	26
51 – 55	25
56 – 61	24
62 and over	23

(C) Connected Loads. The calculated load to which the demand factors of Table 220.84 apply shall include the following:
(1) 33 volt-amperes/m^2 or 3 volt-amperes/ft^2 for general lighting and general-use receptacles.
(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit specified in 220.52 .
(3) The nameplate rating of all appliances that are fastened in place, permanently connected or located to be on a specific circuit, ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers and water heaters , and space heaters . If water heater elements are interlocked so that all elements cannot be used at the same time the maximum possible load shall be considered the nameplate load.
(4) The nameplate ampere or kilovolt-ampere rating of all motors and of all low-power-factor loads.
(5) The larger of the air conditioning load or the space-heating load.
Substantiation: Space heaters are listed in subsection (3) and in subsection (5). This requires that the space heating load be calculated twice when determining the demand. The space heating load only needs to be calculated once. This is effectively done in subsection (5).
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 2-349.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-353 Log #1124 NEC-P02 **Final Action: Accept in Principle**
(Table 220.86)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise heading:
OPTIONAL METHOD - DEMAND FACTORS for FEEDERS AND SERVICE - ~~ENTRANCE~~ CONDUCTORS
Substantiation: Edit. There may be no service-entrance conductors per the FPN to definition of Service-Entrance Conductors, Underground System.
Panel Meeting Action: Accept in Principle
In addition to the submitter's recommendation revise the second paragraph to read: "Feeders and service ~~-entrance~~ conductors..."
Panel Statement: The panel has made the same revision within the body of the requirement as was recommended for the table title.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-354 Log #1164 NEC-P02 **Final Action: Accept**
(Table 220.86)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise heading:
OPTIONAL METHOD - DEMAND FACTORS for FEEDERS and SERVICE ~~ENTRANCE~~ CONDUCTORS
Substantiation: Edit. There may be no service-entrance conductors per the FPN to definition of Service-Entrance Conductors, Underground System.
Panel Meeting Action: Accept
Panel Statement: See the panel action and statement on Proposal 2-353.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-355 Log #3159 NEC-P02 **Final Action: Reject**
(Table 220.86)

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Reformat Table as presented below:

Table 220.86 Optional Method — Demand Factors for Feeders and Service-Entrance Conductors for Schools

Connected Load		Demand Factor (Percent)
First 33 VA/m2	(3 VA/ft2) at	100
Plus overage from 34 to 220 VA/m2	(3 to 20 VA/ft2) at	75
Plus overage from 221 VA/m2 and up	(20 VA/ft2) at	25

Substantiation: Use of the terminology in this Table is often times confusing to some users of the Code. Present use of the term "Over 33 to 220…" actually means from 34 to 220. Present use of the term "Remainder over 220…" actually means from 221 and up. It would seem that this proposal would help make the Code more user friendly, eliminate mental blocks for some users, and eliminate some confusion as to interpretation when this Table is used.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree that the current table is unclear. The submitter's revisions do not improve clarity.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-356 Log #2683 NEC-P02 **Final Action: Reject**
(220.89)

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:
220.89 Optional Calculations - Supervised Industrial Installations
(A) Supervised Industrial Installations - For the purposes of this article, Supervised Industrial Installations shall be defined as installations that meet the following criteria:
(1) Conditions of maintenance and engineering supervision ensure that only qualified persons design, control, monitor and service the system.
(2) The premises has at least one service or feeder that is more than 150 volts to ground and more than 300 volts phase-to-phase.
This definition excludes installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant, substation, or control center.
(B) Demand Factor - For services and feeders in Supervised Industrial Installations, calculation of load shall be permitted to be the product of the total connected load and a demand factor. The demand factor shall be calculated and applied under engineering supervision and meet the following requirements:
(1) The application of a determined demand factor must yield a sufficient ampacity capable of serving the actual operating load.
(2) The allowable demand factor applied shall not be less than 50%
(FPN): Demand factors determined in the design of new facilities can often be validated against actual historical experience from similar installations. Refer to ANSI/IEEE Std. 141, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants and ANSI/IEEE Std. 241 for information on the calculation of loads and demand factor.
Substantiation: The NEC does not specifically recognize the use of demand factors in the determination of loads in Supervised Industrial Installations. As a result, the NEC determined loads for supervised industrial installations are overly conservative and require distribution systems with higher than needed ratings at a significant cost to owners and misuse of finite natural resources. This approach is inconsistent with the historical experience found in both utilities and industry. Utilities have been successfully sizing and operating supplies using a demand-based approach for many years. Industry has also had success applying a demand-based approach in calculating loads when allowed by the authority having jurisdiction. The NEC recognizes this as an issue and partially addresses it in Article 220 by allowing sixteen optional methods that make use of demand factors for determining particular types of loads. However, none of these optional methods address Supervised Industrial Installations. This proposal makes use of concepts the NEC already recognizes such as demand factor, Supervised Industrial Installations (240.21(C)(3)), and engineering supervision to allow an optional demand-based approach in determining loads for Supervised Industrial Installations. The proposed FPN is also currently recognized by the NEC in 430.26. Finally, the NEC was established to safeguard persons and property. Allowing a demand-based approach for sizing feeders in Supervised Industrial Installations does not compromise safety to persons or property. This is due to the overcurrent protection requirements already given in Article 240. Even if misapplied due to calculation errors, the required overcurrent protection will de-energize overloaded equipment ensuring safety of persons and property.
Panel Meeting Action: Reject
Panel Statement: The panel requests that the submitter provide more data to support the new optional calculation for supervised industrial installations. The panel is not sure that the proposed approach will be applicable for all industrial installations.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
NENNINGER, B.: Recognizing the panel's concerns regarding applicability and need for data, a more restrictive text is offered below as an alternate proposal. Using this revised text addresses the applicability concerns of broadly applying the optional calculation to all Supervised Industrial Installations and narrows the scope to only new petroleum and chemical processing plants. Additionally, the requirement that the petroleum or chemical plant qualify as being within a Supervised Industrial Installation per section 240.2 was left to ensure only qualified persons monitor and service the system and that the plant was part of an overall system load that exceeded 2500 kVA. Finally, requiring the use of measured maximum demand data per section 220.87 for two comparable plants in operation was added in establishing a minimum demand factor. In this case, it is difficult to gather comparable load data as was done for the restaurant calculations. In order to achieve a similar approach, one would need to gather extensive data sets around a long list of specific process technologies such as Polyethylene, Chlor-alkali, Polycarbonate, Ethylene, etc. Even then, the process technology used within these processes evolves impacting demand. By employing the conditions in the proposed text, comparable and relevant demand data would be gathered on a case by case basis. Please keep in mind allowing this approach will not compromise safety even if misapplied due to overcurrent protection requirements already required in Article 240.

220.89 Optional Calculations - New Petroleum and Chemical Processing Plants.

(A) Applicability. New petroleum and chemical processing plants must comply with the following criteria in order to apply the optional calculations permitted in 220.89 in lieu of Part III of this article.

(1) Exist for the primary purpose of manufacturing, refining and/or processing petroleum and chemical products.

(2) Qualify as a plant within a Supervised Industrial Installation as defined in Section 240.2.

(3) Have measured demand data obtained in accordance with Section 220.87(1) from at least two existing petroleum or chemical processing plants using similar process technology in the manufacture of the same product(s).

(B) Demand Factor. For services and feeders in Petroleum and Chemical Processing Plants, calculation of load shall be permitted to be the product of the total connected load and a demand factor. The applied demand factor shall meet the following requirements:

(1) Be calculated and applied under engineering supervision.

(2) Yield a sufficient ampacity capable of serving the actual operating load.

(3) Not be less than 50 percent of the connected load.

(4) Not be less than 125 percent times the highest maximum demand determined for two similar plants as measured per Section 220.87(1).

PURVIS, R.: This proposal should have been accepted in Principle with a reference to EEI Statement on Proposal 2-357.

2-357 Log #3191 NEC-P02 **Final Action: Reject**
(220.90 (New))

Submitter: Timothy M. Croushore, Allegheny Power
Recommendation: Please add new section in Part IV Optional Feeder and Service Load Calculations in Article 220 for Engineering Supervision for feeder and service load calculations. The new section is as follows:

220.90 Engineering Supervision. Feeder and service load calculations for new or existing loads shall be permitted by a qualified Registered Professional Engineer. Feeder conductors shall not be required to be of greater ampacity than the service conductors. Service or feeder conductors shall be permitted to have neutral load determined by 220.61.

Substantiation: The purpose of this change is to add the provision for a qualified Registered Professional Engineer to perform load calculations by using either the real and reactive components of load or to use appropriate demand/diversity factors for occupancies of similar loads to calculate the feeder or service load.

The requirement for a qualified Registered Professional Engineer is similar to the requirement in 505.7(A) for the supervision of area classification for hazardous locations. The requirement for a qualified Registered Professional Engineer is the most stringent requirement for the capabilities of the individual calculating load. This Code accepted term is more limiting to the requirements and capabilities of the engineer than does the Code accepted term "engineering supervision." Using this term in this new section will assure that calculations done by the requirements of this section will be done carefully and accurately.

This provision would provide the capabilities of a qualified registered professional engineer to calculate loads using the exact method of adding all of the real (kW) loads together and adding all of the reactive (rkVA) loads together to get a total real (kW) and reactive (rkVA) load. Once the actual real and reactive load is determined, the actual kVA load and power factor can be determined more accurately than just adding the amps of various power factor loads together as is done in the remainder of Article 220.

This provision would also provide the capabilities of a qualified registered professional engineer to calculate loads for similar occupancies in a manner similar to the way 220.87 does for existing loads. The qualified registered professional engineer will have the ability to apply demand or diversity factors to the loads of feeders or services. These demand or diversity factors are for similar uses and similar occupancies and are either published or are available from sources of data that meter such loads. For example, this new section may be used by an electrical engineer with a Professional Engineering registration calculating the service or feeder size for commercial occupancies such as a Lowes, Home Depot, Wal-Mart, Target, K-Mart, Eckerd Pharmacy, Walgreens, Rite-Aid, Krogers, Wynn-Dixie, Supervalue, PetSmart, Petco, etc. and other occupancies based on previously installed and monitored electrical metering. This section could also be used for industrial occupancies under the supervision of a qualified registered professional engineer where demand/diversity factors are accepted by industry for process loads and manufacturing loads.

The last two sentences of this new section are the same as the last two sentences of 220.88 for New Restaurants.

Panel Meeting Action: Reject
Panel Statement: The proposal provides an open ended approach to load calculations and does not establish a minimum level of safety. The current NEC rules adequately provide a minimum load calculation and take into account demand factors for areas that have been shown to be substantiated (e.g. lighting demand in 220.42). See the panel action and statement on Proposal 2-356.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

PURVIS, R.: Proposal 2-357 (Load Calculations) should have been accepted in principal.

The submitter makes two technical points with load calculations:
1. The current load calculations in Article 220 do not differentiate between loads with different power factors or non-coincidental demand. For example, 1 ampere plus 1 ampere plus 1 ampere does not necessarily equal 3 amperes of load current that will be flowing in the circuit.
2. There are diversities and demand factors published in IEEE documents that are applicable to commercial and industiral occupancies that a qualified Registered Professional Engineer could use.

The panel should have accepted the following text for 220.90.

220.90 Engineering Supervision. Feeder and service entrance load calculations for new or existing loads, except for one- and two family dwelling units, shall be permitted by a qualified Registered Professional Engineer. Feeder conductors shall not be required to be of greater ampacity than the service conductors. Service entrance or feeder conductors shall be permitted to have neutral load determined by 220.61.

An exception for one- and two-family dwellings has been added to the original proposed language. There are existing optional service and feeder size calculation methods for one- and two-family dwellings in the current NEC.

2-358 Log #104 NEC-P02 **Final Action: Reject**
(220.100)

Submitter: Matt Knieper, Chesaning, MI
Recommendation: Add the following to the end of the sentence:

"Farm loads shall be calculated in accordance with Part V and applicable sections of Part II and Part III.

Substantiation: Agricultural buildings are being constructed for mixed applications such as a horse barn, riding arena, and living quarters. Some agricultural buildings have a kitchen and lounging area. There are other mixed combinations. Some agricultural buildings for livestock confinement have locker rooms and laundry facilities. It needs to be made clear that applicable sections of Article 220 also apply. It needs to be made clear that 220.50 applies to motor loads. It is not clear to many in the field whether to include the largest motor at 125 percent of full-load current or whether it is included at 100 percent.
Panel Meeting Action: Reject
Panel Statement: The submitter has not substantiated revising the calculations for farm loads. The method of calculation in 220.102(B) would require that all loads be known. If they are not known, then Parts II and III would have to be used.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-359 Log #102 NEC-P02 **Final Action: Reject**
(Table 220.102)

Submitter: Ian Papp, Burton, MI
Recommendation: From the table, delete the phrase "not less than 125 percent full-load current of the largest motor" so the entry reads as follows:

"Loads expected to operate simultaneously, but ~~not less than 125 percent full-load current of the largest motor and~~ not less than the first 60 amperes of load."

Substantiation: This statement is confusing. It is understood that the full-load current of the largest motor is required to be included in the calculation at 125 percent, therefore, if it is already in the calculation, this statement is redundant. See companion proposal dealing with agricultural building load calculations.
Panel Meeting Action: Reject
Panel Statement: The submitter is confusing the general calculation for motor loads with the optional calculation for farms. The statement in the table is correct and requires that the largest motor be added at 125% along with 60 amperes of other load. No demand factor can be applied to this portion of the calculation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-360 Log #103 NEC-P02 **Final Action: Reject**
(220.103)

Submitter: Russell Dones, Saginaw, MI
Recommendation: Revise the first sentence as follows:

"Where there is a common supply for buildings and structures, ~~supplied by a common service,~~ the total load ~~of the farm~~ for ~~service~~ distribution point conductors and ~~service~~ equipment shall be calculated in accordance with ~~the farm~~ any dwelling unit load and demand factors specified in Table 220.103."

Substantiation: The distribution point is not necessarily a service as permitted by 547.9 and needs to be referred to as the distribution point conductors and equipment to avoid confusion. The term "farm"is being removed because the term is too restrictive. Article 547 makes reference to agricultural buildings and not to farm buildings. In some parts of the country, the term "ranch" is used in place of "farm" and the same rules should apply to a ranch as well as a farm. The word "any" was added before dwelling unit because there may be more than one dwelling unit supplied from a central distribution point. As used in the present section, the implication is that only one dwelling unit is included at 100% of the dwelling demand load. Keep in mind, the term "dwelling unit" can be a broad term that can include a multi-family dwelling unit in some cases.

Panel Meeting Action: Reject
Panel Statement: Per Article 100, "service" includes the service drops, service laterals and service entrance conductors. Together these contain the distribution point.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

4-3 Log #912 NEC-P04 **Final Action: Reject**
(220.203 (New))

TCC Action: Although the Technical Correlating Committee does not oppose the panel action to reject this proposal, it does express significant concern and disagreement with the panel statement. The Technical Correlating Committee notes that service laterals and service drops are not, by current definitions and code requirements, limited to the "utility company side of the service point". The service point can be established at many locations, including at the secondary of a utility owned transformer or at a utility owned pole. The conductors from that location to the building can be a service lateral or service drop that is covered by the NEC.

Changing the definitions and related code rules to redefine what customer owned conductors are called would require significant work that is beyond the scope of what can be accomplished in this code cycle and allow for adequate public review.

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:

230.203 Service Lateral Conductors. Service lateral conductors shall be installed in accordance with the applicable requirements of this Code covering the type of wiring method used and shall be limited to the following methods:

1. Rigid metal conduit
2. Intermediate metal conduit
3. Type NUCC conduit
4. Type HDPE conduit
5. Rigid nonmetallic conduit
6. Direct-burial conductors in accordance with 300.50.

Substantiation: Edit. Service incorporating service-lateral conductors do not appear to be covered.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees that this is an "editorial change." Service lateral conductors are on the utility company side of the service point and, based on 90.2(B)(5)(a), are under the exclusive control of an electric utility and not covered by the NEC.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

Comment on Affirmative:

BECK, C.: The aspect of Service and what constitutes Service, and related issues, has been the subject of comments and revisions for the last several code cycles. That issue has also been debated by Panel 1 vis-a-vis the NEC Section 90.2(B)(5) over the last several cycles and it has been finally clarified in the 2005 NEC. The primary concept that has been carried forth is that only utilities supply service. That has also been carried forth is via the definitions of "service drops" and "service laterals". Those too are utility installed extensions of the services. What comes after the "point of delivery" or "the point of connection" are "service entrance conductors" either underground or overhead.

This panel action adds clarity to the above concept, and Panel 4's support and application of those concepts that have previously been put forth (e.g.by CMP1). It is recognized, however, that the definitions of "service entrance conductors" (either overhead and/or underground) need to have the concept of "service Point" added to ensure further clarity of the issue. Also, in NEC Section 230.30, I would recommend that the title be changed from "service lateral" to "service entrance conductor, underground" to insure clarity and support CMP-4's panel statement. Finally, elsewhere in the code, all sections that use the terms "service lateral" or "service drop" need to be reviewed to insure the correctness of the use of those terms or whether actually "service entrance conductor, overhead" or "service entrance conductor, underground" are more appropriate.

The panel has stated its position, but I recommend that the Technical Correlating Committee review the following three definitions in Article 100 and the underlined recommended revisions. I believe they need to be revised as recommended to assure that all the other related definitions are clarified within the NEC. These have not previously been updated to correlate with the other existing definitions related to services and service entrances and capture the above stated intent and understanding in the NEC.

They are as follows:

Service -Entrance Cable. Service -entrance conductors made up in the form of a cable.

Service -Entrance Conductor. The conductors from the service point to the service disconnecting means.

Service Equipment. The necessary equipment, usually consisting of a circuit breaker(s) or switch(es) and fuses(s) and their accessories, connected to the load end of service -entrance conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cutoff of the supply.

Additionally, it is recommended that the Correlating Committee form a Task Group or take other appropriate action with the following sections, as they need to be reviewed and revised as appropriate to assure the concept of services are suppled by utilities and provide clarity of the demarcation between the utility and premises systems. They are:

[Proposal 4-3 (Log #912)]

215.2(A)(2)	230.24	230.54(F)	250.24(A)(2)	490.46
215.2(A)(3)	230.24(B)	230.54(G)	250.24(D)	545.5
220.51, Except.	230.24(B)(1)	230.56	250.24(E)	547.2
220.84(A)(3)	230.24, Ex 3	230.90(A)	250.80	547.9(A)(3)
220.88	230.24, Ex 4	230.90(B)	250.86	553.5
220.102(B)	230.27	230.91	250.92(A)(1)	680.8(A)
220.103	230.28	230.92	250.92(A)(2)	695.6(A)
225.37	230.29	230.93	250.92(B)	695.6(D)
Art 230 Title	230 Part III Title	230.94, Ex 3	250.97	700.12(D)(2)
230.1	230.30	230.94, Ex 4	250.130(A)	800.44(A)(4)
230.2	230.31	230.94, Ex 5	250.130(C)	800.44(B), Ex 2
230.2(C)(2)	230.32	230.200	280.21(1)	810.13
230.3	230.33	230.205(B)	300.5(D)(3)	820.44(B), Ex
230.7	230.50	230.209	Table 310.13	820.44(C), Ex
230.8	230.50(A)	240.2	310.15(B)(6)	820.44(D), Ex 2
230.9	230.50(B)	240.21(D)	338.10(A)	820.47(B), Ex 1
230.9(C)	230.51	250.24(A)	408.3(C)	830.44(C), Ex
230.10	230.54	250.24(A)(1)	430.95	830.47(B), Ex
230 Part II Title				

And, in Annex D:
Example D1(a)
Example D3
Example D4(a)

ROGERS, J.: I agree with the Panel action on this proposal. I do not agree with the Panel statement that service lateral conductors are always on the utility side of the service point. If that were the case there would be no need to define the installation of service lateral conductors in the NEC as 90.2(b)(5) would apply to all installations of service lateral conductors. In reality that is not the case and thus the language in 90.2(b)(5) that states "installations under the exclusive control of an electric utility", in many cases these conductors are installed on private property by private contractors and thus are not under the exclusive control of the electric utility. The definition of service lateral defines these conductors as all conductors between the connection at the street and some type of enclosure at the building served, this definition does not limit these conductors to being utility owned or controlled conductors. The definition of "Service Point" first appeared in the 1993 NEC, there was only one proposal, in the substantiation for that proposal the submitter stated that he was seeking clarity that the "Service Point" could be at locations other than at the building served and that the installation of service lateral conductors could be done by other than the serving utility. CMP 1 accepted that portion of the proposal. Since that time there has been much more clarity on this issue throughout the country and some utility companies define the service point as being at the pole or handhole at the property edge and thus the service lateral is not under their exclusive control and some define the service point at the building meter enclosure or tap box and thus they are responsible for the service lateral conductors. To go backward at this time and state that service lateral conductors are always under the exclusive control of the electric utility would only lead to another round of confusion in an area that has not displayed real confusion since the 1993 NEC. In addition if this interpretation was to be used any requirements for either listing or sizing of these cables installed on private property would be lost. If CMP 4 is truly of the opinion that these conductors are exclusively utility conductors then Part III of Article 230 should be removed. I have provided two drawings, one from the Nstar Electric Installations Requirements book and the other from the National Grid Electric Installations Requirements book. Both of these drawings indicate that the service lateral is installed by private contractors. I am sure that to many this statement seems lengthy for such a minute item, however, it would create enormous problems for installers, inspectors and utility companies if the belief that all service laterals are exclusively under the control of electric utilities was to come about due to this panel statement.

Note: Supporting material is available for review at NFPA Headquarters.

ARTICLE 225 — OUTSIDE BRANCH CIRCUITS AND FEEDERS

4-4 Log #1533 NEC-P04 **Final Action: Accept in Principle in Part (225 and 230)**

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding Task Group for review and comment.

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Revise Articles 225 and 230 as described in the following, relative to the terms bonding and grounding.

225.18 Revise the title of this section as follows:

225.18 Clearance from Grade ~~Ground~~

230.7 Exception No. 1 Revise Exception No. 1 as follows:

Exception No. 1: Conductors or jumpers used for grounding or bonding. ~~Grounding conductors and bonding jumpers.~~

230.24(B) Revise the title of this section as follows:

(B) Vertical Clearance from Grade ~~Ground~~

230.50 : Revise the title and section as follows:

230.50 Protection of Open Conductors and Cables Against Damage — Above Grade ~~Ground~~

Service-entrance conductors installed above grade ~~ground~~ shall be protected against physical damage as specified in 230.50(A) or (B). …

230.82(2) and (3) Revise these sections as follows:

(2) Meters and meter sockets nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded and bonded in accordance with Part V and VII of Article 250.

(3) Meter disconnect switches nominally rated not in excess of 600 volts that have a short-circuit current rating equal to or greater than the available short circuit current, provided all metal housings and service enclosures are grounded and bonded in accordance with Part V and VII of Article 250.

230.95: Revise this section as follows:

230.95 Ground-Fault Protection of Equipment. Ground-fault protection of equipment shall be provided for solidly grounded wye electrical services of more than 150 volts to ground but not exceeding 600 volts phase-to-phase for each service disconnect rated 1000 amperes or more. The grounded conductor for the solidly grounded wye system shall be connected directly to ground through a grounding electrode as specified in 250.50 without inserting any resistor or impedance device.

230.204: Revise the title and section as follows:

(D) Grounding Electrode Connection Isolating switches shall be provided with a means for readily connecting the load side conductors to a grounding electrode when disconnected from the source of supply.

A means for grounding the load side conductors to a grounding electrode shall not be required for any duplicate isolating switch installed and maintained by the electric supply company.

Substantiation: 225.18: This section refers to clearances from grade levels, sidewalks, streets, parking areas, etc or any platform or projection. Although the word "grade" can sometimes mean the "ground" it does not always in this section. The proposed revision is intended to correlate with the revision to the definition of the word "ground" and replace it with a more appropriate word.

230.87 Exception No. 1: The exception is proposed to be revised to have more general coverage of any conductors that would be performing grounding or bonding functions. Grounding conductor is defined in Article 100.

230.24(B): This section refers to clearances from grade levels, sidewalks, streets, parking areas, etc or any platform or projection. Although the word "grade" can sometimes mean the "ground" it does not always in this section. The proposed revision is intended to correlate with the revision to the definition of the word "ground" and replace it with a more appropriate word.

230.50: The proposed revision is to include the function of bonding in this section in addition to grounding since both functions are apparent in these installations.

230.82(2) and (3): The proposed revision is to include the function of bonding in this section in addition to grounding since both functions are apparent in these installations.

230.95: This proposed revision is proposed to be more prescriptive and specific with respect to the connection to ground. This connection is required to be a solid connection to a grounding electrode.

230.204: This proposed revision is proposed to be more prescriptive and specific with respect to the connection to ground. This connection is required to be a solid connection to a grounding electrode.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

Item (1). Accept in principle the proposed change of "ground" to "grade" in the titles to 225.18, 230.24(B), and 230.50. Accept in principle the change of "ground" to "grade" to the text in 230.50. See the panel action in Proposals 4-12 and 4-40 and (log #CP400.)

Item (2). Reject the change of "Grounding conductors and bonding jumpers" to "Conductors or jumpers used for grounding and bonding" in 230.7, Exception No. 1.

Item (3). Reject the text changes to Section 230.204(D).

Item (4). Change the proposed text in 230.82(2) and (3) to "…grounded in accordance with Part VII and bonded in accordance with Part V of Article 250," to read as follows:

230.82 Equipment Connected to the Supply Side of Service Disconnect

(1). [remains unchanged from the NEC 2005 text]

(2). Meters and meter sockets nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with VII and bonded in accordance with Part V of Article 250.

(3). Meter disconnect switches nominally rated not in excess of 600 volts that have a short-circuit current rating equal to or greater than the available short circuit current, provided all metal housings and service enclosures are grounded and bonded in accordance with Part V and VII of Article 250.

[the remainder of this section is not changed by this proposal]

Item (5). Change the proposed text in 230.95 by adding the word "system" after the word "electrode" and before the word "as" to read as follows:

230.95 Ground-Fault Protection of Equipment. Ground-fault protection of equipment shall be provided for solidly grounded wye electrical services of more than 150 volts to ground but not exceeding 600 volts phase-to-phase for each service disconnect rated 1000 amperes or more. The grounded conductor for the solidly grounded wye system shall be connected directly to ground through a grounding electrode system as specified in 250.50 without inserting any resistor or impedance device.

Panel Statement: Item (1). See the panel action in Proposals 4-12 and 4-40 and (log #CP400.) The proposed changes from "ground" to "grade" in 225.18, 230.24(B), and 230.50 were really outside the scope of the Task Group dealing with grounding and bonding issues. However, the text within the sections used the term "grade." The task group seemed to feel this change was necessary due to a new definition proposed for the term "ground" in Article 100, but this definition has existed for many Code cycles, as has the term "ground" for measurement purposes in Article 225 and 230.

Item (2). The proposed change to 230.7, Exception No. 1, was rejected, since the existing text more adequately and specifically describes grounding conductors and bonding jumpers that are permitted in the same raceways with service conductors. The proposed text can cause confusion, since "grounding jumpers" is not a phrase normally used in conjunction with service conductors in a raceway, but "bonding jumpers" certainly is a phrase commonly used. The proposed text applies "conductors and jumpers" to both "grounding and bonding" at the end of the sentence.

Item (3). The proposed text to Section 230.204 has been rejected, since the purpose of this requirement in the existing text is to provide a grounding point for connection of a grounding or bonding jumper during servicing of the system in conjunction with a lock-off, tag-off procedure. This point of connection provides an accessible point of connection from the isolating switch to a grounding point in close proximity to the switch. Connection to a grounding electrode is not necessary in this case, since the grounding point may be a ground mat installed as part of the substation. Ground mats are not one of the recognized grounding electrodes as described in 250.50 and 250.52 but can be used to ground the system on a temporary basis as required in OSHA 1910.269M.

Item (4). The changes made to the proposed text in 230.82(2) and (3) more accurately describe the specific parts for both grounding and bonding with each specific part immediately following the term as applied.

Item (5). Adding "system" to the proposed text in 230.95 requires compliance with installing a grounding electrode system as required by 250.50 and not connection just to a single electrode as the proposed text would imply.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-5 Log #3186 NEC-P04 **Final Action: Reject**

(225.1, FPN)

Submitter: Donald Cook, Shelby County Development Services

Recommendation: Delete this FPN completely.

Substantiation: A review of 90.2 (A) and (B), the Article 100 definition of service point, the complete NEC text and specifically the text in Articles 225, and 230 leads one to believe that electrical wiring and equipment located on the load side of the service point is under the scope of the NEC. This FPN, which based on the text in 90.5(C) is not enforceable, provides no value to the NEC user.

If industry believes information in the NESC is necessary for installations on the load side of the service point, that information should included as requirements of the NEC, not as a FPN. As an FPN, it only adds to the confusion of designers, installers, and AHJ's working on installations working on premises wiring.

Panel Meeting Action: Reject

Panel Statement: As mentioned in the proposal substantiation, this is a fine print note and, as stated in Section 90.5(C), it is for added information. The purpose is to point out that more information on high voltage installations is available by accessing the National Electrical Safety Code (the utility company standard from IEEE). A similar fine print note referencing the National Electrical Safety Code can be found in 110.71 for additional information on the loading that can be expected to bear on underground manholes. This added information should not be confusing to anyone dealing with premises wiring for high voltage systems.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 9 Negative: 1

Explanation of Negative:

NAUGHTON, J.: I agree with the submitter, removing this FPN from the Scope would eliminate any conflicting confusion.

Comment on Affirmative:

ROGERS, J.: I agree with the Panel action on this proposal. I do not totally agree with the Panel statement. The term confusion may not be the correct term, perhaps the term conflicting requirements would be better as NEC requirements are not in harmony with NESC requirements for electrical installations over 600 volts that are installed on the customer side of the service point. As an AHJ, there are many times problems in convincing local jurisdictions to adopt the most recent edition of the NEC, to add the NESC to this creates even more of a dilemma. The NEC is silent on many of these requirements and this has become very problematic in recent years as throughout the country installations that were formerly installed and maintained by electric utilities are now being installed or maintained by private contractors as premises wiring beyond the service point.

4-6 Log #2428 NEC-P04 **Final Action: Reject**

(225.4 Exception)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Delete the following words from Section 225.4, Exception, "and grounded circuit conductors".

Substantiation: It is unnecessary to remind you, the panel members but for the reader of the ROC it is important to re-state the **PURPOSE OF THE NEC: It is the safeguarding of persons from hazards arising from the use of electricity.**

By continuing to allow the "grounded circuit conductors", commonly referred to as the neutral to be installed bare allows the neutral current to flow uncontrolled over the earth. This uncontrolled flow of "stray current" results in the potential to harm not only humans but to cows and pigs.

When a person reports to me that, they are getting an electric shock from their swimming pool, hot tub, shower or a dairy farmer with cows, the first thing I determine is if the neutral conductors within the structure is free from neutral conductor-to-earth faults. This eliminates the owner of the property from contributing to the problem. The NEC by continuing to allow the installation of bare grounded circuit conductors, the neutral, contributes to the flow of uncontrolled dangerous and hazardous neutral currents over the earth.

There are three (3) sources of these dangerous and hazardous stray currents. One is from stray bare grounded circuit conductors (NEC) originating from the utility's secondary power, the service entrance source. Another source 2) is the bastardized transformer's high voltage primary neutral to secondary neutral connection.

The third source is multigrounded neutral electrical distribution system neutral connection to earth four (4) times per mile. The stray current either enter the bare neutral conductor and travel back to the substation or conversely the stray current flows into the bare grounded conductor and enters the earth on its way back to the substation. In either case, the dangerous and hazardous stray current is flowing one way or the other and the NEC allowed bare neutral conductor is in the circuit.

EPRI: "Created by the nation's electric utilities in 1973, EPRI is one of America's oldest and largest research consortia, with some 700 members and an annual budget of about $ 500 million. Linked to a global network of technical specialists, EPRI scientists and engineers develop innovative solutions to the world's toughest energy problems while expanding opportunities for a dynamic industry."

An EPRI document states that 40 to 60 percent of the neutral return current in a multigrounded neutral electrical distribution system returns over the earth. We have measured 88 percent of the neutral current returning over the earth. This dangerous and hazardous stray current will use the bare grounded circuit conductor that is presently allowed by the NEC to either flow from the multigrounded neutral electrical distribution system into the earth on its way back to the substation or will flow onto the bare neutral conductor, the neutral, and onto the multigrounded neutral electrical distribution system in order to get back to the substation.

I suggest that for your own edification you obtain the proposal to eliminate the equipotential planes in 547.2 and 547.10. In addition, if you are interested in more information on multigrounded neutral electrical distribution system see the technical paper titled, "The Hazardous Multigrounded Neutral Distribution System and Dangerous Stray Currents", Copyright Material IEEE Paper No. PCIC-03-03.

Zipse's Law states "In order to have and maintain an electrical installation safe from electrical shocks and to prevent electrocution from stray current: All continuously, flowing current shall be contained within a conductor, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth."

This is accomplished within industrial facilities since they do not make the bastardized electrical transformer connection between the primary neutral and the secondary neutral, which allows the continuous flow of dangerous and hazardous high voltage neutral current over the earth and ground conductors. The industrial facilities keep the neutral insulated and carry the ground conductor with the phase conductors.. (See IEEE Standard 141, "Electrical Power Distribution", The Red Book.

Panel Meeting Action: Reject

Panel Statement: This exception is necessary, since it recognizes that an uninsulated grounded conductor is permitted to be bare or covered in other articles of the NEC. For example, Article 396 permits messenger-supported wiring to have an uninsulated or covered messenger wire to support insulated conductors. Another example of a wiring method permitting an uninsulated grounded conductor is found in 338.10(B)(2), Exception, covering service entrance cable (Type SE cable).

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-7 Log #1563 NEC-P04 **Final Action: Accept**

(225.7(B))

TCC Action: The Technical Correlating Committee directs that this proposal be referred to the Technical Correlating Committee Neutral Conductor Task Group for information.

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 225.7(B):

Change second appearance of "neutral" to "neutral conductor"

The revised text would appear as follows:

(B) Common Neutral. The ampacity of the neutral conductor shall not be less than the maximum net computed load current between the neutral <u>conductor</u> and all ungrounded conductors connected to any one phase of the circuit.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Panel Statement: The use of the term "neutral conductor" as provided by the two definitions in the substantiation by the task group does not seem to fit within the proposed neutral point since the neutral is required to be sized to not less than the maximum net computed load current between the neutral and all ungrounded conductors connected to any one phase of the circuit. The definition proposed by the task group does not recognize a neutral, as a common point to a single-phase conductor as covered in Section 225.7(B) so the substantiation does not fit the proposed text. However, the existing text on this type of neutral has been in the NEC for many Code cycles.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

BECK, C.: The Panel action to Accept is correct. However, the Panel Statement does not clearly indicate that while the Panel agrees with the proposed change, it does not agree with the proposed definitions for the reasons stated in the Panel Statement. The Technical Correlating Committee should refer the Panel Action and Statement to other CMPs affected by this definition.

4-8 Log #2128 NEC-P04 **Final Action: Reject**
(225.10)

Submitter: Russell LeBlanc, Peterson School of Engineering

Recommendation: Change heading to:

Wiring on Buildings <u>and Other Structures.</u>

Insert: <u>and other structures</u> after the word "buildings" in the first sentence.

Substantiation: The same action needs to be taken in several sections of this article. See 225.11, 225.15, 225.16(A) and (B), 225.19 heading, 225.21.

Panel Meeting Action: Reject

Panel Statement: The proposal does not meet the requirements of Section 4-3.3 of the Regulations Governing Committee Projects. The submitter has not included a statement of the problem in his substantiation, and the recommendation to take similar action on the other sections referenced must be done in individual proposals for those sections. The submitter did not provide the location where the text is to be inserted in the other sections noted in the substantiation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-9 Log #2204 NEC-P04 **Final Action: Reject**
(225.10)

Submitter: Kyle Cope, Prysmian Cables and Systems

Recommendation: Revise as follows:

"... as open wiring on insulators, as multiconductor cable, <u>as Type PA cable</u> , as Type MC cable...".

Substantiation: Statement on Problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection, i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA cable offers enhanced mechanical protection over Type MC cable for this application. See test data provided. A UL Fact-Finding Study comparing the subject cable to Type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This cable and the acceptance of a special article covering this type of cable is under the jurisdiction of Panel 7 and must first be accepted by Panel 7 before it is included in the NEC. In addition, the UL fact-finding report should be submitted as part of the substantiation for acceptance of the cable to help determine the acceptability and the installation criteria for the cable.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-10 Log #3472 NEC-P04 **Final Action: Accept**
(225.10)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read:

225.10 Wiring on Buildings. The installation off outside wiring on surfaces of buildings shall be permitted for circuits of not over 600 volts, nominal, as open wiring on insulators, as multiconductor cable, as Type MC cable, <u>as Type UF cable,</u> as Type MI cable, etc.

Substantiation: This article needs rewording in order to clarify that UF cable is allowed to be installed outdoors on the building surface.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ODE, M.: Adding "Type UF" cable to the acceptable wiring methods in 225.10 for wiring on buildings not does not absolve the user from complying with the requirements in Article 340.

4-11 Log #570 NEC-P04 **Final Action: Reject**
(225.12)

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona

Recommendation: Revise as follows:

~~Open~~ Conductor Supports. ~~Open conductors shall be supported on glass or porcelain knobs, racks, brackets, or strain insulators~~ . Cables or individual open-conductors shall be installed as specified in 230.51(A), (B), (C), Article 396, and Article 398.

Substantiation: As currently written, it does not address the support of cable assemblies used as outside branch circuits and feeders.

Panel Meeting Action: Reject

Panel Statement: This section specifically covers open conductors; the other wiring methods defined by the submitter are covered elsewhere.

The purpose of Section 225.12 is to specifically provide methods of support for open conductors by requiring these open conductors to be supported on glass or porcelain knobs, racks, brackets, or strain insulators, and not to deal with messenger-supported wiring as covered in Article 396 or open wiring on insulators as covered by Article 398. Open wiring on insulators is a wiring method with a very narrow application since it is only permitted for industrial or agricultural establishments. The NEC Style Manual does not permit a reference to an entire article within a section.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-12 Log #620 NEC-P04 **Final Action: Accept in Principle**
(225.18)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

225.18 Clearance from <u>Grade</u> ~~Ground~~ .

Overhead spans of open conductors and open multiconductor cables of not over 600 volts, nominal, shall have a clearance of not less than the following:

(1) 3.0 m (10 ft) - above finished grade, sidewalks, or from any platform or projection from which they might be reached where the voltage does not exceed 150 volts to ground and accessible to pedestrians only

(2) 3.7 m (12 ft) - over residential property and driveways, and those commercial areas not subject to truck traffic where the voltage does not exceed 300 volts to ground

(3) 4.5 m (15 ft) - for those areas listed in the 3.7-m (12 ft) classification where the voltage exceeds 300 volts to ground

(4) 5.5 m (18 ft) - over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles, such as cultivated, grazing forest, and orchard

Substantiation: This proposal is for clarification purposes. The term "from grade" is currently used approximately 23 times in the Code. Ground is a defined term in Article 100 and relates to the concepts of grounding and bonding. The words used in this section are "finished Grade" "sidewalks" and "platform or projection". The word "ground" is used in this section in the term "voltage to ground". This proposal is part of a larger effort being placed on the correct use of the word "ground" or any derivatives of the word. No technical changes are being proposed to revise this section.

Panel Meeting Action: Accept in Principle

Change the title to "Clearance for Overhead Conductors and Cables."

Panel Statement: The term "grade" was too subjective since there is initial grade at time of construction, there is intermediate grade during construction, and then final grade at the end of construction. "Grade" could ultimately be changed at any future time. The title change uses the actual text within the section itself.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-13 Log #1462 NEC-P04 **Final Action: Reject**

(225.22)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

225.22 Raceways on Exterior Surfaces of Buildings or Other Structures. Raceways on exteriors of buildings or other structures shall be arranged to drain and shall be raintight in wet locations.

Exception (1): Flexible metal conduit, where permitted in 348.12(1), shall not be required to be raintight.

Exception (2): Raceways shall not be required to be raintight as permitted in 312.2.

Substantiation: The language new to the 2005 NEC in 312.2 is moot without this exception, as the two requirements contradict.

Panel Meeting Action: Reject

Panel Statement: Section 312.2, last sentence, deals with raceway entries into an enclosure in a wet location whereas Section 225.22 deals with a raceway on the exterior of a building or other structure. There is no contradiction, as alluded to in the substantiation, between the two sections, since one deals specifically with a raceway entry into an enclosure and the other deals with a raceway installed on a building. Raceways are only required to be raintight in wet locations.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-14 Log #2608 NEC-P04 **Final Action: Reject**

(225.22)

Submitter: David H. Kendall, Carlon

Recommendation: Revise as follows:

225.22 Raceways on Exterior Surfaces of Buildings or Other Structures. Raceways on exteriors of buildings or other structures shall be arranged to drain and shall be raintight in wet locations.

~~Exception: Flexible meal conduit, where permitted in 348.12(1), shall not be required to be raintight.~~

Substantiation: The exception should be deleted since installations found in Chapter 3 of the code apply generally per 90.3.

Panel Meeting Action: Reject

Panel Statement: Section 90.3 states that Chapters 1 through 4 apply generally except as amended or supplemented by Chapters 5, 6, or 7, but an application in Chapter 3 does not amend or supplement the information in Chapter 2. The exception in 225.22 recognizes that flexible metal conduit installed on a building or other structure is not required to be raintight where installed in accordance with 348.12. This exception helps clarify an application commonly used in the field and therefore must be retained,

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-15 Log #1280 NEC-P04 **Final Action: Reject**

(225 Part II)

Submitter: Mark R. Hilbert, State of New Hampshire

Recommendation: Change the title of Part II of Article 225 as follows:

II. ~~More Than One Building or Other Structure~~ Buildings or Structures Supplied by Feeder(s) or Branch Circuit(s)

Substantiation: Please consider changing the title of Part II to reference buildings or structures supplied by feeder(s) or branch circuit(s) as opposed to the current title that references more than one building or other structure. The language referencing two or more buildings supplied by a common service no longer exists in the title or text of 250.32 which addresses grounding of buildings or other structures that have been supplied by a feeder(s) or a branch circuit(s). Accepting the recommended text will correlate the title of Part II of Article 225 with the change in the title and text of 250.32 accepted by Panel 5 in the 2005 cycle. It will also identify that the requirements of the section pertain to a building or other structure that is being supplied by a feeder or branch circuit that may or may not be from a common service.

Panel Meeting Action: Reject

Panel Statement: Most buildings have electrical systems and equipment supplied by feeders and branch circuits. By changing the title, as suggested in the proposal, Part II would apply to all buildings and structures where the branch circuit or feeder was routed outside the building or structure and not just more than one building or structure supplied by outside branch circuits and feeders, as is intended in the present NEC.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-16 Log #1281 NEC-P04 **Final Action: Reject**

(225.30)

Submitter: Mark R. Hilbert, State of New Hampshire

Recommendation: Revise the text in the main paragraph of 225.30 as follows:

~~Where more than one building or other structure is on the same property and under single management, each additional building or other structure that is served by a branch circuit or feeder on the load side of the service disconnecting means shall be supplied by only one feeder or branch circuit.~~ A building or other structure shall be permitted to be supplied by one set of feeder conductors or by one set of branch circuit conductors unless otherwise permitted in 225.30(A) through (E). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit. Feeders or branch circuits shall be permitted to run from one building or other structure to another building or other structure where the buildings or other structures are on the same property and under single management.

Substantiation: Please consider changing the text in this section that references buildings or other structures that are served by a feeder(s) or branch circuit(s) to ones that are supplied by a feeder(s) or branch circuit(s). The revised wording will still identify that a building or other structure can only be supplied by one feeder or branch circuit unless otherwise permitted by the section and that feeders or branch circuits can be run between buildings or other structures on the same property with single management. Additionally, the rewording will help clarify that a single building supplied by one set of conductors from a remote metering pedestal is not "multiple buildings or buildings and other structures."

Panel Meeting Action: Reject

Panel Statement: The proposed new first sentence references a single building or structure supplied by one set of feeders or branch circuits. This proposed change would provide language without the restrictive language in the present NEC text stating that this section only applies to each additional building or structure served by a feeder or branch circuit on the load side of the service disconnecting means from the first building. This limitation must remain in this section to retain the original intent to apply to additional buildings or structures on the premises.

The proposed last sentence implies that multiple feeders and branch circuits can be installed between buildings but permission for multiple feeders or branch circuits is only permitted in 225.30(B) through (D) so the proposed new text would be in conflict with the restrictive text in the existing first sentence.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-17 Log #1486 NEC-P04 **Final Action: Reject**

(225.30(A)(6))

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

225.30 Number of Supplies.

(A) Special Conditions. Additional feeders or branch circuits shall be permitted to supply the following:

(6) ~~Systems~~ designed for connection to multiple sources of supply for the purpose of enhanced reliability.

(6) Equipment designed for connection to multiple sources of supply for the purpose of enhanced reliability.

Substantiation: Permitting an additional feeder or branch circuit for "systems" designed for enhanced reliability is too vague. The code user can easily argue that it is up to the registered design professional of the building to design a system for enhanced reliability. If the intent of this allowance is to permit multiple services to provide enhanced reliability for a piece (or pieces of) equipment, it should be written as such.

I urge the members of Panel 4 to revisit Mr. Pauley's statements at the comment stage of the 2005 cycle (4-19 Log #1579) which was accepted in principle. In the comment, the point was made that "enhanced reliability" should be considered. While the panel did, in fact, judge wisely, it also left out one of the key parts of Mr. Pauley's comment, which is the word "equipment".

A similar proposal will be made to 230.2 for the purposes of correlation.

Panel Meeting Action: Reject

Panel Statement: The allowance for redundant supplies is intended for engineered systems, not just engineered equipment. The panel stated in the 2004 Report on Comments in Comment Number 4-19, Log #1579 in response to its action to accept in principle as follows: "The submitter is correct in pointing out that the term 'redundant system' may be confusing. The type of equipment used to facilitate such a system is not defined, since different types of equipment may be used depending on the application."

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-18 Log #3329 NEC-P04 **Final Action: Reject**
(225.30(E))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise to read as follows:
(E) Documented Switching Procedures. Additional feeders or branch circuits shall be permitted to supply large capacity multibuilding industrial or institutional installations under single management where documented safe switching procedures are established and maintained for disconnection.
Substantiation: The 2005 NEC is far too broad given the multiplicity of jurisdictions subject to the NEC. It potentially reaches a single-family house with a detached garage, which is rather far afield from the limitation to “large capacity multibuilding industrial,” a limitation that had been in the Code since it first appeared in the 1984 edition. Other occupancies are unlikely to maintain the documentation in a form that would be practical for Authorities Having Jurisdiction to be able to rely on.
Panel Meeting Action: Reject
Panel Statement: The submitter’s substantiation implies that the limitation for large capacity, multi-building industrial and institutional installations was deleted in the 2005 NEC process, when in fact, this limitation has not been in the Code since the 1996 NEC. There was no technical substantiation provided in the proposal to require documented switching procedures to be limited to industrial and institutional installations. The key to the use of this provision is for the installation to be under single management with documented safe switching procedures. This provision could apply to large multi-building office complexes, schools, apartments, and other similar facilities where provisions have been made to safely and effectively shut the system down where necessary.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-19 Log #3332 NEC-P04 **Final Action: Reject**
(225.32 Exception No. 1)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise to read as follows:
Exception No. 1: For large capacity multibuilding industrial or institutional installations under single management where documented safe switching procedures are established and maintained for disconnection, and where the disconnection is monitored by qualified individuals, the disconnecting means shall be permitted to be located elsewhere on the premises.
Substantiation: This is a companion proposal to one for 225.30(E), submitted for consistency. The substantiation for the other proposal (governing the allowance for multiple feeder supplies) applies equally to an allowance for remote disconnecting means.
Panel Meeting Action: Reject
Panel Statement: There was no technical substantiation provided in the proposal to require documented switching procedures to be limited to industrial and institutional installations. The key to the use of this provision is for the installation to be under single management with documented safe switching procedures, with the additional requirement that qualified individuals must monitor the installation This provision could apply to large multi-building office complexes, schools, apartments, and other similar facilities where provisions have been made to safely and effectively shut the system down where necessary.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-20 Log #1333 NEC-P04 **Final Action: Accept**
(225.33)

TCC Action: The Technical Correlating Committee understands that the Panel Action on this proposal is Accept.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
225.33 Maximum Number of Disconnects.
(B) Single-Pole Units. Two or three single-pole switches or breakers capable of individual operation shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with identified handle ties or a master handle to disconnect all ungrounded conductors with no more than six operations of the hand.
Substantiation: This change is meant to provide correlation with the 2005 change to 240.20.
Panel Meeting Action: Accept in Part
The panel does not accept the deletion of 225.33(A) and the exception.
Panel Statement: The panel accepts the addition of the word “identified” because it correlates with 240.20(B).
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-21 Log #1103 NEC-P04 **Final Action: Reject**
(225.34(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise (B):
ADDITIONAL DISCONNECTING MEANS . The one or more additional disconnecting means covered in 225.32 for each additional supply circui t for fire pumps, or for emergency, or for legally required or optional standby systems permitted by 225.3(A) shall be installed sufficiently remote from the one to six disconnecting means for ~~normal~~ all other supply systems to minimize the possibility of simultaneous interruption of supply.
Substantiation: The present wording does not require the disconnecting means for fire pumps and emergency systems to be remote from each other. There could be a total of twelve disconnects at one location which could be confusing to personnel. Safety should require the disconnecting means for fire pumps, emergency and legally required standby systems to be remote from all other disconnecting means. There is no guarantee that an “occurrence” in these systems is less likely than on “normal” systems. Conductors, wiring methods, voltages, could be essentially the same as normal systems. 695.4(B)(2)(3) requires remote location from other (all) disconnecting means. 700.12(D) requires separation of service drops and laterals which infers the disconnecting means where they terminate should be separated. This section is not consistent with that section.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided the panel with enough information. The existing NEC text requires the disconnecting means for fire pumps, emergency, legally required standby, and optional standby systems to be located sufficiently remote from the normal supply to the building to minimize the possibility of simultaneously disconnecting these loads. Any disconnects for these loads, no matter how many, must be located sufficiently remote from any other disconnects, so confusion should not be an issue as implied by the substantiation. The proposed new text “all other supply systems” could apply to pneumatic, steam, natural gas, or any other supply to the building and could very easily be misapplied since the original application was intended to apply to the normal electrical supply to the building.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-22 Log #968 NEC-P04 **Final Action: Accept in Part**
(225.39)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
The feeder and branch circuit disconnecting means shall have a rating not less than the calculated load to be carried, determined in accordance with Part I, II, III, and IV of Article 220, as applicable . In no case shall the ampere rating be less than specified in 225.39(A), (B), or (C).
(A) ONE CIRCUIT INSTALLATION . For installations to supply only ~~limited~~ loads of a single branch circuit, the feeder and branch circuit disconnecting means shall have a rating of not less than 15 amperes.
(B) TWO CIRCUIT INSTALLATION . For installations consisting of ~~not more than~~ two 2-wire branch circuits ~~the~~ a 2-wire feeder ~~or branch circuit~~ disconnecting means shall have a rating of not less than 30 amperes. For installations consisting of two multiwire branch circuits or two 3-phase branch circuits, the feeder disconnecting means shall have a rating of not less than 30 amperes.
Substantiation: Edit. “Calculated” load should be specified; some motor loads and continuous loads are calculated at 125 percent of ampere ratings. References should not be made to entire articles. In (A) “limited” is not defined; load is limited by circuit ratings and other requirements. A branch circuit breaker in the building supplied may be supplied by a 15 ampere feeder breaker. In (B) “not more than” literally includes one circuit; 225.30 basically requires one circuit, therefore, the two branch circuits of this sections are presumed to be supplied by a feeder. Without the proposed requirement for two multiwire and 3-phase circuits, the disconnect rating is required to be 60 amperes for two such circuits, which is excessive.
Panel Meeting Action: Accept in Part
Accept only the addition of the word “calculated” in the first sentence of the section, and reject the remainder of the proposed changes.

Panel Statement: This proposal is not editorial. The word “calculated” was accepted to be consistent with the changes in the text in Article 220 and other parts of the NEC in the 2005 NEC.
The addition of the words “as applicable” is not necessary since the changes in the 2005 NEC have accomplished the goal of referencing the various parts of Article 220 that apply.
Deleting the word “limited” in (A) would make this section inconsistent with the text in 230.23(B), Exception, that refers specifically to limited loads of a single branch circuit being required to be not smaller than 12 AWG in size for small overhead service drops on limited loads. Adding the phrase “the feeder and” would apply this section to feeders supplying a single branch circuit. There is no reason to apply feeder requirements to a single branch circuit since it is the final overcurrent protective device before the load.

There is no technical substantiation for the suggested changes to (B). If there is only a single branch circuit, then (A) covers the application of a single branch circuit, not (B). In the substantiation, an incorrect statement is made that 225.30 requires one circuit. An additional building or structure on the same property as another building is not required to have power at all but can have a feeder or a branch circuit from the first building or structure. This has been clarified in the text changes to 225.30 for the 2005 NEC. There also was no substantiation provided to change from two 2-wire branch circuits to two multiwire branch circuits or two three-phase branch circuits.
In addition, the panel does not accept the deletion of (C) and (D).
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-23 Log #1334 NEC-P04 **Final Action: Reject**
(225.39)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
225.39 Rating of Disconnect.
The feeder or branch-circuit disconnecting means shall have a rating of not less than the load to be supplied, determined in accordance with Parts I and II of Article 220 for branch circuits, Parts III or IV of Article 220 for feeders, or Part V of Article 220 for farm loads. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).
(A) One-Circuit Installation. For installations that supply only limited loads of a single 2-wire or multiwire branch circuit, the branch circuit disconnecting means shall have a rating of not less than 15 amperes.
(B) Two-Circuit Installations. For installations consisting of not more than two 2-wire or multiwire branch circuits, the feeder or branch-circuit disconnecting means shall have a rating of not less than 30 amperes.
Substantiation: Whether the circuit is a 2 wire or multiwire circuit, the load requirements shouldn't change.
Panel Meeting Action: Reject
Panel Statement: There was no technical substantiation provided with the proposal to expand this requirement from not more than two 2-wire branch circuits to apply to multiwire branch circuits.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-24 Log #1400 NEC-P04 **Final Action: Reject**
(225.39)

Submitter: George Stolz, II, Pierce, CO
Recommendation: Delete this section and its subsections.
Substantiation: Currently, this section is unclear as to what the "rating" requirement is referring to. Some view it as an addition of the ratings of the breakers installed at the separate structure in the panel(s). Some view it as a rating requirement for the enclosure itself. Some even view it as the rating for the OCPD that is installed at the supply side at the originating building, protecting feeder conductors. In any case, it appears evident that the size of conductors feeding the disconnecting means are truly what constitute the capacity of the system, and those conductors are sized and installed independent of the requirements laid out in this section.
Given the requirement given in 225.36, it appears that the purpose of this area of Article 225 is geared towards the ease of future expansion: should a separate structure at some point be supplied by a separate service, such an improvement would be made easier if the existing equipment were already suitable for such use. The requirements of this area are a reflection of nearly identical requirements of Article 230.
However, section 90.1(B) states that compliance with the NEC "...will result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use." There is no hazard that is prevented by this section, it appears to exist solely for future expansion, which is explicitly outside the desired scope of the NEC per 90.1.
Further, if such an improvement is made to a structure at a later date, it is probable that most if not all equipment supplying that structure will be removed due to age or fundamental changes in the use of the building requiring greater capacity. Given the rampant misunderstanding of the nature of this section, if it is retained, the language should be clarified to reflect what exact component of the system is to bear the ratings listed in (A) through (D).
Panel Meeting Action: Reject
Panel Statement: The title of the section clearly states the "Rating of Disconnect". Simply stated, this is the minimum ampacity rating of the disconnecting means regardless of type. The fact that it is service rated does not establish an ampacity rating. Future expansion has nothing to do with this requirement.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-25 Log #2156 NEC-P04 **Final Action: Accept in Principle**
(225.39)

TCC Action: The Technical Correlating Committee understands that the panel action on Proposal 4-22 adds the word "calculated" to the wording in this panel action.
Submitter: James Grant, Rochester, NH
Recommendation: Revise text to read:
225.39 Rating of Disconnect. The feeder or branch-circuit disconnecting means shall have a rating of not less than the load to be supplied, determined in accordance with Parts I and II of Article 220 for branch circuits, Parts III or IV of Article 220 for feeders, or Part V of Article 220 for farm loads. Where the branch circuit or feeder disconnecting means consists of more than one switch or circuit breaker, as permitted by 225.33, the combined ratings of all the switches or circuit breakers used shall be permitted. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).
Substantiation: When using up to six disconnects, as permitted by 225.33, the present wording requires all the disconnects to be rated at the value as determined by 225.39. This revised article would directly parallel with 230.80. For the same reason that 230 has it for calculating the service, it would allow the value of some of the breakers to be used as the rating of the disconnect for the feeder or branch circuit.
The panel's statement to 4-36 Log #609 NEC-P04 in the 2005 report of proposals made the following comment:
"Since a disconnect is a device or group of devices, permission is already inherent to add each device to reach a total rating in compliance with this section." The new revised text will eliminate any confusion that there is inherent permission for breakers to be additive in calculating the rating of a disconnect.
Panel Meeting Action: Accept in Principle
Accept the added sentence with the exception of the word "used" and revise the proposed text by changing "combined ratings of" to "combining the ratings of" and add the phrase "for determining the rating of the disconnecting means" to the text before "shall be permitted" in the NEC to read as follows: "The feeder or branch-circuit disconnecting means shall have a rating of not less than the load to be supplied, determined in accordance with Parts I and II of Article 220 for branch circuits, Parts III or IV of Article 220 for feeders, or Part V of Article 220 for farm loads. Where the branch circuit or feeder disconnecting means consists of more than one switch or circuit breaker, as permitted by 225.33, combining the ratings of all the switches or circuit breakers for determining the rating of the disconnecting means shall be permitted. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D)"
Do not revise any other text within this section.
Panel Statement: The word "used" was deleted and text was added to the proposed new sentence to provide clarity and to be more specific in what constitutes the combined ratings of the disconnecting means for feeder or branch circuit disconnecting means for separate buildings or structures.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-26 Log #2194 NEC-P04 **Final Action: Reject**
(225.39, FPN)

Submitter: David Williams, Lansing, MI
Recommendation: Revise as follows:
The rating feeder or branch-circuit disconnecting means shall have a rating of not less than the load to be supplied, determined in accordance with Parts I and II of Article 220 for branch circuits. Parts III or IV of Article 220 for feeders, or Part V of Article 220 for farm loads. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).
FPN: The rating of the overcurrent device protecting the feeder does not need to be rated to the minimum rating in this section.
Substantiation: The code section specifies the minimum rating of the disconnect and is not clear that the feeder or branch circuit needs to be rated for this minimum rating. As an inspector, I am not positive if this section only applies to the rating of the disconnect or does this mean that the minimum size of a feeder to a building should be 60 amperes.
Just trying to clear up a concern.
Panel Meeting Action: Reject
Panel Statement: An additional FPN is not necessary. The title of 225.39 defines the requirement as solely being the rating of the disconnect.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-27 Log #2959 NEC-P04 **Final Action: Reject**
(225, Part IV)

Submitter: James J. Rogers, Bay State Inspectional Agency
Recommendation: Add new text as follows:
Insert in it entirety Part 2 of the 2002 National Electrical Safety Code pages 59 through 190 inclusive.
Substantiation: In submitting this proposal the submitter understands that it most likely will not be accepted in this fashion. However, due to changes in procedures by utility companies across the country many of these installations are now privately owned and AHJs have nothing to enforce, this needs a public review.
Panel Meeting Action: Reject
Panel Statement: This proposal is not in compliance with Section 4-3.3(C) of the NFPA Regulations Governing Committee Projects, since the recommended text has not been submitted as part of the proposal. In addition, the submitter proposes adding text that was developed and under copywrite protection by IEEE. In rejecting this proposal, the panel recognizes the issue and recommends that he submit a letter to the TCC requesting a Task Group be assigned from the various code panels with high voltage installation requirements to insert additional text to cover high voltage installations.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-28 Log #2993 NEC-P04 **Final Action: Reject**
(225, Part V)

Submitter: James J. Rogers, Bay State Inspectional Agency
Recommendation: Add new text as follows:
Insert in its entirely Part 3 of the 2002 National Electrical Safety Code pages 191 through 214 inclusive.
Substantiation: In submitting this proposal the submitter understands that it most likely will not be accepted in this fashion. However, due to changes in procedures by utility companies across the country many of these installations are now privately owned and AHJs have nothing to enforce, this needs public review.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-27.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

ARTICLE 230 — SERVICES

4-29 Log #2102 NEC-P04 **Final Action: Reject**
(230.2)

Submitter: Jon Farren, Farren Engineering, Inc.
Recommendation: Revise text to read as follows:
230.2 ~~Number~~ Quantity of Services.
Substantiation: The term "quantity" refers to "total amount of", which is the intent of this code section.
Although the term "number" is sometimes used to indicate a quantity, it does not always specify the "total" quantity. The word "number" can also be used to designate a specific object, such as: "circuit number 3, in a 42 circuit panelboard", where 3 is the number and 42 is the quantity or "total amount of".
The word "number" has multiple meanings, the word "quantity" is more specifically related to "total amount of", which is the intent of this code section.
*Also refer to proposal for same word change in 220.11 and 220.42.
Panel Meeting Action: Reject
Panel Statement: The existing word "number" is used in the title to establish an actual number of services that are permitted to be supplied to a building or structure. The basic number of services to a single building or structure is one but the remainder of 230.2 gives permission for additional services to be added under specific conditions. The word "number" adequately provides the necessary information and provides clarity on the application of the Code rule.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-30 Log #3227 NEC-P04 **Final Action: Reject**
(230.2 (New))

Submitter: Michael A. Anthony, University of Michigan Business & Finance / Rep. Association of Higher Education Facilities Officers
Recommendation: Add new text to read:
230.2 Location. Service conductors from the electrical utility source shall be located the closest distance to the service disconnecting means required in 230.7(A)(1) unless they can be located outside the building according to 230.6.
Substantiation: Essentially this re-states the requirements of 230.6 and 230.70(A)(1) but at an earlier position in Article 230. Making this linkage may clarify the requirement for utility service planners. A clear straightforward statement like this early in Article 230 may help electrical system designers build their case for adequate, dedicated space for electric service equipment when architects and building owners are planning a new facility.
Panel Meeting Action: Reject
Panel Statement: Article 230 provides requirements for service conductors and equipment, as explained in the Scope statement in Section 230.1, and should be used in its entirety. Adding this proposed text at the beginning of the Article does not add clarity and, in fact, provides questionable text, such as "Service conductors from the electric utility source shall be located the closest distance to the service disconnecting means required in 230.70(A)(1) [the proposed text reads 230.7(A)(1) but should be 230.70(A)(1)]." Requiring the distance to be closest to the utility company source would be an undetermined distance and would be almost unenforceable.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-31 Log #1155 NEC-P04 **Final Action: Reject**
(230.2(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete: Optional Standby Systems.
Substantiation: 702.2 states optional standby systems are intended to supply onsite generator power. Does "intended" connote an option or a requirement? 90.3 indicates Chapter 7 modifies Chapter 3.
Panel Meeting Action: Reject
Panel Statement: The submitter has not presented adequate substantiation for this change. Article 702 does not indicate that optional standby systems should be allowed as an additional service. The allowance in 230.2(A) clearly identifies optional standby systems as an additional service.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-32 Log #1092 NEC-P04 **Final Action: Reject**
(230.2(A)(4))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete: (4) Optional Standby Systems.
Substantiation: 702.2 states: "optional standby systems are intended to supply onsite generated power." While the "intent" seems to exclude power from a serving utility, it doesn't seem to be a mandatory type of statement. To avoid confusion (4) should be deleted or modified. Chapter 7 may modify Chapter 2.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-31.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-33 Log #1487 NEC-P04 **Final Action: Reject**
(230.2(A)(6))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
230.2 Number of Services.
(A) Special Conditions. Additional services shall be permitted to supply the following:
(6) ~~Systems~~ designed for connection to multiple sources of supply for the purpose of enhanced reliability.
(6) Equipment designed for connection to multiple sources of supply for the purpose of enhanced reliability.
Substantiation: Permitting an additional service for "systems" designed for enhanced reliability is too vague. The code user can easily argue that it is up to the registered design professional of the building to design a system for enhanced reliability. If the intent of this allowance is to permit multiple services to provide enhanced reliability for a piece (or pieces of) equipment, it should be written as such.
I urge the members of Panel 4 to revisit Mr. Pauley's statements at the comment stage of the 2005 cycle (4-33 Log #1580), which was accepted in principle. In the comment, the point was made that "enhanced reliability" should be considered. While the panel did, in fact, judge wisely, it also left out one of the key parts of Mr. Pauley's comment, which is the word "equipment".
A similar proposal will be made to 225.30 for the purposes of correlation.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-17.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-34 Log #566 NEC-P04 **Final Action: Reject**
(230.2(C))

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise as follows:
(C) Capacity Requirements. Additional services shall be permitted under any of the following:
(1) Where the capacity requirements are in excess of ~~2000 amperes~~ local serving utilities capacity at a supply voltage of 600 volts or less.
(2) Where the load requirements of a single-phase installation are greater than the serving agency normally supplies through one service.
(3) By special permission.

Substantiation: This will eliminate problems and confusion between the local AHJ, designers, and the local serving utility. The NEC identifies in excess of 2000 amps and the local serving utilities have serving capacities larger than this amount. Designers will design multiple services to a single building based on the 2000 amp capacity; the AHJ will approve the plans and design based on the NEC and then the serving utility company requests the local AHJ in writing to the serving utility, approve the installation of multiple services.

This written approval constitutes special permission, and based on current code language there is no need for special permission. However, the serving utility sates that 2000 amps is less than their serving capacity and will not allow or energize without this written approval by the AHJ.

In the metro Phoenix area, we have two electrical utility companies, SRP (Salt River Project) and APS (Arizona Public Service).

SRP has a maximum service size of 2000 amps 3-phase 277/480 volt overhead, 3600 amps 3-phase 277/480 volt underground, 2500 amps 3-phase 120/208 volt overhead and 4000 amps 3-phase 120/208 volt underground.

APS has a maximum service size of 6000 amps in the Phoenix network area, 3000 amps 3-phase 120/208 volt and 277/480 volt underground outside the Phoenix network area, 1600 amps, 3-phase 120/208 volt overhead and 600 amps 3-phase 277/480 volt overhead.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: A single service exceeding 2000 amps does not require special permission. More than one service "shall be permitted" according to 230.2(C). Where the capacity requirements are in excess of 2000 amps, the NEC does not require special permission in accordance with 230.2(C)(1). The restriction to require written approval by the AHJ, as noted by the submitter, may be a local serving utility requirement not found in the NEC.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-35 Log #3308 NEC-P04 **Final Action: Reject**

(230.7)

Submitter: Redwood Kardon, Code Check Institute

Recommendation: Revise text to read as follows:

230.7 Other Conductors in <u>Cable Tray</u> , Raceway or Cable.

<u>FPN: For service conductors in cable trays see 230.44.</u>

Substantiation: The safety concerns that require separation for service conductors from "other conductors" applies equally to cable tray as it does raceways or cable assemblies.

Panel Meeting Action: Reject

Panel Statement: Section 230.7 covers raceways and cables generally for all service conductors, service entrance, service drop, and service laterals, not cable trays. Cable trays are more likely to be used for service entrance conductors than for service drop or service lateral applications, and thus belong not in the general requirements in 230.7 for raceways or cables that are used for service drop or service laterals but should stay exclusively in 230.44.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-36 Log #3481 NEC-P04 **Final Action: Reject**

(230.7 Exception No. 1)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read:

230.7 Other Conductors in Raceway or Cable.

Exception No. 1: Grounding conductors, <u>grounding electrode conductors</u> and bonding jumpers.

Substantiation: This article needs rewording because the installer sometimes feels the need to drill a second hole through 24 in. thick walls because the Code is not clear that the GEC can pass through in the same hole that the service cable enters into the building.

Panel Meeting Action: Reject

Panel Statement: Section 230.7 addresses conductors within raceways or cable assemblies. The submitter is describing conductors adjacent to service entrance cables, not within. The installation as described is not prohibited by 230.7.

Grounding conductors include grounding electrode conductors, so permission is already present in 230.7, Exception No. 1, to allow grounding electrode conductors to be in the same raceway with service conductors. Adding the proposed new wording may cause confusion in applying this section since it clearly is permitted.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-37 Log #2822 NEC-P04 **Final Action: Reject**

(230.24 Exception No. 4)

Submitter: Lanny G. McMahill, Phoenix, AZ

Recommendation: Add new Exception Number 4:

<u>Exception No. 4: Where the voltage between conductors does not exceed 300, and the roof is not readily accessible, reduction in clearance to not less than 900 mm (3 ft) shall be permitted.</u>

Substantiation: This proposed change is intended to coordinate with requirements in the National Electrical Safety Code (NESC). The NESC allows the reduction of the conductor clearance to 3 ft above a roof surface where not readily accessible. Although this change is less restrictive, it is the position of at least one utility company representative that it does not create an unsafe condition. In addition, coordinating the requirements will help to eliminate any differences in standards. These differences can cause problems from a code enforcement standpoint.

Panel Meeting Action: Reject

Panel Statement: Many building roofs are not readily accessible, based on the definition for Readily Accessible in Article 100. Roof access ladders and stairs onto the roof of a building make that roof readily accessible and thus this proposed exception would not apply to those buildings but reducing the clearance from the roof to service drop conductors to 3 feet would affect installations where a ladder is used to access the roof, meaning the roof is not readily accessible.

A person walking across the roof is still subject to the danger of the service drop. Utility company ungrounded service drop cables may be covered, not insulated, and may have some leakage current through the covering, even where well maintained. In addition, the bare grounded conductor is also the messenger cable. Based on this proposed new exception, the bare grounded conductor of the service drop cable would be permitted to be within 3 feet of the surface of the roof and any metal in close proximity to the roof surface creating a potential danger to anyone on the roof.

CMP-4 notes that there are significant differences in terms and definitions used in the NEC and the NESC. This can create differences in the installation practices.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ROGERS, J.: I voted with the Panel on this proposal, however, the submitter is correct in his concern relative to these conflicting requirements. The fact is that most electric utilities define the service point for overhead services as the connection of the service drop conductors to the service entrance conductors at the premises served. This being the case, as stated in 90.2(b)(5), these conductors are not covered by the NEC.

4-38 Log #1832 NEC-P04 **Final Action: Accept**

(230.24(A) Exception No. 4 (New))

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician

Recommendation: Add an exception to read as follows:

Exception No. 4: The requirement for maintaining the vertical clearance 900 mm (3 ft) from the edge of the roof shall not apply to the final conductor span where the service drop is attached to the side of the building.

Substantiation: The number 4 is missing from the last exception.

Panel Meeting Action: Accept

Panel Statement: The missing number 4 is an erratum that was picked up by NFPA staff and added to the errata sheets sent out with the NEC or corrected in the later printing of the Code.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-39 Log #2872 NEC-P04 **Final Action: Reject**

(230.24(A) Exception No. 4 (New))

Submitter: Michael L. Dyer, Salt River Project

Recommendation: Add new Exception Number 4:

<u>Exception No.4: Where the service drop cable is insulated, supported on an effectively grounded bare messenger or neutral, the voltage between conductors does not exceed 750V, and the roof is not readily accessible, the clearance may be not less than 900 mm (3 ft).</u>

Substantiation: This proposed change will harmonize 230.24(A) with the National Electrical Safety Code rule 234C3d1 exception 1, eliminating the differences in these standards. These differences have caused problems with respect to code enforcement.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 4-37.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-40 Log #619 NEC-P04 **Final Action: Accept in Principle**

(230.24(B))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

(B) Vertical Clearance from <u>Grade</u> ~~Ground~~ . Service-drop conductors, where not in excess of 600 volts, nominal, shall have the following minimum clearance from final grade:

(1) 3.0 m (10 ft) - at the electric service entrance to buildings, also at the lowest point of the drip loop of the building electric entrance, and above areas or sidewalks accessible only to pedestrians, measured from final grade or other accessible surface only for service-drop cables supported on and cabled together with a grounded bare messenger where the voltage does not exceed 150 volts to ground

(2) 3.7 m (12 ft) - over residential property and driveways, and those commercial areas not subject to truck traffic where the voltage does not exceed 300 volts to ground

(3) 4.5 m (15 ft) - for those areas listed in the 3.7-m (12 ft) classification where the voltage exceeds 300 volts to ground

(4) 5.5 m (18 ft) - over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land such as cultivated, grazing, forest, and orchard

Substantiation: This proposal is for clarification purposes. The term "from grade" is currently used approximately 23 times in the Code. Ground is a defined term in Article 100 and relates to the concepts of grounding and bonding. The words used in this section are "finished grade" "sidewalks" and "platform or projection". The word "ground" is used in this section in the term "voltage to ground". This proposal is part of a larger effort being placed on the correct use of the word "ground" or any derivatives of the word. No technical changes are being proposed to revise this section.

Panel Meeting Action: Accept in Principle

Change the title to (B) to "Vertical Clearance for Service-drop Conductors."

Panel Statement: The term "grade" was not specific enough, since there is initial grade at time of construction, there is intermediate grade during construction, and then final grade at the end of construction. "Grade" could ultimately be changed at any future time. The title change uses the actual text within the section itself.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-41 Log #1066 NEC-P04 **Final Action: Reject**

(230.34 (New))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add: 230.34 WIRING METHODS for 600 VOLTS, NOMINAL, or LESS. Underground service - lateral conductors shall be installed in accordance with the requirements of the Code covering the type of wiring method used and shall be limited to the following methods:

1. Type IGS cable
2. Rigid metal conduit
3. Intermediate metal conduit
4. Type MI cable
5. Type USE cable

Substantiation: Provision should be made for underground service lateral wiring methods, especially when the FPN for service conductor, underground systems indicate there may be no service-entrance conductors. These conductors are not included in the definition of Service-Entrance Conductors, Underground Systems in Article 100.

Panel Meeting Action: Reject

Panel Statement: Wiring methods are not provided in Article 230 for either overhead service drops or underground service laterals. These service conductors <u>in some instances</u> are under the exclusive control of the utility company in accordance with 90.2(B)(5) and are not governed by the NEC. Service entrance conductors are under the jurisdiction of the NEC and are covered by the wiring methods in 230.43.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 8 Negative: 2

Explanation of Negative:

NAUGHTON, J.: I disagree with the panel statement and panel action. If these conductors are truly service entrance conductors, they belong under the jurisdiction of the NEC and not the utility sector.

ROGERS, J.: As described in my comment on proposal 4-3, there are many time when service laterals are installed by private contractors on private property. The submitter is correct that these installations are not adequately covered in the NEC. The Panel should have accepted this proposal in principle and reviewed the requirements for the installation of service laterals.

Comment on Affirmative:

BECK, C.: See my Affirmative Comment on Proposal 4-3.

4-42 Log #2188 NEC-P04 **Final Action: Accept in Principle**

(230.40 Exception No. 1)

Submitter: Dann Strube, Strube Consulting

Recommendation: Revise text to read as follows:

"A building <u>with more than one occupancy</u> should be permitted...".

Substantiation: 230.2 and 230.40 main rules are clear that a building with one occupancy can have more than one service. It is also clear that a set of entrance conductors is allowed for each service to a one occupant building. The only application for Exception No. 1 is when a multi-occupant situation is involved. To reduce confusion, that condition should be clearly stated.

Panel Meeting Action: Accept in Principle

Change the word "should" to "shall" in the recommendation to read as follows: "A building with more than one occupancy shall be permitted…."

Panel Statement: The word "should" in the proposal was replaced with the word "shall" to comply with 90.5(B) for permissive language.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-43 Log #3384 NEC-P04 **Final Action: Reject**

(230.40 Exception No. 1)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Revise text to read:

If the number of service disconnect locations for any given classification of service is not more than six, the requirements of 230.2(E) shall apply at each location. If the number of service disconnect locations is more than six for any given supply classification, all service disconnect locations for all supply characteristics shall be clearly described using suitable graphics or text or both on one or more plaque(s) located in an approved, readily accessible location(s) on the building or structure served and as near as practicable to the point(s) of attachment or entry(ies) for each service drop or lateral.

Substantiation: Some control over the potential proliferation of service disconnects at widely dispersed locations is needed by the inspection community, preferably without resort to 90.4. In the comment period for the 2005 NEC the panel seemed to be moving in this direction, having accepted part of this concept. However, that action was set aside by the TCC, giving CMP 4 a fresh opportunity to consider these questions. This proposal responds to concerns in the voting on 2005 NEC Proposal 4-71 that when the exception is applied to allow a large number of remote service entrance conductor sets and their disconnects, it may become unwieldy to provide full reciprocal labeling at each location.

The proposal suggests a limit of six disconnecting means, considered for each classification of supply characteristics. Suppose, for example, there were one 480Y/277V service for large power loads using a single disconnect at the owner's mechanical room and one 208Y/120V service with service entrance conductors run to each of ten occupancies with service disconnects in each. Assuming each occupancy does not qualify as a separate building, this wording would result in either one or two plaques (instead of eleven) depending on whether the two service drops or laterals arrive at the same or at different locations. The proposed text includes the word "approved" in order to allow the AHJ to review the proposed locations for suitability.

Panel Meeting Action: Reject

Panel Statement: The permission to use 230.40, Exception No. 1 has been in the NEC for the past 60 years in one form or another without a requirement for location plaques to be installed at each disconnect location. Where there are more than six disconnect locations, the proposal would require all supply characteristics to be clearly described using graphics or text or both on a plaque. Locating this graphic/text plaque on the building in a readily accessible location that is acceptable to the authority having jurisdiction, usable for any location identification, and that is as near as practicable to the point of attachment or service entrance entry into the building would be extremely difficult on all but the smallest buildings.

A large building or a high-rise building in a city is often on the exact footprint of the city lot with underground service laterals supplying a utility company vault. Even smaller buildings are often supplied with underground service laterals so the entrance into the building is not obvious so a plaque installed at the point of entrance of the service conductors into the building would only be of use where someone searched for the plaque. In an emergency situation, another power disconnection point would most often be used rather than a search made for the plaque first and then an attempt made to disconnect power at multiple locations.

The submitter has not provided any substantiation that there is a problem with not marking these locations for the last 60 years. There does not seem to be a large number of people submitting proposals to require these plaques for installations where multiple occupancies exist with multiple disconnect locations. The suggested recommendation has too many unenforceable requirements.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-44 Log #3262 NEC-P04 **Final Action: Reject**

(230.40 Exception No. 1 and 230.71(A))

Submitter: Eugene E. Morgan, Clakamas County, Building Codes Divison

Recommendation: Revise text to read as follows:

230.40 Number of service-Entrance Conductor Sets. Each service drop or lateral shall supply only one set of service-entrance conductors.

~~*Exception No.1: A building shall be permitted to have one set of service entrance conductors for each service, as defined in 230.2, run to each occupancy or group of occupancies.*~~

(Delete Exception No.1 and re-number Exceptions 2, 3, 4 and 5 to Exceptions 1, 2, 3, and 4.)

230.71 Maximum Number of Disconnects.

(A) General. The service disconnecting means for each service permitted by 230.2, or for each set of service-entrance conductors permitted by 230.40, Exception No. ~~1, 3, 4 or~~ 5 <u>2, 3 or 4,</u> shall consist of not more than six switches or sets of circuit breakers...

(Revise the Exception Nos. to match the deletion of Exception No.1, and renumber the other exceptions to Section 230.40.)

Substantiation: Exception No.1 to 230.40 is the source of considerable misunderstanding for installers as well as inspectors. It is in apparent conflict with 230.70(A)(1) **Readily Accessible Location,** and with **230.72(A) Grouping of Disconnects.** It is also in apparent conflict with the basic safety premise of 230.71(A) **Maximum Number of Disconnects.**

When taken literally, 230.40 Exception No. 1 would seem to allow an unlimited number of disconnects in an unspecified number of tenant spaces, as long as there were no more than six at any one location. There is no mention of area separation requirements that are essential to prevent the spread of fire and provide for the safety of fire fighters or rescue personnel. In the event of a fire, earthquake or other disaster, rescue personnel would be severely hampered by working against energized service, feeder, and branch circuit conductors that could not be readily disconnected at a common location in such an emergency.

The term “occupancy” is not defined in the National Electrical Code or in the generally adopted building codes. The building codes (several words are unreadable) some which require fire rated or area separation walls, and others which do not. The result is that “occupancy” in 230.40, Exception No. 1 is used to justify running service conductors to a number of tenant spaces. With the flexible tenant space nature of many commercial buildings, this results in modified spaces that have no service or panel, or enlarged tenant spaces and may have two sets of service conductors and disconnects within the single, enlarged tenant space. This creates additional Code violations, besides the extremely hazardous situation created by having multiple service locations in the original building configuration.

The National Electrical Code has continually moved forward to promote safety for buildings, the occupants, and rescue personnel. 230.40, Exception No.1 runs counter to those safety concepts. There is no compelling need for this exception, as other provisions in Article 230 provide ample opportunities for installations to be made in every conceivable building and to every occupancy, without the associated hazard of running service conductors to each of them. It is time to remove this unnecessary exception to an otherwise good installation standard for electrical services.

Panel Meeting Action: Reject

Panel Statement: This particular exception has been in the NEC since at least the 1946 NEC where Section 1807 permitted, by special permission, more than one set of service drop in a multi-occupancy building where there was no available space for service equipment accessible to all occupants. This exception permitted the occupant to have access to their own service disconnecting means. Section 1837 required a multiple occupancy building having individual occupancies above the second floor to have the service equipment grouped in a common accessible location and to consist of not more than six switches or circuit breakers. However, any multiple occupancy building that did not have any individual occupancy above the second floor could have the service conductors run to each occupancy and have up to six switches or circuit breakers at that location.

Since this rule has existed since the early 1940s without a major change to the intent, there does not seem to be a compelling reason to change this section of the Code and there was no technical substantiation given in the proposal to provide a reason to delete this rule. The submitter did not provide any specific examples of problems that have occurred where service entrance conductors have been installed in accordance with the current permissive requirements in this section.

Exception 1 to 230.40 is a necessary and commonly used allowance for supplying power in multiple occupancy buildings. The building is still only permitted to have one service riser or lateral that would allow the power to be removed from all occupancies when necessary by the disconnection of the riser or lateral conductors.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-45 Log #1088 NEC-P04 **Final Action: Reject**
(230.41 Exception No. 1)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add “except cablebus” after “raceways”.

Substantiation: Edit. Cablebus meets Article 100 definition of raceway and 370.2 indicates (all) circuit conductors are insulated. Since Chapters 2 and 3 are equal in rank, the proposal eliminates a perceived conflict.

Panel Meeting Action: Reject

Panel Statement: This recommendation is not editorial as stated in the substantiation. In Section 370.2, the definition states that cablebus is an assembly of insulated conductors in a completely enclosed, ventilated protective metal housing. Since all the conductors within cablebus are required to be insulated and Section 230.41, Exception, deals with permission to use uninsulated grounded conductors, adding cablebus to this exception would be inappropriate.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-46 Log #2758 NEC-P04 **Final Action: Accept in Part**
(230.42)

Submitter: Truman C. Surbrook, Michigan State University

Recommendation: Add a new first paragraph as follows:

230.42 Minimum Size and Rating. <u>The minimum size of service entrance conductors shall be not less than as specified in (A), (B), and (C).</u>

Delete the first portion of (B) as follows:

(B) Specific Installations. ~~In addition to the requirements of 230.42(A),~~ <u>T</u> he minimum ampacity...

In (C) change less to smaller to read as follows:

(C) Grounded Conductors. The grounded conductor shall not be ~~less~~ <u>smaller</u> than the minimum...

Substantiation: There needs to be a lead statement making it clear that all of the provisions of this section are to be applied where applicable. By adding the new lead paragraph, the first part of the sentence of (B) can be deleted. In (C) the word “less” needs to be replaced with <u>smaller</u> .

Panel Meeting Action: Accept in Part

Accept the part to change “less” to “smaller” in (C) and reject the remainder of the recommendation.

Panel Statement: The phrase “smaller than” is more appropriate, since the issue is an actual size of grounded conductor required. The remainder of the recommendation is rejected, since adding this opening sentence to 230.42 with the phrase “as specified in (A), (B), and (C)” would require service entrance conductors to include a grounded conductor even where one is not provided as part of the source from the utility company, such as where an ungrounded delta system is supplied to the premises.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-47 Log #1326 NEC-P04 **Final Action: Accept in Principle in Part**
(230.42(A))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise as follows:

230.42 Minimum Size and Rating.

~~**(A)**~~ **General.** <u>Service-entrance conductors shall have an ampacity not less than required to supply the load as calculated in Parts III, IV, and V of Article 220. Service-entrance conductors that are connected to an overcurrent device assembly shall have a minimum allowable ampacity, before the application of any adjustment or correction factors, that is not less than the noncontinuous load plus 125 percent of the continuous load.</u> ~~The ampacity of the service entrance conductors before the application of any adjustment or correction factors shall not be less than either (A)(1) or (A)(2). Loads shall be determined in accordance with Article 220. Ampacity shall be determined from 310.15. The maximum allowable current shall be that value for which the busway has been listed or labelled.~~

~~(1) The sum of the noncontinuous loads plus 125 percent of continuous loads~~

~~(2) The sum of the noncontinuous load plus the continuous load if the service entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating~~

<u>*Exception: Where the assembly, including the overcurrent devices to which the service-entrance conductors terminate, is listed for operation at 100 percent of its rating, the allowable ampacity of the service-entrance conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.*</u>

Substantiation: “Minimum Rating and Size”: The identical wording should be used for 210.19, 215.2, and 230.42.

This proposal deletes the reference to busways as unnecessary.

Confusion reigns as to under what conditions grounded conductors are subject to the same 125 percent of continuous load sizing requirements as are ungrounded conductors. During the 2005 *Code* cycle this issue was addressed for feeders, but action was deferred. ROC No. 2-145 included a lucid, sound “substantiation” that unfortunately was rejected by CMP 2 at that time. Now is an excellent time to re-evaluate that “substantiation” and adopt its intent.

The basis for the 125 percent requirement stems from the manner in which listed overcurrent devices are tested. During continuous load tests of enclosed overcurrent devices, in order to prevent nuisance tripping, it has been found that it is necessary to limit the current to 80 percent of the device’s rating. Conductors are sized, then, (1) at 125 percent of the continuous current in accordance with the allowable ampacity determined from Table 310.16, and (2) per the terminal temperature limitations of 110.14(C).

The reality is that the enclosed overcurrent devices rely on the mass of the conductors to act as heat sinks that dissipate excess thermal energy and thereby avoid unacceptable nuisance tripping. Of course, since overcurrent devices cannot distinguish between ungrounded and grounded conductors, in both cases the conductor sizes must be based on calculations that include an additional 25 percent factor when the load is continuous. On the other hand, there is no reason to add 25 percent to the load of a conductor that is not connected to a device that is not subject to nuisance tripping, such as in the case of a grounded conductor connected a neutral terminal bus.

The end result of this proposal is twofold:

1. The additional 25 percent continuous load requirement applies only to conductors, both ungrounded and grounded, that connect to an overcurrent device (unless, of course, the assembly is listed for operation at 100 percent of its rating).

2. Grounded conductors that carry continuous loads and that connect only to neutral buses, or to devices not subject to nuisance tripping, are not required to have their loads increased by 25 percent.

This proposal accomplishes that goal and, in hand with similar proposals made in two other Articles, brings into conformity the requirements for branch circuits (210.19), feeders (215.2), and services (230.42).

The deletion of the reference to busways removes obvious, unnecessary information.

Panel Meeting Action: Accept in Principle in Part

In the second sentence in 230.42(A), accept the addition of "Parts III, IV" and "V" but change the "and" to "or". Reject the remainder of the proposal. The second sentence in the 2005 NEC is to read as follows: "Loads shall be determined in accordance with <u>Parts III, IV, or V</u> of Article 220 <u>, as applicable</u> ."

Panel Statement: The word "and" in the recommendation was changed to "or" since service calculations must be based on the standard calculations in Part III, optional calculations in Part IV, or farm calculations based on Part V but not on all three as indicated in the proposal.

The suggested changes as indicated in the proposed second sentence would cover only service entrance conductors that are connected to an overcurrent protective device and would not cover service entrance conductors installed in auxiliary gutters, metal wireways, junction boxes, and other enclosures, unless the conductors were directly connected to an overcurrent protective device. The existing text in the NEC adequately covers the sizing of all service entrance conductors, including those connected to other service entrance conductors that may be larger or smaller but not connected to an overcurrent protective device.

Deleting the sentence requiring the ampacity of the service entrance conductors to be determined from 310.15 would leave the user of the Code without clear direction of where in the NEC the ampacity of a service entrance conductor is established since these conductors are not protected against short circuit and ground fault, but simply overload protection in accordance with 230.90. Furthermore, the maximum allowable ampacity of a busway is determined on the listing or labeling ampacity of the busway, not on 310.15, so this information must also remain in 230.42.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-48 Log #1494 NEC-P04 **Final Action: Reject**

(230.42(A))

Submitter: Larry T. Smith, National Electrical Seminars

Recommendation: Revise text to read as follows:

(1) General. The ampacity of the service-entrance conductors before the application of any adjustment or correction factors shall not be less than either (A)(1) or (A)(2) <u>in accordance with the temperature limitations of 110.14(C)</u> . Loads shall be determined in accordance with Article 220. Ampacity shall be determined from 310.15. The maximum allowable current of busways shall be that value for which the busway has been listed or labeled.

(1) The sum of the noncontinous loads plus 125 percent of continuous loads.

(2) The sum of the noncontinuous load plus the continuous load if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating.

Substantiation: Ignoring the temperature rating of equipment is the most common mistake being made in conductor sizing today. Entirely too many wiremen take no notice of the temperature limitations of 110.14(C) when sizing conductors. They disregard the temperature rating of equipment, and use the 90°C column of Table 310.16 when 90°C rated conductors, such as THHN, are being used. The equipment rating will either be 60° or 75°C, not 90°C.

Observing the temperature rating of the equipment is an integral part of sizing service conductors; it should be included as a requirement of 230.42(A).

Panel Meeting Action: Reject

Panel Statement: Article 110 covers general requirements for the examination and approval, as well as the installation and use of equipment and conductors. Since Section 110.14(C) already covers the temperature limitations of conductor terminations, placing this information into 230.42 is not necessary since it already applies.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-49 Log #2205 NEC-P04 **Final Action: Reject**

(230.43(17))

Submitter: Kyle Cope, Prysmian Cables and Systems

Recommendation: (17) Type PA Cable

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (230.43) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 4-9.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-50 Log #948 NEC-P04 **Final Action: Reject**

(230.43(15) and (16))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

(15) Flexible metal conduit, liquidtight flexible metal conduit, <u>or liquidtight flexible nonmetallic conduit,</u> not over 1.8 m (6 ft) long between <u>rigid type</u> raceways, or between <u>rigid</u> <u>type</u> raceway and service equipment with <u>an</u> equipment bonding jumper ~~routed with the flexible metal conduit or the liquidtight flexible metal conduit~~ according to the provisions of 250.102(A), (B), (C), and (D).

Delete (16).

Substantiation: Edit. Rigid type raceway should be specified. Present wording does not prohibit different types of flexible conduit from being daisy chained together in total lengths exceeding 6 ft. The item (16) has no restrictions similar to (15) which is not reasonable.

Panel Meeting Action: Reject

Panel Statement: This proposal is not editorial. The 6-foot restriction in 230.43(15) applies to metal flex or metal liquidtight and the paralleling action that occurs between the metal ribbon of the flex and the bonding jumper installed either internal or external to the flex. Since there is no paralleling action in a liquidtight flexible nonmetallic conduit, there is not reason to require this type of raceway to comply with the 6-foot requirements in (15). The list is not restricted to rigid-type raceways.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-51 Log #1105 NEC-P04 **Final Action: Reject**

(230.44)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise last sentence:

Cable trays used to support <u>open individual</u> service conductors shall only contain service-entrance conductors <u>of a single service</u> .

Delete present exception and substitute:

Exception: Other service-entrance conductors and conductors other than service-entrance conductors shall be permitted under the following conditions:

(1) The service-entrance conductors of each service and the other conductors are installed in a raceway or metal-covered cable specified in 230.43 or:

(2) The service-entrance conductors of each service and conductors other than service-entrance conductors are identified in a manner acceptable to the Authority Having Jurisdiction and separated by a solid fixed continuous barrier compatible with the cable tray.

FPN: See 700.12 (D) and 701.11 (D) for additional separation requirements.

Substantiation: The basic requirement should apply to open conductors of one service. The present exception doesn't require separation of service-entrance conductors of different services and doesn't include separation provided by suitable raceways or cable covering.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide any technical substantiation for excluding service entrance conductors from one service from occupying the same cable tray with a different service. The text as presently written in the Code applies to service entrance conductors supported by cable trays, not service entrance conductors installed in a cable assembly, a raceway, or some other acceptable wiring method where that wiring method is just supported by the cable tray.

The separations contemplated in Chapter 7 would not allow emergency system service conductors to be installed in the same cable tray as normal service conductors.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-52 Log #1898 NEC-P04 **Final Action: Accept in Principle**
(230.44)

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: In 230.44 add a comma after the first word in the sentence "Conductors" and after the fifth word in the sentence, "conductors" in the exception. Add two new sentences at the end of the exception as follows:

Cable trays shall be identified with permanently affixed labels with the wording "Service-Entrance Conductors" or equivalent. The labels shall be located so as to be visible after installation and placed so that they may be readily traced through the entire length of the cable tray. The exception shall read as follows:

230.44 Cable Trays.

"Exception: Conductors, other than service-entrance conductors, shall be permitted to be installed in a cable tray with service-entrance conductors, provided a solid fixed barrier of a material compatible with the cable tray is installed to separate the service-entrance conductors from other conductors installed in the cable tray. <u>Cable trays shall be identified with permanently affixed labels with the wording "Service-Entrance Conductors" or equivalent and the labels shall be located so as to be visible after installation and placed so that the service entrance conductors may be readily traced through the entire length of the cable tray."</u>

Substantiation: The two commas were added for clarification and correct punctuation. The last two sentences were added to ensure that the cable tray containing a barrier separating the service entrance conductors are clearly identified from feeders and branch circuits installed in the other side of the cable tray. The labels should be visible after the installation of the cable tray since an installer may not be able to differentiate between the service entrance conductor side of the cable tray and inadvertently install protected conductors with unprotected conductors.
Panel Meeting Action: Accept in Principle

Editorially revise the last sentence of the recommended text to read as follows:

<u>Cable trays shall be identified with permanently affixed labels with the wording "Service-Entrance Conductors." The labels shall be located so as to be visible after installation and placed so that the service-entrance conductors may be readily traced through the entire length of the cable tray."</u>

_Accept the remainder of the recommendation.
Panel Statement: The proposed text was modified to make two separate sentences for ease of use and clarity. The words "or equivelant" were removed to avoid ambiguity.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-52a Log #CP400 NEC-P04 **Final Action: Accept**
(230.49 and 230.50)

Submitter: Code-Making Panel 4,
Recommendation: Combine Section 230.49 and 230.50 into one section by making 230.49 into 230.50(A) and 230.50 into 230.50(B) to read as follows:

230.50 Protection Against Physical Damage
(A) Underground Service-Entrance Conductors.
Underground service-entrance conductors shall be protected against physical damage in accordance with 300.5.

(B) All Other Service Entrance Conductors.
All other service-entrance conductors, other than underground service entrance conductors, shall be protected against physical damage as specified in 230.50(B)(1) or (B)(2).

(1) Service Cables. Service cables, where subject to physical damage, shall be protected by any of the following:

(a)	Rigid metal conduit
(b)	Intermediate metal conduit
(c)	Schedule 80 rigid nonmetallic conduit
(d)	Electrical metallic tubing
(e)	Other approved means

(2) Other Than Service Cable. Individual open conductors and cables, other than service cables, shall not be installed within 3.0 m (10 ft) of grade level or where exposed to physical damage.

Exception to (2): Type MI and Type MC cable shall be permitted within 3.0 m (10 ft) of grade level where not exposed to physical damage or where protected in accordance with 300.5(D).
Substantiation: The two sections were combined since both were addressing protection from physical damage, Section 230.49 for underground service-entrance conductors and Section 230.50 for all others. This change will provide specific information and requirements without using the phrase "above ground" and will provide clarity on the physical protection requirements for service-entrance conductors.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-53 Log #1911 NEC-P04 **Final Action: Reject**
(230.50(A))

Submitter: William Wagner, Certification Solutions
Recommendation: Revise as follows:

230.50 Protection of Open Conductors and Cables Against Damage – Above Ground. Service-entrance conductors installed above ground shall be protected against physical damage as specified in 230.50(A) or (B).

(A) Service Cables. Service cables, where subject to physical damage, shall be protected by any of the following:

(1) Rigid metal conduit.
(2) Intermediate metal conduit
(3) Schedule 80 rigid ~~nonmetallic~~ <u>PVC</u> conduit
(4) Electrical metallic tubing
(5) Other approved means

Substantiation: This is a companion proposal for the definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC Conduit. It clarifies that rigid polyvinyl chloride conduit is designated as Type PVC, rather than the broader designation of rigid nonmetallic conduit (Type RNC) which includes PVC, HDPE and RTRC.
Panel Meeting Action: Reject
Panel Statement: The AHJ should have the flexibility to know and enforce the uses of nonmetallic rigid conduit. The submitter did not provide any technical substantiation in the proposal to justify removing the term "nonmetallic conduit" and replacing it with "PVC conduit." Article 352 applies to rigid nonmetallic conduit, as it is used in 230.50(A) at this time, and is under the jurisdiction of Panel 8. Any change to the type of nonmetallic conduit must first be addressed in Article 352.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-54 Log #3659 NEC-P04 **Final Action: Reject**
(230.50(A))

Submitter: Derrick Jones, Local Union #98 IBEW
Recommendation: Service cables, shall be protected by any of the following:

Deleted text: (Where subject to physical damage).

Substantiation: Mostly in residential construction, electricians are installing the service entrance cable in open back driveways and yards with no physical protection. Remember, these are non-fused conductors and are an accident waiting to happen.
Panel Meeting Action: Reject
Panel Statement: The phrase "where subject to physical damage" permits the electrician to install service entrance conductors as service entrance cable, for example, where the cable is not subject to physical damage as permitted by Article 338. This proposed change would require all service entrance cables to be protected, even where the cables are not subject to damage. No technical substantiation was provided showing this total protection is warranted.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-55 Log #2206 NEC-P04 **Final Action: Reject**
(230.50(B) Exception)

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise to read as follows:

Exception: Type PA. Type MI and Type MC cable shall be permitted within 3.0 m (10 ft) of grade level where not exposed to physical damage or where protected in accordance with 300.5(D).

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA (proposal attached) cable offers enhanced mechanical protection over Type MC Cable for this application. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-9.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-56 Log #405 NEC-P04 **Final Action: Reject**
(230.53)

Submitter: Sam Marcovici, NY City Buildings Dept.
Recommendation: Revise text to read as follows:
230.53 Raceways to Drain.
Where exposed to the weather, raceways enclosing service-entrance conductors shall be raintight and arranged to drain. Where embedded in masonry, raceways shall be arranged to drain.
Exception: As ~~permitted~~ specified in 348.12(1).
Substantiation: The Exception refers to 348.12, whose title is "Uses not permitted". By grouping together [via 348.12(1)] the words "permitted" and "not permitted", the statement becomes confusing. Using a word other than "permitted" would clarify the meaning of the Exception.
Panel Meeting Action: Reject
Panel Statement: Even though Section 348.12 is the "not permitted" section, there is permissive text within 348.12(1) where it states flexible metal conduit can be used in a wet location if the conductors are approved for the specific location and liquid is not likely to enter raceways or enclosures to which the conduit is connected. This is a permissive statement and the exception to 230.53 recognizes that permissive statement.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-57 Log #1975 NEC-P04 **Final Action: Reject**
(230.53)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise 230.53 as follows:
230.53 Raceways to Drain. Where exposed to the weather, raceways enclosing service-entrance conductors shall be ~~raintight~~ suitable for use in wet locations and arranged to drain. Where embedded in masonry, raceways shall be arranged to drain.
Exception: As permitted in 348.12(1).
Substantiation: The word "raintight" is not appropriate in this section. The "uses permitted" and "uses not permitted" sections in the Articles for each raceway type, including 348.12(1), address the provisions for use in wet locations . The suitability for use of listed conduit and cable raceways has been determined by means which may include a rainwater exclusion test as well as other tests for their suitability within the full scope of the Article 100 definition of "Locations, Wet".
Panel Meeting Action: Reject
Panel Statement: The word "raintight" is appropriate for this application as defined in Article 100 for raintight as constructed or protected so that exposure to a beating rain will not result in the entrance of water under specified test conditions. Using raintight fittings for the service entrance conductor raceway and installing the raceway so that it will drain will ensure that water will not remain inside the raceway, thereby contributing to deterioration of the raceway. Section 230.53 is used in conjunction with 230.54(A), (B), (F), and (G), so that the service entrance conductor raceway, the service head, and all fittings are raintight. Section 230.54(A) and (B) also uses the term "raintight" to describe the service head on the service riser.
CMP-4 encourages the submitter to provide more substantiation for this change.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 9 Negative: 1
Explanation of Negative:
YOUNG, J.: With respect to the raceways specified in the wiring methods in 230.43, the individual articles identify such raceways for their suitability for use in "wet locations." The word "raintight" in 230.53 is overridden, or introduces confusion as to which is the true requirement. The definition of "raceway" in Article 100 does not include fittings. 314.15(A) requires that "... fittings installed in wet locations shall be listed for use in wet locations." Not "raintight". The definition of "raintight" in Article 100 contains unenforceable language "...will not result in entrance of water under specified test conditions" verifiable only for listed raceways. Raceways suitable for use in wet locations are listed for use in wet locations, not "raintight".

4-58 Log #2609 NEC-P04 **Final Action: Accept**
(230.53 Exception)

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
230.53 Raceways to Drain. Where exposed to the weather, raceways enclosing service-entrance conductors shall be raintight and arranged to drain. Where embedded in masonry, raceways shall be arranged to drain.
~~Exception: As permitted in 348.12(1).~~
Substantiation: The exception should be deleted since installations found in Chapter 3 of the code apply generally per 90.3.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 9 Negative: 1
Explanation of Negative:
ODE, M.: This proposal should be a reject to correlate with panel actions on similar Proposal 4-14 and 4-56 dealing with similar issues. This exception was inserted in 230.53 to recognize that flexible metal conduit can be used to enclose service entrance conductors in a wet location and is not required to be raintight as the main rule states. This exception provides information in 230.53 that might be otherwise overlooked by the installer or by the inspector and must remain as a reference.

4-59 Log #1970 NEC-P04 **Final Action: Reject**
(230.54(A))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revised 230.54(A) as follows:
230.54 Overhead Service Locations.
(A) ~~Raintight~~ Service Head. Service raceways shall be equipped with a ~~raintight~~ service head at the point of connection to service-drop conductors. The service head shall comply with the requirement for fittings in 314.15(A).
Substantiation: The word "raintight" is not appropriate in this Section. A "service head" is a conduit fitting and is intended for installation in damp or wet locations. The requirements in 314.15(A) pertain to all such fittings installed in damp and wet locations. UL 514B, Fittings for Conduit and Cable, contains the requirements for listed service heads.
Panel Meeting Action: Reject
Panel Statement: The word "raintight" is appropriate for this application as defined in Article 100 "as constructed or protected so that exposure to a beating rain will not result in the entrance of water under specified test conditions." Using raintight fittings for the service entrance conductor raceway and installing the raceway so that it will drain will ensure that water will not remain inside the raceway, thereby contributing to deterioration of the raceway. Section 230.53 is used in conjunction with 230.54(A), (B), (F), and (G), so that the service entrance conductor raceway, the service head, and all fittings are raintight so water will not enter the service equipment. The purpose of "raintight" to describe the service head on the service riser in 230.54(A) is to ensure the weatherhead will not permit water to enter the raceway in a driving rain.
The added reference of 314.15(A) is not necessary or complete, since the service raceway may not be connected to a box or a conduit body as covered by Article 314 but may be connected to a cabinet, a cutout box, or a meter socket enclosure that must comply with 312.2. Sections 312.2 and 314.12 already covers these applications, and a reference in 230.54 is not necessary.
The submitter is encouraged to provide additional substantiation on the this change.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 9 Negative: 1
Explanation of Negative:
YOUNG, J.: The definition of "raintight" in Article 100 contains unenforceable language "...will not result in entrance of water under specified test conditions" verifiable only for listed service entrance heads. Since service heads are not required to be listed, the "test conditions" are not "specified". The express purpose of a service head is to prevent water from entering the service mast. All listed service heads are subjected to the same test in UL514B as fittings intended and listed for use in wet locations according to 314.15(A).

4-60 Log #1971 NEC-P04 **Final Action: Reject**
(230.54(B))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise 230.54(B) as follows:
230.54 Overhead Service Locations.
(B) Service Cable Equipped with ~~Raintight~~ Service Head or Gooseneck. Service cables shall be equipped with a ~~raintight~~ service head. The service head shall comply with the requirement for fittings in 314.15(A).
Substantiation: The word "raintight" is not appropriate in this section. A "service head" is a conduit fitting and is intended for installation in damp or wet locations. The requirements in 314.15(A) pertain to all such fittings installed in damp and wet locations. UL 514B, Fittings for Conduit and Cable, contains the requirements for listed service heads.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-59.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 9 Negative: 1
Explanation of Negative:
YOUNG, J.: The definition of "raintight" in Article 100 contains unenforceable language "...will not result in entrance of water under specified test conditions" verifiable only for listed service heads. Since service heads are not required to be listed, the "test conditions" are not "specified". The express purpose of a service head is to prevent water from entering the service mast. All listed service heads are subjected to the same test in UL514B as fittings intended and listed for use in wet locations according to 314.15(A).

4-61 Log #576 NEC-P04 **Final Action: Reject**
(230.70(A)(1))

Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Revise as follows:
(1) Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location either ~~outside of~~ on the exterior o f a building or structure or inside the building or structure nearest the point of entrance of the service conductors.
Substantiation: As it now reads, the service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside..., implies that an outside service disconnecting means can be located anywhere, any distance from the building or structure. If it's located inside, it must be nearest the point of the entrance of the service conductors; at Code seminars more than one engineer or electrical contractor has pointed this out to me. If I were an AHJ, and I have been one, I would have a hard time talking them out of their interpretation; it's at this point that we have to resort to, "Well, the intent of the Code is...".
If the intent is for an outside service disconnecting means to be located on the exterior of the building or structure and not adjacent to it, then 230.70(A)(1) should state so, and in plain English.
Panel Meeting Action: Reject
Panel Statement: In recent Code cycles, the panel has tried to develop a particular distance at which the service disconnecting means can be located outside the building or structure, but based on the architectural design of the building, problems with landscape and plant, and other premises problems, a reasonable distance could not be established. If the unprotected utility company conductors remain outside the building, there really is not a hazard associated with these conductors, where properly maintained by the utility company.
Where these unprotected conductors enter into a building, it is now necessary to terminate these conductors in a proper overcurrent protection device at a location nearest the point of entrance of these conductors into the building. Requiring the service disconnecting means to be located on the exterior of the building, instead of somewhere outside the building or structure, would be too restrictive and would result in too many exceptions. This concept has been acceptable, in one form or another, since the 1897 NEC and should remain as presently written.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-62 Log #3211 NEC-P04 **Final Action: Reject**
(230.70(A)(1))

Submitter: H. Dean Schumacher, H. Dean Schumacher Electrical Inspections
Recommendation: Revise text to read as follows:
230.70 (A)(1)...or inside nearest the point of entrance of the service conductors. 0-500 ampere conductors shall enter maximum 3.0 m (10 ft) 50/ampere and above maximum 6.0 m (20 ft).
Substantiation: Ambiguous code statements (nearest the point of entrance) allow varied interpretation. This change would assist installer and Inspector.
Panel Meeting Action: Reject
Panel Statement: The submitter has not presented any technical data to support the defined distances that he has recommended. There was no defined problem described in the submitters substantiation.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-63 Log #3386 NEC-P04 **Final Action: Reject**
(230.70(A)(1))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
The service disconnecting means shall be installed at a readily accessible location either outside and attached to or immediately adjacent to the building or structure served , or inside nearest the point of entrance of the service conductors.
Substantiation: This provision is sorely in need of some sort of proximity rule for service disconnects. This proposal avoids a prescriptive distance limitation that may be problematic in some cases. It does, however, eliminate the possibility that the service disconnect could be outside the building at any indefinite distance. A service disconnect at long distances, or even at a shorter distance but out of view, represents a safety hazard for occupants in an emergency. Note that if the service disconnect is a stand-alone item, it will not qualify as a structure, and the rules in Part II of Article 225 will not control the disconnection protocol when the conductors finally arrive at the building.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-61. The panel reaffirms its previous statement from Comment 4-51 on page 70-114 of the 2004 NEC Report on Comments that the service disconnecting means is not required to be attached to the building.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-72 Log #227 NEC-P04 **Final Action: Reject**
(230.70(A)(4))

Submitter: Chuck Monasmith, Fluor Federal Services
Recommendation: Add text to read as follows:
230.70(A)(4) Relocatable Structures. Service disconnecting means shall not be located on or in structures designed or intended to be relocated.
Substantiation: Structures with utilization equipment, that are designed or intended to be relocated, such as skids or semitrailers, may not have anchorage as secure as a building or other structure with an in-earth foundation. Service conductors not protected in accordance with NEC Article 240 become a hazard when an unanchored structure is moved. This proposal is consistent with service disconnect requirements in NEC Article 550 for mobile homes which also are structures designed to be relocated.
Panel Meeting Action: Reject
Panel Statement: Conductors do not become a hazard when properly installed and used. According to Section 90.3, Articles within Chapter 5 may modify the requirements of Article 230. The submitter has not provided substantiation of any safety issues with installing a service disconnecting means on a relocatable structure as long as the service drop or lateral is de-energized prior to relocating the structure. Section 550.32(B) permits a service to be installed on a manufactured home with certain conditions. While certainly not a mobile home, manufactured homes are designed to be transportable and can be installed on a non-permanent foundation and could be considered to be a relocatable structure.
Some of the structures that are described are already covered by other NEC requirements. Further clarity on what the proposed structures are would be required prior to evaluating the merit of this proposal.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-64 Log #2915 NEC-P04 **Final Action: Reject**
(230.70(B))

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Revise as follows:
230.70(B) Marking. Each service disconnect shall be permanently marked to identify it as a service disconnect. Disconnecting means located on the supply side of the service equipment shall be permanently marked to identify it as NOT A SERVICE DISCONNECT.
Substantiation: Many electrical distribution utilities are now requiring a disconnecting switch on the line side of their metering equipment to protect meter technicians. Confusion exists as to whether this switch is now the service disconnecting means. These switches must be identified.
Panel Meeting Action: Reject
Panel Statement: While the NEC recognizes these switches located on the line side of the service disconnecting means as meter disconnect switches in 230.82(3), these switches are technically utility company equipment. If these disconnects are under the exclusive control of the electric utility, then Section 90.2(B)(5) states the NEC does not cover these disconnects. Therefore, requiring marking of any kind in 230.70(B) for utility company equipment would be outside the scope of the NEC.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-65 Log #1327 NEC-P04 **Final Action: Accept**
(230.71)

TCC Action: The Technical Correlating Committee understands that the Panel Action on this proposal is Accept.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
230.71 Maximum Number of Disconnects.
(B) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with identified handle ties or a master handle to disconnect all conductors of the service with no more than six operations of the hand.
Substantiation: This change is meant to provide correlation with the 2005 change to 240.20.
Panel Meeting Action: Accept in Part
The panel does not accept the deletion of 230.71(A) and the fine print note.
Panel Statement: The panel accepts the addition of the word "identified" because it correlates with 240.20(B).
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-66 Log #2602 NEC-P04 **Final Action: Accept**
(230.71, 230.82 and 230.94)

Submitter: Joseph P. DeGregoria, Underwriters Laboratories Inc.
Recommendation: Revise text to read:

230.71 Maximum Number of Disconnects.

(A) General. The service disconnecting means for each service permitted by 230.2, or for each set of service-entrance conductors permitted by 230.40, Exception Nos. 1, 3, 4, or 5, shall consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be not more than six sets of disconnects per service grouped in any one location. For the purpose of this section, disconnecting means used solely for power monitoring equipment, surge protective devices ~~transient voltage surge suppressors~~ , or the control circuit of the ground-fault protection system or power-operable service disconnecting means, installed as part of the listed equipment, shall not be considered a service disconnecting means.

(B) Single-Phase Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with handle ties or a master handle to disconnect all conductors of the service with no more than six operations of the hand.

FPN: See 408.36(A) for service equipment in panelboards, and see 430.95 for service equipment in motor control centers.

230.82 Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

(1) Cable limiters or other current-limiting devices

(2) Meters and meter sockets nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded

(3) Meter disconnect switches nominally rated not in excess of 600 volts that have a short-circuit current rating equal to or greater than the available short circuit current, provided all metal housings and service enclosures are grounded

(4) Instrument transformers (current and voltage), impedance shunts, load management devices, ~~and~~ surge arresters and Type 1 surge protective devices

(5) Taps used only to supply load management devices circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors

(6) Solar photovoltaic systems, fuel cell systems, or interconnected electric power production sources

(7) Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided

(8) Ground-fault protection systems or Type 2 surge protective devices ~~transient voltage surge suppressors~~ , where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided

230.94 Relative Location of Overcurrent Device and Other Service Equipment. The overcurrent device shall protect all circuits and devices.

Exception No. 1: The service switch shall be permitted on the supply side.

Exception No. 2: High-impedance shunt circuits, surge arresters, Type 1 surge protective devices, surge-protective capacitors, and instrument transformers (current and voltage) shall be permitted to be connected and installed on the supply side of the service disconnecting means as permitted in 230.82.

Exception No. 3: Circuits for load management devices shall be permitted to be connected on the supply side of the service overcurrent device where separately provided with overcurrent protection.

Exception No. 4: Circuits used only for the operation of fire alarm, other protective signaling systems, or the supply to fire pump equipment shall be permitted to be connected on the supply side of the service overcurrent device where separately provided with overcurrent protection.

Exception No. 5: Meters nominally rated not in excess of 600 volts shall be permitted, provided all metal housings and service enclosures are grounded.

Exception No. 6: Where service equipment is power operable, the control circuit shall be permitted to be connected ahead of the service equipment if suitable overcurrent protection and disconnecting means are provided.

Substantiation: This is one of several related proposals affecting Articles 100, 230, 250, 280, 285, 501, and 502 based on the following:

1) UL intends to combine the categories of Surge Arresters (Article 280) and Transient Voltage Surge Suppressors (Article 285) into one category and Standard, UL 1449, renamed Surge Protective Devices(SPDs).

UL 1449 will include SPD designations Type 1 and Type 2 for permanently connected devices for use on circuits not exceeding 600 V.

The technology of both low voltage Surge Arresters and TVSSs are now basically the same, thereby justifying coverage under one Standard, UL 1449, and one test program with consideration given to the installation location on the line side (Type 1) or load side (Type 2) of the service disconnect overcurrent protection.

2) The Surge Arrester designation will only be retained for devices used in circuits of 1 kV and over and evaluated to IEEE C62.11-1999.

Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10
Comment on Affirmative:

BECK, C.: The Technical Correlating Committee should refer this Panel Action to CMP 5 for correlation with Articles 280 and 285.

9-7c Log #CP900 NEC-P09 **Final Action: Accept**
(230.71(B), FPN)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for action. This action will be considered by Code-Making Panel 4 as a public comment.
Submitter: Code-Making Panel 9,
Recommendation: Revise 230.71(B) (FPN) to read as follows:

FPN: See 408.36 Exception No. 1 and Exception No. 3 for service equipment in certain panelboards, and see 430.95 for service equipment in motor control centers.

Substantiation: CMP-9 has removed the categories of "lighting and appliance branch circuit panelboard" and "power panelboard" from Article 408 by virtue of its action on Proposal 9-117. This proposal correlates the reference in this fine print note with that action. Panelboards are now treated equally, and the only unique service requirements are in two of the three exceptions that follow 408.36.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:

RUPP, B.: NEMA assumes the proposal is dealing with the text in (230.71(B)(FPN)).

4-67 Log #994 NEC-P04 **Final Action: Reject**
(230.72(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:

(B) ADDITIONAL SERVICE DISCONNECTING MEANS. The one or more additional service disconnecting means covered in 230.71(A) for fire pumps, emergency systems, legally required standby systems or optional standby systems permitted by 230.2 shall be installed sufficiently remote from the one to six disconnecting means for ~~normal~~ all other services to minimize the possibility of simultaneous interruption of supply.

Substantiation: The present wording does not require the disconnecting means for fire pumps and emergency systems to be remote from each other. There could be a total of twelve disconnects at one location which could be confusing to personnel. Safety should require the disconnecting means for these systems to be remote from all other disconnecting means. There is no guarantee that an "occurrence" in one of these systems is less likely than on "normal" systems. 695.4(B)(2) requires remote location from (all) other disconnecting means. 700.12(D) requires separation of service drops and laterals which infers the disconnecting means where they terminate should be separated. This section is not consistent with that section.
Panel Meeting Action: Reject
Panel Statement: This is a repeat of similar proposals from the previous two Code cycles. The panel continues to say that the AHJ should make that determination. The submitter has not provided sufficient substantiation for this change. The panel reaffirms its position from the 2004 Report on Proposals, dealing with Proposal 4-94 as well as the ROC in Comment 4-61.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-68 Log #1091 NEC-P04 **Final Action: Reject**
(230.72(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "or for optional standby ".
Substantiation: This article and section relate to services, defined as supplied from a utility. 702.2 defines optional standby systems as on-site generated power. Clarification is needed.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-31.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-69 Log #925 NEC-P04 **Final Action: Accept in Principle in Part**
(230.79)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:

RATING OF SERVICE DISCONNECTING MEANS. The service disconnecting means shall have a current rating, not less than the calculated load to be carried, determined in accordance with Parts I, II, III and IV of Article 200, as applicable . In no case shall the rating be less than specified in 250.79(A), (B), (C), or (D).

(A) ONE CIRCUIT INSTALLATION. For installations supplying only ~~limited~~ loads of a single branch circuit, the service disconnecting means shall have a rating of not less than 15 amperes.

(B) TWO CIRCUIT INSTALLATION For installations consisting of ~~not more than~~ two 2-wire circuits, the service disconnecting means for a 2-wire service shall have a rating of not less than 30 amperes. For installations consisting of two multiwire circuits or two 3-phase branch circuits, the service disconnecting means shall have a rating of not less than 30 amperes.

Substantiation: Edit. "Calculated" load should be specified; some loads are based on 125 percent of ratings. The Style Manual indicates reference should not be made to entie articles. In (A) "limited" is not defined; load is limited by circuit ratings and other requirements. In (B), "not more than" literally includes one circuit which (A) permits to be 15 amperes. Without the proposed part for two multiwire or 3-phase circuits, two such 15 ampere branch circuits require a 60 ampere disconnecting means, per (D), which is excessive.

Panel Meeting Action: Accept in Principle in Part

Accept the addition of the word "calculated" and accept the addition of "Parts III, IV, or V, of Article 220, as applicable" but change the "and" to "or" in the first sentence of the section. Reject the remainder of the proposed changes.

The amended text to read as follows: "230.79 Rating of Service Disconnecting Means.

The service disconnecting means shall have a rating not less than the calculated load to be carried, determined in accordance with Parts III, IV, or V, of Article 220 , as applicable . In no case shall the rating be lower than specified in 230.79(A), (B), (C), or (D)."

The existing text in (A) through (D) is to remain as written in the present Code

Panel Statement: This proposal is not editorial. The submitter is incorrect in citing Article 200. The word "calculated" was accepted to be consistent with the changes in the text in Article 220 and other parts of the NEC in the 2005 NEC. Parts III, IV, or V were inserted to be consistent with Section 4.1.1 of the NEC Style Manual. Parts I and II were not accepted in the recommendation, since Parts III, IV, and V of Article 220 deal with service calculations.

Deleting the word "limited" in (A) would make this section inconsistent with the text in 230.23(B), Exception, that refers specifically to limited loads of a single branch circuit not being required to be smaller than 12 AWG in size for small overhead service drops on limited loads.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-70 Log #1090 NEC-P04 **Final Action: Accept in Principle in Part**
(230.79)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

RATING OF DISCONNECTING MEANS . The service disconnecting means shall have a current rating not less than the calculated load ~~to be carried~~ , determined in accordance with Parts I, II, III, and IV of Article 220, as applicable . In no case shall the rating be less than specified in 230.79(A),(B), (C) or (D).

(A) ONE CIRCUIT INSTALLATION . For installations to supply only ~~limited~~ load(s) of a single branch circuit, the service disconnecting means shall have a rating of not less than 15 amperes.

(B) TWO CIRCUIT INSTALLATION . For installations consisting of ~~not more than~~ two 2-wire branch circuits, the service disconnecting means for a 2-wire service shall have a rating of not less than 30 amperes. For installations consisting of two multiwire branch circuits or two 3-phase branch circuits, the service disconnecting means shall have a rating not less than 30 amperes.

Substantiation: Edit. "Calculated" load should be specified; some motor loads and continuous loads are based on 125 percent of current ratings. Per style manual, reference should not be made to an entire article. In (A), "limited" is not defined; load is limited by circuit ratings and other requirements. In (B,) "not more than " literally includes one circuit, which (A) permits to be 15 amperes. Without the proposed part for two multiwire or 3-phase circuits, two such 15 ampere circuits require a 60 ampere disconnecting means per (D), which is excessive.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: See panel action and statement on Proposal 4-69.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-71 Log #1328 NEC-P04 **Final Action: Reject**
(230.79)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise as follows:

230.79 Rating of Service Disconnecting Means.

The service disconnecting means shall have a rating not less than the load to be carried, determined in accordance with Article 220. In no case shall the rating be lower than specified in 230.79(A), (B), (C), or (D).

(A) One-Circuit Installation. For installations ~~to~~ that supply only limited loads of a single 2-wire or multiwire branch circuit, the service disconnecting means shall have a rating of not less than 15 amperes.

(B) Two-Circuit Installations. For installations consisting of not more than two 2-wire or multiwire branch circuits, the service disconnecting means shall have a rating of not less than 30 amperes.

Substantiation: Whether the circuit is a 2 wire or multiwire circuit, the load requirements shouldn't change.

Panel Meeting Action: Reject

Panel Statement: There was no technical substantiation provided for the proposed change. Multiwire branch circuit loads could exceed the 15 amps permitted in (A) or the 30 amps permitted in (B). See panel action and statement on Proposal 4-23.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-73 Log #3334 NEC-P04 **Final Action: Reject**
(230.82)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Revise this section to read as follows:

230.82. Equipment Connected to the Supply Side of Service Disconnect. Only equipment included in this section shall be permitted to be connected to the supply side of the service disconnecting means.

(A) Unswitched Equipment.

(1) Cable limiters or other current limiting devices

(2) Meters or meter sockets nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded

(3) Instrument transformers (current and voltage), high-impedance shunts, load management devices, and surge arresters

(4) Taps used only to supply load management devices, circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors

(5) Solar photovoltaic systems, fuel cell systems, or interconnected electric power production sources

(6) Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided

(7) Ground-fault protection systems or transient voltage surge suppressors, where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided

(B) Meter Disconnect Switches. A disconnecting means shall be permitted to be located ahead of the service equipment provided the installation complies with 230.82(B)(1) through 230.82(B)(3). A separate service disconnecting means that complies with Part V of Article 230 shall be installed, and shall be located as provided in 230.70(A)(1).

(1) Rating. A meter disconnect shall be capable of interrupting the load served. It shall have a short-circuit current rating not less than the available short-circuit current.

(2) Marking. A meter disconnect shall be legibly field marked on its exterior in a manner suitable for the environment substantially as follows:

METER DISCONNECT
NOT SERVICE EQUIPMENT

(3) Grounding. A meter disconnect shall be grounded. The grounding connections shall be permitted to be in accordance with 250.142(A)(1).

Substantiation: This proposal should be read as fully supportive of the technical objectives of the 2002 NEC change in this section that added meter disconnects. The problem is to achieve those objectives in a way that does not create confusion and controversy around a fundamental principle of code application, namely, the determination of exactly which device located where constitutes the service disconnect.

Meter disconnects have been around for a very long time, normally consisting of a multipole circuit breaker mounted within a multifunction meter enclosure or in a self-contained metering pedestal. Theoretically a manufacturer could make any of them as convertible to either "hot sequence" (meter ahead of switch) or "cold sequence" (switch ahead of meter) in the field, to suit local utility requirements. At present, most of this market consists of hot sequence units that aren't field-convertible. If these breakers are on the load side of the service point (the usual case), and if they provide overcurrent protection for the conductors they supply (also the usual case), then what they supply is a conventional feeder, and not a continuation of service conductors.

Although these switches can always be installed as service disconnects, the Advisory Committee understands the practical reluctance to do so in many cases. One major reason is that if they are so classified a grounding electrode would have to be provided at the metering point. If the meter is on the outside of the building that isn't a big problem, but if the meter is hundreds of feet away, it would involve an additional electrode that would meet code but accomplish very little in terms of safety, since there would be no electrical loads at the remote metering point. It would be like requiring a grounding electrode conductor to be brought to every conventional meter socket.

The Committee also recognizes the increased, and justified, utility interest in cold sequence metering, especially on self-contained 480Y/277 volt metering systems, because of the greater safety it affords their service personnel. Pulling a meter under load at 277 volts to ground can result in a severe arc, which is why the NEC has required GFPE on 480Y/277 volt services for the last thirty-five years. The remote switch makes sense, and clearly increases safety.

Considering that the conductors run from the meter to the "service" disconnect are usually run as unprotected service conductors, requiring overload protection for these conductors has no observable safety justification. Remember also that bypass switches in meter sockets are to maintain load continuity, not load interruption, and opening a meter bypass switch under load may destroy the meter socket.

Some other utilities have also expressed interest in this concept where the metering is to be at a roadside, with the service running to the building served typically using an underground wiring method. This is true even on ordinary 120/240 volt single phase services to single family dwellings. Utility representatives point out, correctly, that here as well a remote disconnect adds an additional level of safety. Often electricians have been in the position of needing to pull a meter in order to deenergize service equipment in a flooded basement; a remote disconnect is much safer.

Unfortunately, countless NEC rules depend on a common understanding of exactly where the service is. Allowing two devices, often widely separated on the same property, that each potentially qualify as service disconnecting means is extremely troublesome. This proposal clearly covers this equipment in a way that precludes confusing meter disconnects with service disconnects.

It was only in the 1999 cycle that the following similar allowance was deleted from Section 230.82: "Fuses and disconnecting means or circuit breakers suitable for use as service equipment, in meter pedestals or otherwise provided and connected in series with the ungrounded service conductors and located away from the building supplied." The reason this provision was deleted (Proposal 4-159 in the 1999 NEC cycle) was that such disconnecting means are in fact service disconnects and the normal requirements in Part B of Article 225 should generally apply because the conductors they supply are feeders. Further, the existence of this provision (which originated in the 1971 NEC, long before building disconnects moved from old Section 230-84 to Article 225) was leading to confusion and inconsistent application of the rules because of conflicts with Article 225. That action was essentially correct.

Furthermore, the NEC may finally impose a proximity rule on outdoor service disconnects. Only the lack of consensus within CMP 4 prevented its incorporation in the last two codes, something likely to be resolved soon. Assuming such action takes place, an outdoor disconnect at some distance to be specified from the building could be viewed as the service disconnect. If not, then we would have a switch in the service conductors of the premises wiring system that (1) would be a service disconnect, but (2) could not be, in and of itself, the disconnecting means for the building or structure served. If the remote service disconnect is within a building it doesn't matter because 225.32 imposes the same requirement for a building fed from another building or structure. This adds another potential source of confusion as to what device is the official service disconnect.

The meter disconnect, however, supplies no electric equipment in its vicinity, and therefore requiring all the usual grounding provisions at a service disconnect appears to add little to safety, and discouraging its placement means reducing safety for the sake of editorial purity. On the other hand, a remote disconnect that waddles and quacks like a service disconnect will be treated accordingly by many inspectors, resulting in substantial argument and inconsistency in the application of a fundamental concept, the location of the service disconnect. This proposal provides the appropriate context for these switches, including a field-marking requirement that makes the function obvious.

This version of the previously submitted language responds to CMP 4's objections during the comment stage of the prior cycle. The subsection (B) title now includes the word "switches" to provide a clearer contrast from (A) on unswitched equipment. The former (B)(1) (service disconnect provided) has been moved into the parent language of (B) so as to not create confusion in a section covering equipment ahead of service disconnects. In addition, for the same reason, former (5) covering service equipment has been dropped. A service disconnect placed ahead of a meter is not within the scope of this location.

CMP 4 also raised the issue of "it would not make any sense to locate a meter disconnecting means on the load side of the metering equipment …" The language in this proposal, however, deliberately allows for such switches on either side of the meter based on the fact that utilities differ as to which side of the meter should be disconnected. The wording has also been clarified to avoid the inference that the entire list must be installed. The second sentence for (2) inserts the rating accepted by CMP 4 from Proposal 4-106.

CMP 4 did not respond to the central issue addressed in the 2005 proposal, that being that the switch described here, and with the short-circuit current rating described in Proposal 4-106, may and likely would otherwise qualify as a service disconnect as defined in Article 100, because it would be capable of constituting the main cutoff of supply. This confusion is exacerbated on systems with high available fault currents because the UL Guide Card information can be interpreted as a requirement for a fused switch at this location. The placement of a fused switch at this location will be interpreted by many as a service disconnect, however unintended. Remember that such a switch would fully comply with the overcurrent placement rule in 230.91.

This proposal is essential to avoid extensive field controversies around the location of the real service disconnect, particularly if CMP 4 moves to make express allowances for service disconnects to be installed at some distance from the building or structure served. It is highly significant that the submitter of related Proposal 4-106 is the same person as the submitter of the successful Proposal 4-159 in the 1999 cycle that deleted the prior allowance for such switches ahead of a service disconnect, precisely because of the confusion and conflicts such provisions create. We respectfully invite CMP 4 to carefully reconsider this proposal.

Panel Meeting Action: Reject

Panel Statement: Based on 90.2(B)(5), the NEC has no jurisdiction over installations under the exclusive control of the utility company. The switch being referenced in 230.82(3) and in this proposal is a utility company switch, and the utility company has exclusive control over the switch, its access, and the operation of this switch. To require this meter disconnect switch to be capable of interrupting the load to be served is more of an issue of the service disconnecting means and not a meter disconnect. The utility company can very easily disconnect all loads by turning the service disconnecting means to the off position, thereby unloading the meters so the meters can be pulled under a no-load condition.

In addition, requiring this meter disconnecting means to be rated for the available short circuit current of the system would then place this disconnect under the responsibility of the owner of the facility and would require the owner to change this disconnect whenever the utility company changed the available fault at the facility by installing a lower impedance transformer or by switching to another substation.

This entire issue of permitting a meter disconnecting means on the line side of the service disconnecting means is better addressed in the utility company regulations and the utility company installation manuals by the individual utility companies. As indicated in the substantiation for this proposal, there are utility companies that require the meter disconnecting means to be located on the load side of the service disconnecting means which makes it a feeder disconnect. Some require it on the line side of the meters but where the service disconnecting means is composed of more than six disconnects, such as would be the case for a meter stack for an apartment complex, the disconnect before the meters is the service main.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-74 Log #3584 NEC-P04 **Final Action: Reject**

(230.82(9) (New))

Submitter: Wes Hoppler, American Power Technologies Inc.

Recommendation: Add a new additional item (9):

<u>(9) Meter-socket and meter-socket-adapter type transfer switches.</u>

(please note companion proposal for 230.94.)

Substantiation: Portable generator demand and use is increasing, particularly in light of post 9/11 preparedness efforts and more recent large-scale power supply failures (2003 Northeastern grid failure, Gulf Coast hurricanes). Significant numbers of portable generators are improperly connected, leading to dangerous conditions for homeowners and utility line crews engaged in restoration efforts. Although organizations such as IBEW have implemented work practices to minimize the threat posted to line crews, deaths from portable generators backfeeding utility lines still occur (at least one worker has been killed from such a situation in the aftermath of recent Gulf Coast hurricanes). Meter-socket-adapter type transfer to switches provide a cost-effective means for addressing this problem in general, and are also particularly well suited to retrofitting existing power pedestals serving traffic signals. Listed units are already in the marketplace, and we (APT) are in the process of listing additional units. It is impractical to include a grounded conductor disconnecting means within these types of units. These units connect at a point of the service-side of the main disconnect where a ground-neutral bond already exists. Requiring additional connections to the main disconnect is not warranted to produce a safe installation and would result in prohibitively expensive installation. The goal should be to decrease unsafe generator connections. With this code change, and additional, viable means of achieving that goal can be recognized and accepted.

Panel Meeting Action: Reject

Panel Statement: The submitter has not presented any technical documentation for the equipment that recommends be added to this section. The requirement for listed transfer equipment on optional standby systems already appears in Article 702.

Where equipment is under the exclusive control of the serving utility, Section 90.2(B)(5) applies and equipment such as this is not covered by the Code. There are products such as these that are listed in accordance with UL 1008, Standard for Transfer Switches. The listing specifically states the product is intended to be installed by and controlled by the serving utility.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ODE, M.: Meter-socket and meter-socket-adapter type transfer switches can provide a viable method to connect a portable generator to a premises wiring system. The availability of this type product may help to reduce the number of improperly connected portable generators, and also will reduce the possibility of portable generators backfeeding utility lines.

Where listed, these types of products have been investigated and tested to the requirements of UL 1008, and meet the same safety requirements as other listed transfer switches. The listing for these particular transfer switches specifically states they are intended to be controlled and installed by the serving utility, and as such, 90.2(B)(5) is applicable. The panel statement that this equipment is not covered by the code is correct since these transfer switches are installed as part of the utility company meter and meter socket. This agreement with the panel action does not imply that these products cannot be safely used where installed and operated correctly.

4-75 Log #187 NEC-P04 **Final Action: Reject**
(230.82(2))

NOTE: The following proposal consists of Comment 4-71 on Proposal 4-105 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-105 was:

Revise text to read as follows:

Meters, meter sockets, meter socket transfer switches, or meter disconnect swicthes nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded.

Submitter: Joseph McCann, City of Coral Springs
Recommendation: Add transfer swtiches (that are listed for service equipment) shall be permitted to be connected to the supply side of the service equipment. 230.82(1)-(7).
Substantiation: Transfer switches are available that are listed as service equipment and should be included in the equipment that are listed in 230.82 (1)-(7).
Panel Meeting Action: Reject
Panel Statement: There are transfer switches that are rated for use as service equipment where there is a center off position and integral overcurrent protection and can be considered to be a service disconnecting means but these transfer switches are not located ahead of the service disconnect since it is the service disconnecting means.

There are also transfer switches that are rated for use as service equipment to comply with 225.36 where the transfer switch must be installed at a separate building or structure, has a center off position but no integral overcurrent protective device but complies as a feeder disconnect at the separate building or structure. Transfer switches without integral overcurrent protection may be rated for use as service equipment but must have a marking to indicate the maximum rating of overcurrent protection to be provided ahead of the transfer switch.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-76 Log #2845 NEC-P04 **Final Action: Reject**
(230.82(2))

Submitter: Doug Eckelkamp, Bell Electric
Recommendation: Revise 230.82(2) by adding the requirement that the meter and meter socket have a marked short-circuit current rating.

230.82 Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

(1) Cable limiters or other current-limiting devices

(2) Meters and meter sockets nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded <u>and the marked short-circuit current rating for the meter and meter socket is not exceeded by the available short-circuit current.</u>

The remainder of 230.82 is to remain the same.
Substantiation: Electrical workers are continually installing meters "hot" without knowing if the meter has the ability to withstand the available short-circuit current if a catastrophic fault should occur. This proposal will drive the product standards to begin marking meters with their short-circuit current rating. That will provide a greater degree of safety for workers that are at serious risk today.
Panel Meeting Action: Reject
Panel Statement: Marking a utility company meter for its withstand rating would not accomplish what the submitter is alluding to in his substantiation. Where a worker is reinstalling a meter back into an energized base, the meter would not be fully engaged in the socket at the time of contact to a live part that may cause arcing between the meter and the meter socket. Most accidents with meters being reinserted into meter sockets occur when a meter is not inserted into the socket at the correct angle with the meter socket jaws and the meter blades not correctly aligned. Even if the meter were marked with a withstand rating, this withstand rating would be established with the meter fully engaged into the socket and not as it is being inserted into the socket. These meters are also not designed to be reinserted under full load conditions where motor contribution would come into play in a fault condition, but this would certainly be a factor if someone was reinserting a meter into a socket without having turned any load off.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-77 Log #3476 NEC-P04 **Final Action: Accept in Principle**
(230.82(4))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:

230.82(4) Instrument transformers (current and voltage) impedance shunts, load management devices and <u>surge</u> arresters.
Substantiation: This article needs rewording in order to stay consistent with the rest of the NEC mentions of this item.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action on Proposal 4-66 that seems to satisfy the submitter's concern.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-78 Log #809 NEC-P04 **Final Action: Reject**
(230.82(9))

Submitter: Frank Garcia, Hollister, CA
Recommendation: Transient Voltage Surge Suppressors shall be used for all branch circuits.
Substantiation: Equipment damage is occuring to electronic controlled systems due to no transient voltage surge suppressors. If surge suppression is installed to all branch circuits, damage to equipment would decrease and save on loss of productivity.

Use of transient voltage surge suppressors for all branch circuits would help to curtail the over use of extension cords devices to protect equipment, minimizing the chance of fire.
Panel Meeting Action: Reject
Panel Statement: Section 230.82 is simply recognizing that there may be transient voltage surge suppression devices connected at the service where suitable overcurrent protection has been provided and a proper disconnecting means is provided. In the substantiation, the submitter alludes to the use of transient voltage surge suppressors curtailing the overuse of extension cord devices by being inserted in the branch circuit. The submitter has submitted no technical substantiation for this statement.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-79 Log #913 NEC-P04 **Final Action: Reject**
(230.90)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "overload" to "overcurrent" throughout this section.
Substantiation: Edit. The heading refers to overcurrent which is not the same as the definition of overload in Article 100, which does not include short circuits or ground faults. The sections referenced in the exceptions cover overcurrent, not overload.
Panel Meeting Action: Reject
Panel Statement: The proposal is not editorial. The use of the phrase "overload protection" in Section 230.90 recognizes that service conductors are not protected against short circuit and ground fault. These conductors are protected against overload by limiting the load on these ungrounded service conductors, and all of the exceptions to this section recognize the limitation of the load as a protection for these conductors. These conductors connect to an overcurrent protective device at the service disconnecting means, but the load is limited to not more than the conductor rating with exceptions.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-80 Log #1702 NEC-P04 **Final Action: Reject**
(230.91, 230.93, 230.94, and 230.94 Exception No.3)

Submitter: Charles M. Trout, Maron Electric Company
Recommendation: Change title and sections as follows:

Part VII. Service Equipment - ~~Overcurrent~~ <u>Overload and Ground-Fault</u> Protection

230.91 Location. The service ~~overcorrect~~ <u>overload</u> device etc.

230.92 Locked Service ~~Overcurrent~~ <u>Overload</u> Devices. Where the service overcorrect overload devices... and shall of a lower ampere rating than the service ~~overcorrect~~ <u>overload</u> device.

230.94 Relative Location of ~~Overcurrent~~ Device and Other Service Equipment. The ~~overcurrent~~ <u>overload</u> device shall protect all circuits and devices on the supply side.

Exception No. 3: "...on the supply side of the service ~~overcorrect~~ <u>overload</u> device...".
Substantiation: Nothing in Part VII relates to overcurrent protection of service equipment. The location of the required overcurrent device provides overcurrent protection only for the feeders from the service equipment and not the service conductors. Ground-fault protection of equipment is a major part of Part VII and should be included in the title.

Panel Meeting Action: Reject
Panel Statement: While the service conductors are protected against overload by limiting the amount of load connected to the conductors, these conductors are connected to overcurrent protective devices, such as circuit breakers and fusible switches with fuses installed so changing these sections to "overload" devices would not be properly identifying them. The conductors on the load side of these devices are being protected against short circuits, ground faults, and overloads.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-81 Log #2935 NEC-P04 **Final Action: Reject**
(230.92)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 230.92 as follows:
230.92 Locked Service Overcurrent Devices. Where the service overcurrent devices are locked or sealed or are not readily accessible to the occupant, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location, and shall be of lower ampere rating than the service overcurrent device. <u>Enclosure housing electrical apparatus that are controlled by lock and key shall be considered accessible to qualified persons.</u>
Substantiation: This is a companion proposal to delete the rule from 110.26 and add it to 230.92 and 240.24(B). 110.26 deals with access to working space about electrical equipment and does not apply to access to the equipment itself. It seems the provision on electrical apparatus controlled by a lock and key would more properly be located in 230.92 and 240.24(B).
Many locations come to mind where electrical equipment is locked to prevent unauthorized access. These include schools, colleges, health care facilities, airport terminals and office buildings that are open to the public. These buildings often have either panelboards with locking covers or electrical equipment located in locked rooms. Electrical inspectors recognize the security that is needed in these and other facilities. Locating this rule with the sections that cover locks on equipment will improve the usability of the Code.
Panel Meeting Action: Reject
Panel Statement: The submitter has not presented a definable technical problem with the current language. The NEC is not intended to be written so as to educate people in the practical application of the various requirements. A change in defining the differing types of access that are described in a number of articles if accepted belongs in Chapter 1 of the NEC.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-82 Log #3583 NEC-P04 **Final Action: Reject**
(230.94 Exception No. 7 (New))

Submitter: Wes Hoppler, American Power Technologies Inc.
Recommendation: Add a new additional Exception No. 7:
<u>Exception No. 7: Meter-socket and meter-socket-adapter type transfer switches shall be permitted to be installed and connected on the supply side of the service disconnecting means.</u>
(Please note companion proposal for 230.82)
Substantiation: Portable generator demand and use is increasing, particularly in light of post 9/11 preparedness efforts and more recent large-scale power supply failures (2003 Northeastern grid failure, Gulf Coast hurricanes). Significant numbers of portable generators are improperly connected, leading to dangerous conditions for homeowners and utility line crews engaged in restoration efforts. Although organizations such as IBEW have implemented work practices to minimize the threat posted to line crews, deaths from portable generators backfeeding utility lines still occur (at least one worker has been killed from such a situation in the aftermath of recent Gulf Coast hurricanes). Meter-socket-adapter type transfer to switches provide a cost-effective means for addressing this problem in general, and are also particularly well suited to retrofitting existing power pedestals serving traffic signals. Listed units are already in the marketplace, and we (APT) are in the process of listing additional units. It is impractical to include a grounded conductor disconnecting means within these types of units. These units connect at a point of the service-side of the main disconnect where a ground-neutral bond already exists. Requiring additional connections to the main disconnect is not warranted to produce a safe installation and would result in prohibitively expensive installation. The goal should be to decrease unsafe generator connections. With this code change, and additional, viable means of achieving that goal can be recognized and accepted.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 4-74.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10
Comment on Affirmative:
ODE, M.: See my Affirmative Comment on Proposal 4-74.

4-83 Log #3619 NEC-P04 **Final Action: Reject**
(230.95)

Submitter: John Sioumcas, St. Louis, MO
Recommendation: Revise the existing text in the second paragraph of 230.95 to read:
The rating of the service disconnect shall be considered to be the rating of the actual fuse installed or the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted.
Substantiation: The existing text of 230.95 requires that ALL 1200A or larger fused switches require ground fault protection for the system types specified, regardless of the actual fuse installed. Therefore, a 1200A or larger switch with an 601A, 650A, 700A, 750A, 800A, 801A, or 900A, with appropriate sized and installed conductors would require ground fault protection despite not meeting the overcurrent protection size criteria of 1000A or more.
However, a similar 1200A circuit breaker with a 1200A Trip Unit would not require ground fault protection provided the actual rating plug selected was a fixed rating of 600A, 700A, 800A or 900A with appropriately sized and installed conductors despite the fact that the rating plug can easily and inexpensively increased to 1000A or more.
I understand the Code panels concern about the ability of the user to increase the rating of a fuse in a fused switch, but in reality, it is much easier to change a single $100 rating plug from 800A to 1000A than to change 3-800A fuses to 3-1000A fuses that can total more than $1500. Thus, the belief that a user is going to increase the fuse rating in a service disconnect (where the fuses rarely operate) and conductors after the inspection of the installation just to avoid the addition of ground fault to a fused switch is completely unfounded - and infact more realistic for a circuit breaker type system - in which it is permitted.
Therefore, the text as written should be changed because it requires users who prefer fused equipment to incur unnecessary added cost of ground fault protection for properly installed installations 1000A or less that utilize a 1200A or larger sized switch.
Panel Meeting Action: Reject
Panel Statement: The reason the rating of the fusible disconnecting switch is used is to discourage someone from installing a smaller fuse so that the more costly ground fault protection of equipment does not have to be installed and then increasing the size of the fuse to match the size of the disconnecting means. This is more easily accomplished with a fusible switch than with a circuit breaker and replacing the fuse with a larger size is much less costly than installing the ground fault protection of equipment required in this section.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 8 Negative: 2
Explanation of Negative:
ALLISON, M.: I disagree with the panel action, and vote negative. The proposal should be accepted.
Substantiation: The submitter is correct. A 1200 amp frame circuit breaker used as the service disconnecting means equipped with a smaller than 1000 amp rating plug does not have to be equipped with ground fault protection according to the existing code.
This is a safety concern, as it is with fused switches. The user or installer can easily make the circuit breaker installation 1000, or 1200 amps. It is quite simple and not expensive to install a higher rating plug.
The rational in the panel statement is:
"The reason the rating of the fusible disconnecting switch is used is to discourage someone from installing a smaller fuse so that the more costly ground fault protection of equipment does not have to be installed and then increasing the size of the fuse to match the size of the disconnecting means. This is more easily accomplished with a fusible switch than with a circuit breaker and replacing the fuse with a larger size is much less costly than installing the ground fault protection of equipment required in this section".
This rationale is flawed, in view of the ease of simply installing a higher rating plug. The necessity of GFP 1000 amps and over applied equally if not more appropriately to 1200 amp frame circuit breakers as it does to fused switches. The type of disconnecting means in this case has little bearing on the need for safety.
NAUGHTON, J.: I disagree with the panel action and statement. This proposal needs further consideration, during the comment stage.

4-84 Log #3500 NEC-P04 **Final Action: Accept**
(230.95 Exception No. 2)

Submitter: Jim Pauley, Square D Company
Recommendation: Delete Exception No. 2 of 230.95
~~*Exception No. 2: The ground-fault protection provisions of this section shall not apply to fire pumps.*~~
Substantiation: During the 2005 NEC Cycle, CMP 13 added the provision to prohibit GFPE on fire pumps in 695.6(H). The section reads as follows:
(H) Ground Fault Protection of Equipment. Ground fault protection of equipment shall not be permitted for fire pumps.
Since Chapter 6 can supplement or modify requirements in Chapter 2, there is no need for the exception in 230.95. In fact, the exception adds confusion because code users misinterpret that an exception needs to be in Chapter 2 for Chapter 6 to exempt it.

The deletion is consistent with 90.3 and consistent with the TCC direction to not create redundant rules.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-85 Log #2884 NEC-P04 **Final Action: Reject**
(230.96 (New))

Submitter: B. Wiltse, Mandeville, LA
Recommendation: Add a new 230.96 to read as follows:
230.96 Short-Circuit and Arc-Flash protection of Service-Entrance Conductors. Short-circuit and arc-flash protection shall be provided for service-entrance conductors where the service entrance conductors have an ampacity of 1000 amperes or more. The short-circuit and arc-flash protection shall be located at the service-entrance conductors' source of supply and shall consist of:
(1) Current Limiting Cable Limiters,
(2) Current Limiting Fuses,
(3) Circuit Breakers without short-time delay, or
(4) Current Limiting Circuit Breakers
Substantiation: Workers are being seriously injured and killed by arc-flashes that result from short-circuits that occur in the service equipment that is ahead of or on the line-side of the service entrance overload protective device. This is unprotected territory, "Deadman's Land", because the only hope for protection is for the utility's primary overcurrent device to open, and it is sized so large that it will let the worker burn to death before opening. This short-circuit and arc-flash protection requirement is needed to protect workers from these horrific incidents.
Conductors with ampacity of 1000 amperes were chosen so as not to allow a loophole for the six disconnect rule (For example this short-circuit and arc-flash protection should be required for a 4000 ampere service, even though it consists of five 800 ampere switches.) 1000 was chosen to correlate with 230.95. Circuit breakers without sort-time delay were chosen because they offer a much higher degree of arc-flash protection than circuit breakers with short-time delay. Current limiting cable limiters, current limiting fuses and current limiting circuit breakers were chosen because they offer the very highest degree of arc-flash protection.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided adequate technical substantiation for mandating this radical change in requirements nor evidence of a safety issue or concern with the present language. There is no documentation provided as to how the submitter intends to require the installation of short circuit and arc flash protection at the service-entrance conductor source of supply (supposedly from the serving utility conductors.)
The conductors on the utility side of the service point are utility company conductors and are under the exclusive control of the utility company; so requiring short circuit and arc flash protection would be outside the scope of the NEC. This is adequately explained in Section 90.2(B)(5) of the NEC.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 9 Negative: 1
Explanation of Negative:
NAUGHTON, J.: I disagree with the panel statement. The dangers of arc flash are well documented. This concept has merit and deserves further consideration.

4-86 Log #3214 NEC-P04 **Final Action: Reject**
(230.200, FPN)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete the FPN completely.
Substantiation: A review of 90.2 (A) and (B), the Article 100 definition of service point, the complete NEC text and specifically the text in Articles 225, and 230 leads one to believe that electrical wiring and equipment located on the load side of the service point is under the scope of the NEC. This FPN, which based on the text in 90.5(C) is not enforceable, provides no value to the NEC user.
If industry believes information in the NESC is necessary for installations on the load side of the service point, that information should included as requirements of the NEC, not as a FPN. As an FPN, it only adds to the confusion of designers, installers, and AHJ's working on installations working on premises wiring.
The FPN also appears to include a requirement, which is not permitted to be located in a FPN.
Panel Meeting Action: Reject
Panel Statement: This fine print note does not contain mandatory text or a requirement as stated in the submitter's substantiation. It is providing additional information on where a user of the Code can go to get conductor clearances for utility company conductors on the line side of the service point.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 9 Negative: 1
Explanation of Negative:
NAUGHTON, J.: I agree with the submitter, this FPN gives the impression that for services exceeding 600 Volts, Nominal one must use the NESC for clearances of conductors.

4-87 Log #2952 NEC-P04 **Final Action: Accept**
(230.205(A))

Submitter: James J. Rogers, Bay State Inspectional Agency
Recommendation: Add a second paragraph to read as follows:
For either overhead or underground primary distribution systems on private property the service disconnect shall be permitted to be located in a location that is not readily accessible.
Substantiation: There are many installations where the service point is at the edge of the property and a high voltage switch is the actual service disconnect for the distribution system which then becomes a feeder for multiple buildings on the property, the disconnect requirements in 225 would apply to the buildings.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-88 Log #1772 NEC-P04 **Final Action: Reject**
(230.205(C))

Submitter: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services
Recommendation: Revise text to read as follows:
230.205(C) Remote Control. For multi-building, industrial installations under single management, the service disconnecting means shall be permitted to be located at a separate building or structure. In such cases, the service disconnecting means shall be permitted to be electrically operated by a readily accessible, remote-control device.
<u>This device shall have an "on and off" position showing whether the remote service disconnect is on or off, and a mechanical key interlock to prevent anyone from turning the device on again when it must be turned off for any reason. This remote control device shall be clearly visible to the person who has to turn the circuit off, and shall be clearly marked indicating its purpose.</u>
Substantiation: A person could be injured if the circuit is not locked out. Present language is not definitive enough to establish complete safety of a person working on this circuit.
Panel Meeting Action: Reject
Panel Statement: This remote device is not the service disconnecting means but simply a remote switch that permits operating the high voltage service disconnecting means from a remote location. Any lockout and tagout procedures must still be done at the service main.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-89 Log #3385 NEC-P04 **Final Action: Reject**
(230.211)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
Metal-enclosed switchgear shall <u>comply with 490.46</u> . ~~consist of a substantial metal structure and a sheet metal enclosure. Where installed over a combustible floor, suitable protection thereto shall be provided.~~
Substantiation: This is a companion proposal to one submitted to create comprehensive minimum safety requirements for this equipment in Article 490. Its acceptance should be conditional on CMP 9 action in 490.46.
Panel Meeting Action: Reject
Panel Statement: Section 490.46 presently covers providing a ground bus in the enclosure for the connection of service cable shields and to facilitate the attachment of safety grounds for personnel protection. It does not provide the same requirements of a substantial metal structure and suitable protection where the equipment is installed over a combustible floor as provided by 230.211, so this text must remain.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

ARTICLE 240 — OVERCURRENT PROTECTION

10-4 Log #669 NEC-P10 **Final Action: Accept in Principle**
(240.2)

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
<u>**Industrial Installation.** The industrial portions of a facility where all of the following conditions are met:</u>
<u>(1) The premises wiring system has 300 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220.</u>
<u>(2) The premises has at least one service or supply that is more than 150 volts to ground and more than 300 volts phase-to-phase.</u>
<u>This definition excludes installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant, substation, or control center.</u>
Substantiation: The panels comment in the 2005 code revision cycle were very clear there is a strong need for a definition of industrial installation in the NEC. With no definition for Industrial Installation, people are left to come up

with one on there own, this would help clarify and provide consistent interpretations for what 240.21 (C) (3) means when it reads "Industrial Installation".
Panel Meeting Action: Accept in Principle
Panel Statement: The panel's wording in the action text of Proposal 10-3a (Log #CP1000) clarifies the requirements for an industrial installation in 240.21(C)(3). A definition based on the lower levels of transformer size, etc. is unnecessary.
See panel action and statement on Proposal 10-3a (Log #CP1000).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-5 Log #188 NEC-P10 **Final Action: Accept in Principle**
(240.2. Industrial Installation)

NOTE: The following proposal consists of Comment 10-5 on Proposal 10-8 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 10-8 was:
I underlined added text
<u>Industrial Installation. For the purposes of Part II, the industrial portions of a facility where all of the following conditions are met:</u>
<u>(1) The premises wiring system has 2500 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220.</u>
<u>(2) The premises has at least one service that is more than 150 volts to ground and more than 300 volts phase-to-phase.</u>
<u>This definition excludes installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant, substation, or control center.</u>
Submitter: Jamie McNamara, Hastings, MN
Recommendation: The definition should read:
Industrial Installation. For the purposes of Part II, the industrial portions of a facility the premises wiring system has 300 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220. This definition excludes installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant, substation, or control center.
Substantiation: The comments from several of the panel members is clear there is a strong need for a definition of industrial installation.
I agree with the panel member comments that my original proposal was too restrictive.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel's wording in the action text of Proposal 10-3a (Log #CP1000) clarifies the requirements for an industrial installation in 240.21(C)(3). A definition based on the lower levels of transformer size, etc. is unnecessary.
See panel action and Statement on Proposal 10-3a (Log # CP1000).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-6 Log #2690 NEC-P10 **Final Action: Reject**
(240.2. Supervised Industrial Installation)

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Add a new last sentence to 240.2 Definitions, Supervised Industrial Installation, paragraph (1) to read: "Documentation of the qualified person shall be on file at the office of the establishment in charge of the completed installation."
Substantiation: A lesser degree of safety based on an undocumented qualified person hypothetically servicing the installation is permitted. No requirements are present to ensure that the conditions of maintenance and supervision to ensure that only qualified persons service the installation actually exist.
Panel Meeting Action: Reject
Panel Statement: Article 100 provides a definition of "qualified person" as well as a fine print note referencing NFPA 70E.
Special requirements are best determined by the authority having jurisdiction.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-7 Log #189 NEC-P10 **Final Action: Accept in Principle**
(240.2 Industrial Installations)

NOTE: The following proposal consists of Comment 10-6 on Proposal 10-8 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 10-5 (Log #188).
Submitter: Stan Penrose, Oregon Building Codes Division
Recommendation: Accept this proposal in principle modified by the suggested text in Mr. Frederick's affirmative comment in the ROP.
Substantiation: The term "Industrial Installation" must be defined for those who use the National Electrical Code every day for a living. As inspectors, we need clear guidelines for when the "Industrial Only" rules can be applied. When does a commercial occupancy become an industrial occupancy? Engineers, electricians and inspectors interpret that question very differently. We need help.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel's wording in the action text of Proposal 10-3a (Log #CP1000) clarifies the requirements for an industrial installation as applied in 240.21(C)(3). A definition based on the lower levels of transformer size, etc. is unnecessary. It is outside the scope of Code-Making Panel 10 to develop a global definition of "Industrial Installation".
See panel action and statement on Proposal 10-3a (Log #CP1000).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-8 Log #1466 NEC-P10 **Final Action: Reject**
(240.4and 240.5)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in 240.4 and 240.5
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: The use of fixture wire is not limited to luminaires. The term "fixture wire" is used in various applications/product listings other than for luminaires. See, for example, UL White Book listings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-9 Log #1986 NEC-P10 **Final Action: Reject**
(240.4(C) Exception (New))

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group
Recommendation: Revise as follows:
240.4 Protection of Conductors.
Conductors, other than flexible cords, flexible cables, and fixture wires, shall be protected against overcurrent in accordance with their ampacities specified in 310.15, unless otherwise permitted or required in 240.4(A) through (G).
(C) Devices Rated Over 800 Amperes. Where the overcurrent device is rated over 800 amperes, the ampacity of the conductors it protects shall be equal to or greater than the rating of the overcurrent device defined in 240.6.
<u>Exception: For devices rated no more than 1600 Amperes, the next higher standard overcurrent device rating (above the ampacity of the conductors being protected) shall be permitted to be used, provided all of the following conditions are met:</u>
<u>(1) The next higher standard overcurrent device rating (above the ampacity of the conductors being protected) does not exceed 6% above the ampacity of the conductors being protected.</u>
<u>(2) The ampacity of the conductors does not correspond with the standard ampere rating of a fuse or a circuit breaker without overload trip adjustments above its rating (but that shall be permitted to have other trip or rating adjustments).</u>
<u>(3) The next higher standard rating selected does not exceed 1600 amperes.</u>
<u>(4) The overcurrent device has been listed for use with the smaller conductors</u>
Substantiation: By making this change, a 1600-ampere service could be wired with four sets of 500 kcmil, Cu, 75 degrees C wire. This was done for years without any problems and no problems have been encountered for the existing 800 amperes or less, as permitted now in Section 240.3(B). Of course, all the other Code provisions would have to be followed.
Below 800 amperes, the NEC already allows conductors to be protected at the next standard device rating, effectively allowing these conductors to be protected and up to 18 percent above their allowable ampacity. This practice has proven successful in many thousands of NEC installations and in years of practice. This successful practice is with conductors that are smaller and heat more quickly than those above 800 amperes. Also, the overcurrent protective device is smaller and more sensitive to the wire size below 800 amperes. It would seem that, if anything, there would be more technical merit in restricting the smaller devices and conductor, but again long successful practice and experience supports the existing latitude given in 240.3. The five (5) time-current characteristic (TCC) curves I have provided illustrate this practice.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: There has been no further substantiation presented in this proposal to address the concerns and issues raised by the panel in previous NEC development cycles. There are no specially listed devices that satisfy the proposed 240.4(C)(4), and the impact on the equipment in which these devices are to be used has not been considered.

It is noted that the amount of heat generated in a conductor increases as the square of the current through that conductor, and the characteristics of overcurrent devices are such that overloads are tolerated for significant periods of time before the device operates. At the very least, a study should be conducted to demonstrate that the conductors and equipment would not sustain damage from carrying the current permitted by this proposal. For example, the proposer could approach UL through their open Standards Technical Panel process to address the listing requirements.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

ELDRIDGE, C.: This proposal raises a good concept that should have been accepted. The proposal would have allowed, for devices above 800 amperes, the next higher available size of overcurrent device to be used, where that next higher size was no more than 6% above the allowable conductor ampacity.

Below 800 amperes, the NEC already allows conductors to be protected at the next standard device rating, effectively allowing these conductors to be protected at up to 18% above their allowable ampacity. This practice has proven successful in many thousands of NEC installations and in years of practice. This successful practice is with conductors that are smaller and heat more quickly than those above 800 amperes. Also, the overcurrent protective device is smaller and more sensitive to the wire size below 800 amperes. It would seem that if anything, there would be more technical merit in restricting the smaller devices and conductors, but again long successful practice and experience supports the existing latitude given in 240-3.

There is no technical reason to disallow the modest 5% allowance for conductors above 800 amperes, as proposed in the proposal. Additionally, the requirement for listing would assure that this provision would not be available for use until a manufacturer were to develop devices and equipment that would be able to make use it since there is not as much conductor mass to dissipate (heat sink) the heat.

FREDERICKS, C.: I'm voting against the panel action. This is a concept that has previously been reviewed at length by this panel, receiving support at different voting times. With the additional requirement that any overcurrent device used under this provision be listed for use with the smaller conductors, it is difficult to see a potential safety problem with the proposal.

I believe the original NEC restriction above 800 amps was intended to address large gaps in the standard overcurrent device sequence that existed at the time, for example from 3000 to 4000 amps, not 6% as proposed here, and there would not be a problem with the modest flexibility proposed here.

In response to the panel statement that heat increases with the square of the current through a conductor, I note that temperature rise is a function of current squared multiplied by resistance, multiplied by thermal resistance to the ambient. If a larger device has the same temperature rise as a smaller device, the difference in resistance and thermal resistance to the ambient is compensating for the increase in current squared. In such a case, the larger device will increase in temperature more slowly under an overload condition than a smaller device will.

Comment on Affirmative:

BORTHICK, M.: I support the panel action to reject this proposal. In addition to the points cited in the panel statement, I have concerns that the overcurrent devices will require an extended period of time to open under conditions where the ground-fault current must take a high impedance path. Having seen many instances where the ground-fault return paths have been compromised, my concern is that when a ground fault occurs the conductors could suffer damage due to the extended opening times.

DARLING, D.: For many years, it was a standard in the industry to use a 500 kcmil conductor for 400 amperes even when we were using Type TW insulation rated at 60 degrees C. This is still a standard to use a single 500 kcmil conductor for a 400 ampere feeder and two 500 kcmil conductors per phase for a 800 ampere feeder when there is not a neutral conductor or when there is a very small current in the neutral conductor(s). The proposal is to allow four sets of 500 kcmil conductors to be used for a 1600 amperes feeder under the same neutral conditions as described above. In the case of four sets, each conductor is carrying the same current, 400 amperes, and, therefore, there is not any additional heat assuming that the fours sets of conductors are separated. The most common conductors being used today have insulation rated at 90 degrees C and, therefore, they can actually carry more current than the old TW conductors without that used to be used in this application without damage to the insulation.

This proposal includes the requirement that the circuit breaker or the switch and fuse be listed for this application. There is risk being introduced with this proposal. I predict that if this proposal was accepted, the manufacturers would have their equipment tested and list all of their equipment up to 1600 amperes for 400 amperes per set of 500 kcmil conductors.

10-10 Log #2931 NEC-P10 **Final Action: Accept in Principle**
(240.4(D))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to 110.5. This action will be considered by the Panel as a Public Comment.

Submitter: Todd Lottmann, Cooper Bussmann

Recommendation: Revise as follows:

(D) Small Conductors. Unless specifically permitted in 240.4(E) through (G), the overcurrent protection shall not exceed ~~15 amperes for 14 AWG, 20 amperes for 12 AWG, and 30 amperes for 10 AWG copper; or 15 amperes for 12 AWG and 25 amperes for 10 AWG aluminum and copper clad aluminum~~ <u>the following</u> after any correction factors for ambient temperature and number of conductors have been applied.

(1) 7 amperes for 18 AWG provided all the following conditions are met:
(a) Continuous loads do not exceed 5.6 amperes
(b) Overcurrent protection is provided by one of the following:
(1) Branch circuit rated circuit breakers listed and marked for use with 18 AWG wire
(2) Branch circuit rated fuses listed and marked for use with 18 AWG wire
(3) Class CC, Class J, or Class T fuses
(2) 10 amperes for 16 AWG provided all the following conditions are met:
(a) Continuous loads do not exceed 8 amperes
(b) Overcurrent protection is provided by one of the following:
(1) Branch circuit rated circuit breakers listed and marked for use with 16 AWG wire
(2) Branch circuit rated fuses listed and marked for use with 16 AWG wire
(3) Class CC, Class J, or Class T fuses
(3) 15 amperes for 14 AWG copper or 12 AWG aluminum and copper-clad aluminum
(4) 20 amperes for 12 AWG copper
(5) 25 amperes for 10 AWG aluminum and copper-clad aluminum
(6) 30 amperes for 10 AWG copper

Substantiation: This change correlates with the 2002 Edition of NFPA 79, Electrical Standard for Industrial Machinery. In order to remain competitive in the global marketplace, United States industrial machinery manufacturers on the committee for NFPA 79 (Electrical Standard for Industrial Machinery) expressed the need to be able to utilize power circuit conductors that are smaller than 14 AWG, the existing minimum allowed for branch circuits in the NEC. The use of 16 and 18 AWG conductors for other than control loads should be allowed provided conditions of use are provided. The recommended wording will provide conditions for the use of 16 and 18 AWG conductors in branch circuit applications. The ampacity levels selected correlate with those in UL 508A, UL508, and NEC Table 400.5(A) and the restrictions provided are supported with technical substantiation. This change would provide for the safe protection of 16 and 18 AWG conductors for branch circuit applications.

A UL Special Service Investigation was conducted for the protection of 16 and 18 AWG copper conductors using Class CC, J, or T fuses and the report of this testing is included as substantiation for this change.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

In the recommendation, add "copper" after "18 AWG" in 3 places, and add "copper" after "16 AWG" in 3 places.

Panel Statement: All research and the UL Special Services investigation were conducted with copper conductors. Therefore, the modifier "copper" needs to be added after "18 AWG" and "16 AWG".

The panel recognizes that acceptance of this proposal will not, by itself, allow for the use of 16 AWG and 18 AWG conductors for branch circuit applications. It simply provides the protection requirements for these conductors if their usage is allowed by other sections of the NEC.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

DARLING, D.: This proposal is for conductors used in Industrial Machinery Control Panels only. #18 and #16 conductors should never be used for standard branch circuits.

FREDERICKS, C.: I agree with the panel action, however I note that while the substantiation demonstrated that specific overcurrent devices could protect the smaller conductors adequately and within assumed I 2 t limits, I believe that other overcurrent devices could be demonstrated to adequately protect the same conductors, possibly while letting through larger I 2 t values than the ICEA values that the substantiation assumed as a limit.

The following assumptions that go with the ICEA physics-based formula for I 2 t limits should be considered:

• The formula assumes all heat generated by the current is stored in the conductor.

• The formula does not take into account cooling of the conductor by heat transfer to the insulation or to the ambient.

• The formula does not consider time duration of any overheating and assumes that damage will instantly occur at the assumed temperature.

• The damage temperatures assumed in the use of the formula were based on longer-duration overheating of medium-voltage conductors, and on older insulation types.

As a result, application of the ICEA formula to small conductor applications can be overly conservative.

10-11 Log #830 NEC-P10 **Final Action: Reject**
(240.4(F))

Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Revise text to read as follows:

(F) Transformer Secondary Conductors. Except as permitted in 240.21(C) , single-phase (other than 2-wire) and multiphase (other than delta-delta, 3-wire) transformer secondary conductors shall not be considered to be protected by the primary overcurrent protective device. Conductors supplied by the secondary side of a single-phase transformer having a 2-wire (single-voltage) secondary, or a three-phase, delta-delta connected transformer having a 3-wire (single-voltage) secondary, shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, provided this protection is in accordance with 450.3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary to primary transformer voltage ratio.

Substantiation: Section 240.4(F) makes an uncompromising statement: unless it's a two-wire single-phase or a three-wire delta-delta transformer, secondary conductor overcurrent protection is required. Yet, 240.21(C) contains six rules where secondary conductors are permitted to be protected by the transformer's primary overcurrent device. 240.4(F) and 240.21(C) are at odds. I've talked with several engineers and designers who unnecessarily provide secondary conductor overcurrent protection because of the wording of 240.4(F). When I remind them of the specific rules in 240.21(C), they nod their heads and respond, "Yes, but you can't ignore 240.4(F)." This simple change will remove the conflict between the two sections.

Panel Meeting Action: Reject

Panel Statement: 240.4(F) is the general rule covering transformer secondary conductor protection. 240.21(C) covers overcurrent protection location in the circuit dealing with the unique application for each set of conductors feeding separate loads.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-12 Log #1070 NEC-P10 **Final Action: Accept in Principle in Part**
(240.5(A) (New) and (B) (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add new exception.

Exception: Where permitted elsewhere in this Code to be permanently connected as branch circuit or feeder conductors, extra hard usage flexible cords and flexible cables not in direct contact with equipment containing heat-producing elements shall be permitted to be protected in accordance with 240.4(A) and (B).

(B) BRANCH CIRCUIT OVERCURRENT DEVICE . Flexible cord and fixture wire shall be considered to be protected where supplied by a branch circuit in accordance with one of the methods described in 240.5(B)(1), (2), (3), or (4).

Substantiation: The provisions of 240.4(A), (B) and (G) do not apply to permanently connected flexible cords and cables since the first paragraph excludes them and 310.15 doesn't include them. Permanently connected cords and cables are permitted for motors, cranes and hoists, elevators, material handling magnets, floating buildings, marinas and boatyards. It appears the overcurrent protection permitted by (G) for motor conductors will commonly exceed conductor ampacity specified in Table 400.5(A) and (B) and this should be applicable for other permanently connected installations. Table 520.44 indicates ampacities for extra hard usage cords which exceed ampacities specified in Table 310.16. The proposal doesn't involve ampacities, per se, but seeks to relieve the restriction of overcurrent device requirements.

Panel Meeting Action: Accept in Principle in Part

In the proposed wording, the addition of "considered to be" and the exception are not accepted.

Panel Statement: The addition of "considered to be" is not accepted because 240.5(B)(1), (B)(2), (B)(3), and (B)(4) already contain qualifiers.

The exception is not accepted because the substantiation utilizes Article 520 as an example of needing relief. 90.3 establishes the Code arrangement, and Chapter 5 supplements or modifies Chapters 1 through 4. Therefore, no revision is necessary to provide relief in Article 240.

The addition of the words "fixture wire" is covered by the panel action on Proposal# 10-13.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-13 Log #1899 NEC-P10 **Final Action: Accept**
(240.5(B))

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: In 240.5(B), add commas after the word "protected" and after the word "circuit." Delete "(B)(2)" in the first sentence. Add a second sentence as follows:

"Fixture wire shall be protected, where supplied by a branch circuit, in accordance with 240.5(B)(2)."

The overall text in (B) to read as follows:

240.5 Protection of Flexible Cords, Flexible Cables, and Fixture Wires.

(B) Branch Circuit Overcurrent Device. Flexible cord shall be protected, where supplied by a branch circuit, in accordance with one of the methods described in 240.5(B)(1), ~~(B)(2)~~ , (B)(3), or (B)(4). Fixture wire shall be protected, where supplied by a branch circuit, in accordance with 240.5(B)(2).

No change to (B)(1) through (B)(4).

Substantiation: The commas were added to the existing text to provide clarity and to conform to normal punctuation rules.

The existing text in the introduction part of 240.5(B) in the 2005 NEC does not provide coverage for fixture wire, even though (B)(2) covers fixture wire. The deletion of (B)(2) in the first sentence and the addition of the second sentence as proposed will provide the proper coverage of fixture wire connected to the branch circuit. This added text will also provide the necessary tie-in to 210.19(A)(4), Exception No. 2 that permits conductors smaller than 14 AWG to be used for fixtures. In the 2005 NEC, 210.19(A)(4), Exception No. 2 sent the user to 240.5 for conductors smaller than No. 14 AWG but did not have the necessary text in 240.5(B) to permit fixture wire in the sizes provided in (B)(2). This proposed change clears up this inconsistency in the Code and provides a clear path to 240.5(B) for smaller conductors.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-14 Log #1751 NEC-P10 **Final Action: Accept in Principle**
(240.5(B)(1))

Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Replace the term "portable lamp" with the term "portable luminaire". Revise text as follows:

240.5 Protection of Flexible Cords, Flexible Cables, and Fixture Wires

(B) Branch Circuit Overcurrent Device

(1) Supply Cord of Listed Appliance or Portable ~~Lamps~~ Luminaires . Where flexible cord or tinsel cord is approved for and used with a specific listed appliance or portable ~~lamp~~ luminaire , it shall be considered to be protected when applied within the appliance or portable ~~lamp~~ luminaire listing requirements.

Substantiation: The term "luminaire" has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms "fixture" or "lighting fixture", which were terms for fixed lighting systems.

The term "portable luminaire" has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled "Portable Electric Lamps" and is now titled "Portable Electric Lunimaires".

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 10-15. The word "luminaire" has been used as part of the revised text in Proposal 10-15.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-15 Log #3336 NEC-P10 **Final Action: Accept in Principle**
(240.5(B)(1))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise this paragraph to read as follows:

(1) Supply Cord of Listed Appliance or Luminaire (Fixture). Where flexible cord or tinsel cord is approved for and used with a specific listed appliance or luminaire (fixture), it shall be considered to be protected when applied within the appliance or luminaire (fixture) listing requirements.

Substantiation: This proposal addresses a direct conflict in the NEC. The current wording hinders the orderly application of 410.30(C)(1), since permanently installed luminaires are neither portable lamps nor appliances (as covered in the 2005 NEC), and they never come with 14 or 12 AWG cord supplies. CMP 10 rejected the terminology "utilization equipment" in the comment stage for the 2005 NEC, so as a compromise this proposal limits the application to luminaires (but without a portability restriction) and appliances. The existing (2005) NEC wording is an unintended result of editorial modifications to this section over the years. The 1981 and prior Codes allowed 20 amp. protection on 16 and 18 AWG power supply cords by right, for any load. The 1984 change to "specific listed appliance" was part of a wholesale rewrite of this section (Proposal 4-116), but there was no substantiation provided to restrict the character of load supplied; this restriction appears to be inadvertent. The focus of discussion was on the protection of extension cords and not in this part of the section.

During the 2005 NEC comment stage, CMP 10 stated there was no actual problem with 410.31(C)(1) since the cords in 410.30(C)(1) must be terminated in an attachment plug cap, and a cord- and plug-connected luminaire is inherently one of a portable nature, thereby qualifying under the existing wording of 410.5(B)(1).

Section 410.31(C)(1) allows for a cord-connected luminaire if the luminaire is directly below the outlet, and provided further that the luminaire meets three additional conditions:

It must visible over its entire length outside of the luminaire;

It must not be subject to abuse; and

It must meet one of four connection arrangements, to wit:

It can end in an attachment plug OR

It can end in a busway plug, OR

It can be part of a manufactured wiring system (new in the 2005 NEC), OR

It can be hard wired as part of a luminaire assembly with strain relief and canopy (this is the one in question).

These luminaires are quite common, particularly in higher-end offices and conference rooms. They are not supplied with fuses in their connection canopies. This provision (“d” above) originated in the 1993 NEC and covers permanently installed luminaires that are anything but “portable lamps.” This section [240.5(B)(1)] as now written mandates an unsubstantiated and significant redesign of luminaires developed in the context of 410.30(C)(1)(2)(c).

Panel Meeting Action: Accept in Principle

Add a new last sentence to the wording in the recommendation to read as follows:

“For the purposes of this section, a luminaire (lighting fixture) may be either portable or permanent.”

Panel Statement: The additional wording clarifies that both portable and permanent luminaires are covered in this section. This language will address the use of permanent luminaires where the listing includes the use of flexible cords.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-15a Log #3566 NEC-P10 **Final Action: Reject**

(240.14(A) & (B) (New))

Submitter: Edward A. Schiff, Technology Research Corp.

Recommendation: Add new text to read:

440.14 Leakage Current Detection and Interruption (LCDI) Protection.

(A) Definition. Leakage Current Detection and Interruption (LCDI) Protection. A device provided in a power supply cord or cord set that senses leakage current flowing between or from the cord conductors and interrupts the circuit at a predetermined level of leakage current.

(B) Leakage Current Detection and Interruption (LCDI). Indoor extension cord sets shall be provided with factory-installed LCDI protection. The LCDI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.

Substantiation: Extension Cord Fire Problem

Faulty or damaged cords or plugs caused an estimated 6,900 attended fires, 91 civilian deaths, 421 civilian injuries, and $115.9 million in direct property damage per year in US homes between 1994 and 1998 according to The US Home Product Report , published January, 2002 by the NFPA. The leading cause of cord and plug fires was short circuits and ground faults (52.3% of fires and 39.2% of deaths). Other electrical failure and overloads account for the majority of the balance.

Electrical cord fires are a leading cause of residential fires in the United States. During the five year period from 1994 to 1998, there were 27,400 cord fires attended by the fire service according to the 1998 Residential Fire Loss Estimates published by the U.S. Consumer Product Safety Commission (CPSC) in 2002. These fires resulted in 350 deaths and 1,680 injuries. Extension cords were responsible for over half of these incidents.

The extension cord fire problem is getting worse. 2002 has been another terrible year for extension cord fires. In January alone, there were seven different fatal extension cord fires in US residences. Additionally, two catastrophic fires have occurred that summer.

1. On August 3, 2002 an overloaded extension cord caused the fire that killed six children (ages 10, 4, 3, 2 and eight month old twins) in Baton Route, LA.

2. On June 11, 2002, an overloaded extension cord melted and set the couch on fire in Silver City, NC killing six family members. The 33 year old mother, daughter 6, two stepsons age 10 and 13, 48 year-old brother, and the children’s 41 year-old aunt died of smoke inhalation. The father and their 2 year-old daughter escaped by braking out a rear window.

These two fires accounted for 12 deaths, nine of which were children. The table entitled, “Fire Event Summary Report”, highlights the severity of the problem.

Causes of Extension Cord Fires.

Extension cord fires have been and continue to be a major problem. There are many causes of cord fires including overload, overheating, pinching, crimping, crushing, customer misuse, fraying, and aging of the cord. These problems can cause combustion on their own or in conjunction with one another.

Extension cords are easily overloaded by exceeding the typical 13 Amp rating of the cord with multiple loads. Circuit breakers are designed to protect the fixed wiring in a dwelling. Their continuous current rating is typically 15A or 20A. A breaker allows an overload to exist for a period of time depending on its inverse-time trip curve; therefore, they do not provide overload protection for cords. Overloading damages the insulation from the inside (next to the conductor) to the outside of the cord.

Extension cords are frequently overheated. Consumers often run them under carpet or leave them coiled for ascetic reasons. Combustibles such as clothes or newspapers are put onto the cords. These scenarios prevent proper cooling and will overheat the cord. As with the overload condition, the insulation is damaged from the inside out. This damage is irreversible and may not be visible to inspection.

Extension cords can be mechanically damaged. They are frequently pinched or cramped by furniture and doorways. This will result in broken conductors within the cord and can cut or scrape the insulation. Cords may also be crushed by pedestrian traffic or by heavy items (furniture being placed on top of the cord). This damage is also irreversible and not visible to inspection.

Customer misuse comes in a variety of fashions including leaving the cord in pedestrian traffic, stapling of the cord to baseboards, using the cord as a permanent extension of premises wiring, and using the cord around pets or infants who chew cords. This misuse can result in fires caused by broken conductors and degraded insulation.

Finally, extension cords wear out in time resulting in cracked insulation and fraying of the conductors. Unlike the proposed LCDI cords, they will continue to pass current even though they present a major fire, injury and loss of life risk.

This damage described above results in insulation degradation and breaking of the current carrying conductors. The damage is irreversible and may not be visible to inspection. Circuit breakers and fuses are not sensitive enough to detect this damage before combustion can occur. Even the arc fault breakers (AFCIs) require a significant arc over a period of time which may be a fire in progress before detection. AFCIs are only being required on certain branch circuits in new homes, when the majority of electrical fires occur in older homes that do not have this limited protection.

Extension cords are used in high risk applications. Some of the common characteristics of these applications include unattended operation, high current loads, operation while people are sleeping and used around children and elderly people.

There are two primary types of cord faults. Series faults (the fault is in series with the load) are partially or completely severed conductors within the cord set. A parallel fault, either line to neutral or a ground fault is typically caused by degraded insulation. Both of these faults will lead to tracking within the cord set, leakage current, arcing and then combustion.

Over the past two decades, efforts have been made to reduce the number of extension cord fires including increased conductor size, improved labeling, improved materials and education. These efforts have reduced the annual number of extension cord fires by 35 percent since 1980. However, data for the most current years (1996 to 1998) demonstrates a plateau in number of extension cord fires (the same is true for other electrical cords). The fires cited in the table indicate the actual number of fatalities for 2002 will show a significant increase. LCDI protected cords provide the ability to eliminate extension cord fires.

LCDI protected cord sets sense leakage current flowing from or between conductors. Leakage current is the precursor to an arcing fault. This technology employs a ground fault sensing circuit as the disconnecting means so it also will prevent ground fault fires beyond the power supply cord and provide shock protection for the cord. Over the past six years, millions of LCDI protected cords have been field proven on extension cords, power strips, space heaters, and other appliance cords.

An additional benefit to this technology is preventing electrocutions and serious injury from electrical shock. According to the 1998 Electrocutions Associated with Consumer Products , published by the U.S. Consumer Product Safety Commission in July, 2001 there were 12 electrocutions caused by extension cords in 1998. Since the LCDI utilizes a ground fault sensing circuit as the disconnect means, these deaths would also be prevented.

Economic Impact

This improvement in safety will have a positive economic impact on society. The current retail price of an eight foot 120V/13A two wire LCDI protected extension cord is under $9.00. TRC anticipates the retail price will be under $5.00 for this product in large scale production. Unprotected indoor extension cords currently sell for between $1.00 and $7.00 dependent on length, gauge, number of conductors and receptacle type. The added cost borne by the consumer will be minimal.

In 1998, the property damage from the 2,800 attended extension cord fires was $57.5 million. These fires resulted in 170 serious injuries. The costs associated with the medical treatments, lost work expense, quality of life and pain and suffering, and product liability from these injuries will likely exceed the property damage. The reduction in fire fighting expenses associated with the 2,800 fires per year will also be in the millions. The rough estimate of well over $100,00,000.00 in annual costs caused by these fires will offset the majority of the added cost of the cords.

It is difficult to put a price tag on the loss of life. The fact that the most of the victims are children, makes this cost to society even greater. 40 people each year die from extension cord fires. An additional 12 lives are lost from electrocution. The ground fault protection provided down stream of the extension cord will prevent additional fires electrocutions, and the related costs of property damage and injuries.

Incorporation into the NEC

There are many precedents for incorporation of this requirement in the code. 440.63 requires either AFCI or LCDI protected cord sets for room air conditioners. Ground fault protection on the cord sets for pressure washers and portable hot tubs are long standing NEC requirements. Immersion protection for hair dryers has been part of the code for years.

The NEC code panels provides the only complete representation of the electrical community. This includes standards organizations, industry trade associations, insurance industry, electrical inspectors, contractors, and electricians. Safety is the primary reason for the code and clearly this is a critical safety issue.

Conclusion

Today's indoor extension cords are cheap. The U.S. Consumer Product Safety Commission (CPSC) recalls hundreds of thousands of extension cords every year. Undersized conductors and fake UL markings are common reasons. Raising the bar on performance to an LCDI protected cord set should reduce the likelihood of recalls.

A serious safety problem continues to exist. A proven, cost effective solution exists. There are many precedents for incorporation of this safety improvement into the NEC including the new requirement for AFCI or LCDI protected cord fires, injuries and reduce property damage and have a positive economic impact on society. Most importantly, adoption of this proposal will save lives!

This proposal was referred by Panel 6 to Article 240 and Article 210 during the last code cycle. None of the panels felt it was in their domain (the opinion of those panels was this is not an overcurrent device nor part of the branch circuit). From the work on the task force, Panel 17 is uniquely aware of the problem and the solution. The submitter respectfully requests that the panel take action on this proposal.

Panel Meeting Action: Reject

Panel Statement: 240.5(B)(3) was introduced during the 2005 Code cycle. This section states that extension cord sets are considered to be protected when applied within the extension cord listing requirements. These listing requirements are developed by a technical panel which includes representation from many areas of industry such as third-party testing and listing organizations, cord manufacturers, inspectors and others. Code-Making Panel 10 fully expects the technical committee of the product standard to address any safety issues associated within the listing requirements of the cord and that a construction requirement is not necessary in the NEC. See the panel Statement on Comment 10-20 in the 2005 Code cycle. It is also noted that numerous concerns that are discussed in the submitter's substantiation could be addressed by several different technologies.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-16 Log #2938 NEC-P10 **Final Action: Accept**
(240.15 (New))

TCC Action: The Technical Correlating Committee understands that the panel action on 10-16 moves the text from 240.20 and that 240.20 is deleted from the Code.

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Create new 240.15 in Part I of Article 240 to include the text presently in 240.20.

Substantiation: CMP-10 made improvements to the text of 240.20 during the processing of the 2005 NEC. However, the rules in the section are still located in the wrong part of Article 240.

Part II of Article 240 has a title of "Location." Existing 240.20 contains rules on when and how overcurrent protection is required for ungrounded conductors, using circuit breakers as an overcurrent device and overcurrent protection for closed-loop power distribution systems. None of these rules apply to the "Location" of the overcurrent protection.

These rules located in existing 240.20 do not seem to apply to the *location* of the circuit breaker but with the *operation* of the breaker. Thus, it seems more appropriate for the requirements to be located in Part I General, rather than in Part II Location, of Article 240.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-17 Log #3166 NEC-P10 **Final Action: Reject**
(240.20(B)(1))

Submitter: Wally Harris, Atlantic Inland Inspections

Recommendation: Delete text as indicated by strikethrough text as follows:

Multiwire Branch Circuit. Except where limited by 210.4(B), individual single-pole circuit breakers, with ~~or without~~ approved handle ties, shall be permitted as the protection for each ungrounded conductor of multiwire branch circuits that serve only single-phase line-to-neutral loads.

Substantiation: In reality 210.4(B) limits nothing relative to this Section. This proposal will help to maintain safety by removing a loophole that allows a dangerous practice of allowing two single pole breakers to be used without a handle tie.

Panel Meeting Action: Reject

Panel Statement: The submitter states that this proposal will address a safety issue; however, the submitter has not provided any substantiation describing the nature of the hazard. This section addresses automatic opening of the overcurrent device; and a handle tie does not establish a common trip mechanism.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

FREDERICKS, C.: I'm voting against the panel action. Multi-wire branch circuits are today widely considered a safety hazard during maintenance, due to energization of the neutral conductor that can occur when not all hot poles are switched off and the neutral is opened. Acceptance of the proposal would serve to minimize this safety hazard.

10-18 Log #1565 NEC-P10 **Final Action: Accept in Principle**
(240.20(B)(3))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment.

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 240.20(B)(3):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(3) 3-Phase and 2-Phase Systems. For line-to-line loads in 4-wire, 3-phase systems or 5-wire, 2-phase systems having a grounded neutral <u>conductor</u> and no conductor operating at a voltage greater than permitted in 210.6, individual single-pole circuit breakers with identified handle ties shall be permitted as the protection for each ungrounded conductor.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Revise the wording in the recommendation to read as follows:

"(3) 3-Phase and 2-Phase Systems. For line-to-line loads in 4-wire, 3-phase systems or 5-wire, 2-phase systems having a grounded neutral point and no conductor operating at a voltage greater than permitted in 210.6, individual single-pole circuit breakers with identified handle ties shall be permitted as the protection for each ungrounded conductor."

Panel Statement: The word "conductor" has been changed to "point" because a neutral conductor is not required on line-to-line loads.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-18a Log #3669 NEC-P10 **Final Action: Accept**
(240.21)

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise as follows:
240.21 Location in Circuit
Overcurrent protection shall be provided in each ungrounded circuit conductor and shall be located at the point where the conductors receive their supply except as specified in 240.21(A) through (G). ~~No~~ ~~c~~ C onductor s supplied under the provisions of 240.21(A) through (G) shall not supply another conductor ~~under those provisions~~ , except through an overcurrent protective device meeting the requirements of 240.4.
Substantiation: The intent of this proposal is editorial in nature and is an attempt to provide clarity in the application of the last sentence of the mother text in 240.21. This requirement prevents an installer from “tapping a tap.”
The present text can be confusing to the user of this code.
The present text is modified in this proposal to provide clarity and usability.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-19 Log #870 NEC-P10 **Final Action: Accept**
(240.21(A))

Submitter: Charles Beck, Seattle, WA
Recommendation: Revise as follows:
“...to have overcurrent protection ~~located~~ as specified in ~~that section~~ 210.20 .
Substantiation: This corrects an invalid reference. 210.19 does not address overcurrent protection, and neither 210.19 nor 210.20 addresses “location” of OCPD.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-20 Log #133 NEC-P10 **Final Action: Reject**
(240.21(B) Exception (New))

Submitter: Gary Schilling, CACI Genesis Team
Recommendation: Add an exception to 240.21(B) “Feeder Taps”.
Tapping without overcurrent protection device(s) is permitted for surge devices provided all the following conditions apply:
• The surge device includes some form of fault protection (such as transient fuses, time delay fuses or appropriately thin conductor intended to act as fault protection) and
• The conductors to the device are rated at least ten times the fault ampacity of the fault protection incorporated within the surge device and
• The connecting leads to the surge device are not more than 1.5 meters (5 ft) in length and
• The lead ends, within the surge device, are mechanically supported or electrically braced and
• The feeder taps are of a mechanical nature (not depending solely on soft solder) and
• The connecting leads are protected by metallic wire-way or the surge device is installed within a metallic enclosure where the taps are made.
FPN: The purpose of a surge device is to dissipate transient energy (reducing the probability of fire, structure or equipment damage and reducing sock hazard to personnel). The effectiveness of the protection is reduced by additional electrical lead length (actual length, lead bends, changes in lead routing, changes in lead characteristics, additional devices, splices, etc.)
Substantiation: Editing of the above verbiage is permitted and expected. This proposal is intended to allow (and encourage) surge device installation with resulting maximum transient protection consistent with minimum safety risk. It should also encourage the incorporation of integral panel and/or disconnect surge device(s).
The additional condition is specifically to allow the most effective installation of Transient Voltage Surge Suppression (TVSS) and/or Surge Protection Device (SPD), collectively, surge devices (SD).
Panel Meeting Action: Reject
Panel Statement: Article 285, which covers transient voltage surge protection devices, has a requirement that they be protected by an overcurrent device. The UL 1449 product standard also establishes a marking requirement for the appropriate overcurrent device ahead of the TVSS. Section 240.21(B) can be applied to the installation of surge protection devices.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

9-7a Log #CP901 NEC-P09 **Final Action: Accept**
(240.21(B)(1), FPN)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for action. This action will be considered by Code-Making Panel 10 as a public comment.
Submitter: Code-Making Panel 9,
Recommendation: Revise 240.21(B)(1) FPN to read as follows:
FPN: For overcurrent protection requirements for panelboards, see 408.36.
Substantiation: CMP-9 has removed the categories of “lighting and appliance branch circuit panelboard” and “power panelboard” from Article 408 by virtue of its action on Proposal 9-117. This proposal correlates the reference in this fine print note with that action.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

10-21 Log #2877 NEC-P10 **Final Action: Accept in Principle**
(240.21(B)(2)(1))

Submitter: Robert Padgham, Jacksonville, FL
Recommendation: Revise 240.21(B)(2)(1) as follows and add Table 240.21(B)(2)(1).
(1) The ampacity of the tap conductors is not less than one-third of the rating of the overcurrent device protecting the feeder conductors, or the tap conductors are protected in accordance with Table 240.21(B)(2)(1) by the overcurrent device protecting the feeder conductors.
Table 240.21(B)(2)(1) Tap Conductor Short-Circuit Current Ratings. Tap conductors are considered to be protected under short-circuit conditons when their short-circuit temperature llimit is not exceeded. Conductor heating under short-circuit conditions is determined by (1) or (2):
(1) Short-Circuit Formula for Copper Conductors
$(I^2/A^2)\,t = 0.0297 \log_{10} ((T_2 + 234)(T_1 + 234))$
(2) Short-Circuit Formula for Aluminum Conductors
$(I^2/A^2)\,t = 0.0125 \log_{10} ((T_2 + 228)/(T_1 + 228))$
where
I = short-circuit current in amperes
A = conductor area in circular mils
t = time of short-circuit in seconds (for times less than or equal to 10 seconds)
T_1 = initial conductor temperature in degrees Celsius.
T_2 = final conductor temperature in degrees Celsius.
Copper conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Copper conductor with thermoplastic insulation $T_2 = 150$
Copper conductor wiht crosslinked polyethylene insulation $T_2 = 250$
Copper conductor with ethylene propylene rubber insulation $T_2 = 250$
Aluminum conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Aluminum conductor with thermoplastic insulation $T_2 = 150$
Aluminum conductor with crosslinked polyethylene insulation $T_2 = 250$
Aluminum conductor with ethylene propylene rubber insulation $T_2 = 250$

Substantiation: North American industry is in a daily struggle to compete with global competitors. As such, we need every possible chance to reduce costs, but with safety as the number one directive. That is the intent of this proposal.
The existing NEC requirements for these feeder taps dictate that the ampacity of the secondary tap conductors be at least 1/3 of the overcurrent device protecting the feeder conductor multiplied by the primary-to-secondary voltage ratio. At first, this sizing seems reasonable when considering that the feeder circuit device is being asked to provide short-circuit protection for the smaller tap conductors. But, this is often extremely conservative and frequently results in a conductor sized much larger than is actually required according to the laws of physics. By using formulas that have been widely utilized by IEEE, the Canadian Electrical Code, and the IEC, much smaller conductors can be installed. This will provide significant cost savings for electrical distribution systems, allowing North American manufacturers to be more competitive in the global marketplace.
An example would be helpful. Assume a feeder conductor is a 3/0 with an ampacity of 200 amperes, and protected with a 200 ampere overcurrent protective device. Also assume a one-to-one voltage ratio for simplicity. According to the 2005 NEC, the smallest 25 foot secondary tap conductor would be a 4 AWG with an ampacity of 85 amperes, even if it were only supplying a 10 ampere load. (Three times the ampacity of a 6 AWG, with an ampacity of 65 only gives 195 amperes, which doesn’t meet the 200 ampere requirement.) According to the physics formula, and UL standards, a 200 ampere Class J fuse will protect a 10 AWG conductor for faults up to 200,000 amperes. (Maximum I^2t let-through of a 200 ampere Class J fuse at 600 volts with 200,000 amperes available is 300×10^3 ampere squared seconds, while

the short-circuit withstand of a 10AWG copper conductor is 303 x 10 3 ampere squared seconds.) As we can imagine the cost savings here will be substantial, and within the safety umbrella of internationally accepted standard physics formulas.

The physics formulas submitted with this proposal are the accepted basis for conductor short-circuit temperatures throughout the world. They are found in the ANSI/IEEE Red, Gray, Buff, and Blue Books and in the Canadian Electrical Code. Similar versions of these formulas are found in IEC60204-1 (IEC Machinery Standard), SAE HS-1738 (Automotive Industry Machinery Standard), and IEC 60364-4-43 (IEC Installation Standard).

Let's give North American industry every possible (safe) option to be competitive in the global market by accepting this proposal.

Panel Meeting Action: Accept in Principle

Insert the text shown below in quotations as 240.92(B) and renumber existing 240.92(B), (C), and (D) as 240.92(C), (D), and (E).

Renumber the proposed Table 240.21(B)(2)(1) as Table 240.92(B).

"(B) Feeder Taps. For feeder taps specified in 240.21(B)(2), (B)(3), and (B)(4), the tap conductors shall be permitted to be sized in accordance with Table 240.92(B)."

Insert the renumbered Table 240.92(B) after the above paragraph.

Panel Statement: The panel action will increase the enforceability needed by the inspection community and limit the application to supervised industrial installations.

This action recognizes the performance of the overcurrent device as a factor in determining the tap conductor size.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KIMBLIN, C.: NEMA does not support the panel meeting action. The proposed changes to the tap rules, even for supervised industrial installations, could reduce electrical safety. The proposed tap rules require an in-depth knowledge of the overcurrent device characteristics. In particular, this information is required not only during initial system installation, but throughout the maintenance life of the system to ensure replacement by an identical device.

10-22 Log #2882 NEC-P10 **Final Action: Accept in Principle**
(240.21(B)(3) (New) & Table 240.21(B)(3))

Submitter: Robert Padgham, Jacksonville, FL

Recommendation: Revise 240.21(B)(3) as follows and add Table 240.21(B)(3).

(1) The conductors supplying the primary of a transformer have an ampacity at least one-third the rating of the overcurrent device protecting the feeder conductors, or the tap conductors are protected in accordance with Table 240.21(B)(3) by the overcurrent device protecting the feeder conductors.

(2) The conductors supplied by the secondary of the transformer shall have an ampacity that is not less than the value of the primary-to-secondary voltage ratio multiplied by one-third of the rating of the overcurrent device protecting the feeder conductors, or the secondary tap conductors are protected in accordance with Table 240.21(B)(3) by the overcurrent device protecting the feeder conductors.

((3), (4), and (5) are to remain the same).

Table 240.21(B)(3) Tap Conductor Short-Circuit Current Ratings. Tap conductors are considered to be protected under short-circuit conditons when their short-circuit temperature llimit is not exceeded. Conductor heating under short-circuit conditions is determined by (1) or (2):

(1) Short-Circuit Formula for Copper Conductors

$(I^2/A^2)\,t = 0.0297 \log_{10}((T_2 + 234)/(T_1 + 234))$

(2) Short-Circuit Formula for Aluminum Conductors

$(I^2/A^2)\,t = 0.0125 \log_{10}((T_2 + 228)/(T_1 + 228))$

where

I = short-circuit current in amperes

A = conductor area in circular mils

t = time of short-circuit in seconds (for times less than or equal to 10 seconds)

T_1 = initial conductor temperature in degrees Celsius.

T_2 = final conductor temperature in degrees Celsius.

Copper conductor with paper, rubber, varnished cloth insulation T_2 = 200

Copper conductor with thermoplastic insulation T_2 = 150

Copper conductor with crosslinked polyethylene insulation T_2 = 250

Copper conductor with ethylene propylene rubber insulation T_2 = 250

Aluminum conductor with paper, rubber, varnished cloth insulation T_2 = 200

Aluminum conductor with thermoplastic insulation T_2 = 150

Aluminum conductor with crosslinked polyethylene insulation T_2 = 250

Aluminum conductor with ethylene propylene rubber insulation T_2 = 250

Substantiation: North American industry is in a daily struggle to compete with global competitors. As such, we need every possible chance to reduce costs, but with safety as the number one directive. That is the intent of this proposal.

The existing NEC requirements for these feeder taps dictate that the ampacity of the primary tap conductors be at least 1/3 of the overcurrent device protecting the feeder conductor (or that the ampacity of the secondary tap conductors be at least 1/3 of the overcurrent device protecting the feeder conductor multiplied by the primary-to-secondary voltage ratio). At first, this sizing seems reasonable when considering that the feeder circuit device is being asked to provide short-circuit protection for the smaller tap conductors. But, this is often extremely conservative and frequently results in a conductor sized much larger than is actually required according to the laws of physics. By using formulas that have been widely utilized by IEEE, the Canadian Electrical Code, and the IEC, much smaller conductors can be installed. This will provide significant cost savings for electrical distribution systems, allowing North American manufacturers to be more competitive in the global marketplace.

An example would be helpful. Assume a feeder conductor is a 3/0 with an ampacity of 200 amperes, and protected with a 200 ampere overcurrent protective device. Also, assume a one-to-one voltage ratio for simplicity. According to the 2005 NEC, the smallest tap conductor would be a 4 AWG with an ampacity of 85 amperes, even if it were only supplying a 10 ampere load. (Three times the ampacity of a 6 AWG, with an ampacity of 65 only gives 195 amperes, which doesn't meet the 200 ampere requirement.) According to the physics formula, and UL standards, a 200 ampere Class J fuse will protect a 10 AWG conductor for faults up to 200,000 amperes. (Maximum I 2 t let-through of a 200 ampere Class J fuse at 600 volts with 200,000 amperes available is 300 x 10 3 ampere squared seconds, while the short-circuit withstand of a 10 AWG copper conductor is 303 x 10 3 ampere squared seconds.) As we can imagine the cost savings here will be substantial, and within the safety umbrella of internationally accepted standard physics formulas.

The physics formulas submitted with this proposal are the accepted basis for conductor short-circuit temperatures throughout the world. They are found in the ANSI/IEEE Red, Gray, Buff, and Blue Books and in the Canadian Electrical Code. Similar versions of these formulas are found in IEC 60204-1 (IEC Machinery Standard), SAE HS-1738 (Automotive Industry Machinery Standard), and IEC 60364-4-43 (IEC Installation Standard).

Let's give North American industry every possible (safe) option to be competitive in the global market by accepting this proposal.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 10-21. The panel notes that although the section numbers for this proposal differ, the action addresses this proposal as well.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KIMBLIN, C.: NEMA votes against the panel action. See the explanation of the negative vote on Proposal 10-21.

10-23 Log #2876 NEC-P10 **Final Action: Accept in Principle**
(240.21(B)(4)(3))

Submitter: Robert Padgham, Jacksonville, FL

Recommendation: Revise 240.21(B)(4)(3) as follows and add Table 240.21(B)(4)(3).

(1) The ampacity of the tap conductors is not less than one-third of the rating of the overcurrent device protecting the feeder conductors, or the tap conductors are protected in accordance with Table 240.21(B)(4)(3) by the overcurrent device protecting the feeder conductors.

Table 240.21(B)(4)(3) Tap Conductor Short-Circuit Current Ratings. Tap conductors are considered to be protected under short-circuit conditons when their short-circuit temperature llimit is not exceeded. Conductor heating under short-circuit conditions is determined by (1) or (2):

(1) Short-Circuit Formula for Copper Conductors

$(I^2/A^2)\,t = 0.0297 \log_{10}((T_2 + 234)(T_1 + 234))$

(2) Short-Circuit Formula for Aluminum Conductors

$(I^2/A^2)\,t = 0.0125 \log_{10}((T_2 + 228)/(T_1 + 228))$

where

I = short-circuit current in amperes

A = conductor area in circular mils

t = time of short-circuit in seconds (for times less than or equal to 10 seconds)

T_1 = initial conductor temperature in degrees Celsius.

T_2 = final conductor temperature in degrees Celsius.

Copper conductor with paper, rubber, varnished cloth insulation T_2 = 200

Copper conductor with thermoplastic insulation T_2 = 150

Copper conductor wiht crosslinked polyethylene insulation T_2 = 250

Copper conductor with ethylene propylene rubber insulation T_2 = 250

Aluminum conductor with paper, rubber, varnished cloth insulation T_2 = 200

Aluminum conductor with thermoplastic insulation T_2 = 150

Aluminum conductor with crosslinked polyethylene insulation T_2 = 250

Aluminum conductor with ethylene propylene rubber insulation T_2 = 250

Substantiation: North American industry is in a daily struggle to compete with global competitors. As such, we need every possible chance to reduce costs, but with safety as the number one directive. That is the intent of this proposal.

The existing NEC requirements for these feeder taps dictate that the ampacity of the secondary tap conductors be at least 1/3 of the overcurrent device protecting the feeder conductor multiplied by the primary-to-secondary voltage ratio. At first, this sizing seems reasonable when considering that the feeder circuit device is being asked to provide short-circuit protection for the smaller tap conductors. But, this is often extremely conservative and frequently results in a conductor sized much larger than is actually required according to the laws of physics. By using formulas that have been widely utilized by IEEE, the Canadian Electrical Code, and the IEC, much smaller conductors can be installed. This will provide significant cost savings for electrical distribution systems, allowing North American manufacturers to be more competitive in the global marketplace.

An example would be helpful. Assume a feeder conductor is a 3/0 with an ampacity of 200 amperes, and protected with a 200 ampere overcurrent protective device. Also assume a one-to-one voltage ratio for simplicity. According to the 2005 NEC, the smallest 25 foot secondary tap conductor would be a 4 AWG with an ampacity of 85 amperes, even if it were only supplying a 10 ampere load. (Three times the ampacity of a 6 AWG, with an ampacity of 65 only gives 195 amperes, which doesn't meet the 200 ampere requirement.) According to the physics formula, and UL standards, a 200 ampere Class J fuse will protect a 10 AWG conductor for faults up to 200,000 amperes. (Maximum I^2t let-through of a 200 ampere Class J fuse at 600 volts with 200,000 amperes available is 300 x 10^3 ampere squared seconds, while the short-circuit withstand of a 10AWG copper conductor is 303 x 10^3 ampere squared seconds.) As we can imagine the cost savings here will be substantial, and within the safety umbrella of internationally accepted standard physics formulas.

The physics formulas submitted with this proposal are the accepted basis for conductor short-circuit temperatures throughout the world. They are found in the ANSI/IEEE Red, Gray, Buff, and Blue Books and in the Canadian Electrical Code. Similar versions of these formulas are found in IEC60204-1 (IEC Machinery Standard), SAE HS-1738 (Automotive Industry Machinery Standard), and IEC 60364-4-43 (IEC Installation Standard).

Let's give North American industry every possible (safe) option to be competitive in the global market by accepting this proposal.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 10-21. The panel notes that although the section numbers for this proposal differ, the action addresses this proposal as well.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KIMBLIN, C.: NEMA votes against the panel action. See the explanation of the negative vote on Proposal 10-21.

10-24 Log #1987 NEC-P10 **Final Action: Reject**
(240.21(B)(5))

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group

Recommendation: Revise as follows:

(5) Outside Taps of Unlimited Length. Where the conductors are located outdoors of a building or structure, except at the point of load termination, and comply with all of the following conditions:

(1) The conductors are protected from physical damage in an approved manner.

~~(2) The conductors terminate at a single circuit breaker or a single set of fuses that limit the load to the ampacity of the conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side.~~

(2) The sum of the overcurrent devices at the conductor termination limits the load to the conductor ampacity. The overcurrent devices shall consist of not more than six circuit breakers or sets of fuses, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six overcurrent devices grouped in any one location. Individual conductors terminating in overcurrent devices of separate enclosures shall be permitted to be supplied from the outside tap conductors.

~~(3) The overcurrent device for the conductors is an integral part of a disconnecting means or shall be located immediately adjacent thereto.~~

(3) The tap conductors are installed outdoors of a building or structure except at the point of load termination.

(4) The overcurrent device(s) for the conductors is an integral part of a disconnecting means or shall be located immediately adjacent thereto.

~~(4)~~ (5) The disconnecting means for the conductors is installed at a readily accessible location complying with one of the following:

a. Outside of a building or structure

b. Inside, nearest the point of entrance of the conductors

c. Where installed in accordance with 230.6, nearest the point of entrance of the conductors

Substantiation: Article 225 recognizes buildings served by a feeder. Part II of Article 225 specifies the required disconnecting means for the building or structure. Whether a building is supplied by a service per Article 230 or a feeder per Article 225, the conductors are protected from overload if such protection complies with 230.90. There is no technical justification to treat the building feeder conductor overcurrent protection differently than that required for service conductors in 230.90. Both must be sized to carry the computed load. This is particularly true recognizing that the feeder conductors have short circuit protection on their supply side. For example, when the ownership of the feeder supply conductors change due to a relocation of the service point as frequently occurs, present 240.21(B)(5) in many instances would require the unnecessary installation of a single main overcurrent device to protect the same tap conductors that are adequately protected by conformance with the requirements of 230.90. Section 225.33 permits the supply feeder to terminate in up to six disconnect switches. This proposal resolves the apparent conflict between the requirements of 225.33 and 240.21(B)(5).

Panel Meeting Action: Reject

Panel Statement: The submitter's substantiation confuses two distinct issues:

1) a feeder to a facility, and

2) a feeder tap conductor.

Six disconnects are permitted for the facility disconnect in 225.33 where the conductors are fully protected on the line side. The six disconnect ensures the facility can be isolated with a reasonable number of throws of the hand as determined by Code-Making Panel 4. The restriction placed on the installation in 240.21(B)(5) is to ensure protection of the feeder conductors of unlimited length where no overload protection has been provided on the line side of those feeders. A single overload protective device is necessary to ensure overload protection of this tap. Here, it is noted that supervised industrial installations may indeed terminate in six devices. Here, there is more facility-control, including changes associated with plant expansion and change of ownership.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

DARLING, D.: Outside taps of unlimited length should be allowed for existing installations with more than one, but less than six, service disconnects where a property owner purchases installed equipment such as a utility pad-mounted transformer and service laterals from the utility company. All other requirements of the proposal would also have to be met. Even though this system has safely operated for years, it is not NEC code compliant now that the classification of the conductors from the transformer to the service equipment have changed from service laterals to an outside tap of unlimited length. Since this proposal was rejected, a comment should be prepared that would address this concern by adding an exception for existing installations.

ELDRIDGE, C.: Addressing the panel statement, there is no confusion by the submitter. The submitter is fully aware of the difference between a feeder to a facility and an outside feeder tap of unlimited length. The panel is ignoring the fact that this has been done for years with no problems by various suppliers of electricity across the country.

The problem occurs when a supplier sells its facilities to a customer and installs a primary meter. The installation that has been safe for numerous years is now in violation of the tap rules and declaired unsafe. A change in ownership associated with the sale of a suppler's installation to a customer would not change the safety of the former service conductors, now classified as tap conductors. Tap feeder conductors are sized to carry the load and protected at their load end, the same as all taps. Short circuit and ground fault protection is provided at the source of the feeder. The tap conductors would be protected better if the overcurrent protection were in multiple overcurrent devices instead of a single overcurrent device because of the diversity. Overload, short circuit or a ground fault on the load side of the smaller overcurrent device would have lesser effect on the tap conductors than if it were on the load side of a single, larger overcurrent device. The panel statement does not respond to these facts in its assertion that a single overcurrent device is necessary.

FREDERICKS, C.: I'm voting against the panel action. This issue has been raised before, as previously noted, we should consider that up to six disconnects are presently allowed for feeders in Article 225, and for transformer secondary protection in Article 450. Accepting this proposal and Proposal 10-61 would allow correlation with those articles, at no loss in the quality of overcurrent protection. I do not agree that a single overcurrent device is required to limit the load at the end of the tap conductors. In fact, this same effect can also be accomplished with up to six grouped overcurrent devices, in some cases in an improved manner.

There are pros and cons to the installation of either single or multiple overcurrent devices at the end of a feeder, but I believe it is incorrect to claim that one or the other is always best for overcurrent protection, or for personnel safety or for any other purpose. This panel action continues a lack of correlation with Articles 225 and 450.

10-25 Log #3212 NEC-P10 **Final Action: Reject**
(240.21(B)(5))

Submitter: H. Dean Schumacher, H. Dean Schumacher Electrical Inspections
Recommendation: Delete 240.21(B)(5).
Substantiation: 240.21 location of overcurrent requirement and related justification is not diminished due to compliance with 240.21(B)(5) requirements (1) through (4). Overcurrent protection is a vital system component that demands dutiful consideration to ensure personnel and equipment safety.
Panel Meeting Action: Reject
Panel Statement: The panel agrees with the submitter that overcurrent protection is a vital component of the electrical system; however, there has been no substantiation presented that would indicate the present requirement in the NEC is inadequate.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-26 Log #2939 NEC-P10 **Final Action: Accept in Principle**
(240.21(C))

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise the existing section as follows:

(C) Transformer Secondary Conductors. One or more ~~Each~~ set (s) of conductors ~~feeding separate loads~~ shall be permitted to be connected to a transformer secondary, without overcurrent protection at the secondary, as specified in 240.21(C)(1) through (6). The provisions of 240.4(B) shall not be permitted for transformer secondary conductors.

Retain the existing FPN.

Substantiation: The efforts made by CMP-10 to clarify this section for the 2005 NEC are appreciated. However, it appears the first sentence can be improved upon for clarity. When read literally, sets of conductors are required to feed separate loads, not the same load. We know that more than one set of conductors often supply the same load when installed as parallel sets of conductors.

It seems the changes made by CMP-10 were intended to clarify that more than one set of conductors are permitted to be connected to a transformer secondary so long as the provisions of (C)(1) through (C)(6) are complied with. Hopefully, the above changes will maintain the concept of multiple connections being permitted while not requiring the sets of conductors to supply different loads.

Panel Meeting Action: Accept in Principle

Revise the text in the proposal as follows:

"(C) Transformer Secondary Conductors. A set of conductors feeding a single load, or each set of conductors feeding separate loads, shall be permitted...".

Panel Statement: The panel has added wording to clarify that more than one set of conductors often supply the same load when installed as parallel sets of conductors. The panel does not agree with removal of the reference to separate loads. The intent of the 2005 Code change was to clarify that these secondary conductor rules are not limited in their application to one set per transformer.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

9-7b Log #CP902 NEC-P09 **Final Action: Accept**
(240.21(C)(2), FPN)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for action. This action will be considered by Code-Making Panel 10 as a public comment.
Submitter: Code-Making Panel 9,
Recommendation: Revise 240.21(C)(2) FPN. to read as follows:

FPN: For overcurrent protection requirements for panelboards, see 408.36.

Substantiation: CMP-9 has removed the categories of "lighting and appliance branch circuit panelboard" and "power panelboard" from Article 408 by virtue of its action on Proposal 9-117. This proposal correlates the reference in this fine print note with that action.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

10-27 Log #3387 NEC-P10 **Final Action: Accept**
(240.21(C)(2)(1)(c))

TCC Action: The Technical Correlating Committee directs that the Code-Making Panel clarify the Panel Action on this Proposal with respect to the location of the added text. This action will be considered by the Panel as a Public Comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Insert the following clause at the beginning of the list item:

"For field installations where the secondary conductors leave the enclosure or vault in which the supply connection is made,"

Substantiation: This language correlates this new provision with the conventional ten-foot tap rule that inspired it. This submitter was directly involved in the creation of this language in 210.21(B)(1)(4), where it now resides. If this correlation does not happen, there will be unintended and unsubstantiated design effects on unit substations and comparable gear. Suppose, for example, a unit substation with a 2000 ampere secondary is installed, with five sets of 600 kcmil secondary conductors between the transformer and the disconnecting means for the separately derived system. Suppose the ampacity (2100 amperes) reflects the transformer winding ratio, as it must. According to the literal text of the 2005 NEC, conductors on the secondary side of this transformer, and connected directly thereto, must not be smaller than about 3/0 copper. This is problematic for instrumentation supplied with the gear. In addition, if the installation is located within a vault, there is little likelihood of a problem in such short conductors affecting the building as a whole. It was for these reasons that the allowances were inserted in the rules for conventional ten-foot taps (in the 1993 NEC), and they apply equally now that parallel rules are being applied to transformer secondaries.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-3a Log #CP1000 NEC-P10 **Final Action: Accept**
(240.21(C)(3)1.)

Submitter: Code-Making Panel 10,
Recommendation: Add a new (1) to existing 240.21(C)(3) and renumber accordingly, to read as follows:

(1) Conditions of maintenance and supervision ensure that only qualified persons service the systems.
(2) The ampacity of the secondary conductors is not less than the secondary current rating of the transformer, and the sum of the ratings of the overcurrent devices does not exceed the ampacity of the secondary conductors.
(3) All overcurrent devices are grouped.
(4) The secondary conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.

Substantiation: Section 240.21(C)(3) makes reference to industrial installations. The proposed wording clarifies the requirements for an industrial installation in 240.21(C)(3). A definition based on the lower levels of transformer size, etc. is unnecessary.This panel proposal meets the proposer's intent for Proposals 10-4, 10-5, and 10-7.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-28 Log #1988 NEC-P10 **Final Action: Reject**
(240.21(C)(4))

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group
Recommendation: Revise as follows:

(4) Outside Secondary Conductors Where the conductors are located outdoors of a building or structure, except at the point of load termination, and comply with all of the following conditions:
(1) The conductors are protected from physical damage in an approved manner.
~~(2) The conductors terminate at a single circuit breaker or a single set of fuses that limit the load to the ampacity of the conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side.~~
(2) The sum of the overcurrent devices at the conductor termination limits the load to the conductor ampacity. The overcurrent devices shall consist of not more than six circuit breakers or sets of fuses, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six overcurrent devices grouped in any one location. Individual conductors terminating in overcurrent devices of separate enclosures shall be permitted to be supplied from the outside secondary conductors.

~~(3) The overcurrent device for the conductors is an integral part of a disconnecting means or shall be located immediately adjacent thereto.~~

(3) The tap conductors are installed outdoors of a building or structure except at the point of load termination.

(4) The overcurrent device(s) for the conductors is an integral part of a disconnecting means or shall be located immediately adjacent thereto.

~~(4)~~ (5) The disconnecting means for the conductors is installed at a readily accessible location complying with one of the following:

a. Outside of a building or structure

b. Inside, nearest the point of entrance of the conductors

c. Where installed in accordance with 230.6, nearest the point of entrance of the conductors

Substantiation: Article 225 recognizes buildings served by a feeder. Part II of Article 225 specifies the required disconnecting means for the building or structure. Whether a building is supplied by a service per Article 230 or a feeder per Article 225, the conductors are protected from overload if such protection complies with 230.90. There is no technical justification to treat the building feeder conductor overcurrent protection differently than that required for service conductors in 230.90. Both must be sized to carry the computed load. This is particularly true recognizing that the feeder conductors have short circuit protection on their supply side. For example, when the ownership of the feeder supply conductors change due to a relocation of the service point as frequently occurs, present 240.21(B)(5) in many instances would require the unnecessary installation of a single main overcurrent device to protect the same tap conductors that are adequately protected by conformance with the requirements of 230.90. Section 225.33 permits the supply feeder to terminate in up to six disconnect switches. This proposal resolves the apparent conflict between the requirements of 225.33 and 240.21(B)(5).

Panel Meeting Action: Reject

Panel Statement: The submitter's substantiation confuses two distinct issues:

1) a feeder to a facility, and

2) a feeder tap conductor. Six disconnects are permitted for the facility disconnect in 225.33 where the conductors are fully protected on the line side. The six disconnect's ensure the facility can be isolated with a reasonable number of throws of the hand as determined by Code-Making Panel 4. The restriction placed on the installation in 240.21(C)(4) is to ensure protection of the feeder conductors where no overload protection has been provided on the line side of those feeders. This action reiterates the panel's position that a single overload protective device is necessary to ensure overload protection of this tap. With respect to the equipment, changes associated with a change of ownership, this change is also associated with a change of safety-responsibility.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

DARLING, D.: Outside taps of unlimited length should be allowed for existing installations with more than one, but less than six, service disconnects where a property owner purchases installed equipment such as a utility pad-mounted transformer and service laterals from the utility company. All other requirements of the proposal would also have to be met. Even though this system has safely operated for years, it is not NEC code compliant now that the classification of the conductors from the transformer to the service equipment have changed from service laterals to an outside tap of unlimited length. Since this proposal was rejected, a comment should be prepared that would address this concern by adding an exception for existing installations.

ELDRIDGE, C.: Addressing the panel statement, there is no confusion by the submitter. The submitter is fully aware of the difference between a feeder to a facility and an outside feeder tap of unlimited length. The panel is ignoring the fact that this has been done for years with no problems by various suppliers of electricity across the country.

The problem occurs when a supplier sells its facilities to a customer and installs a primary meter. The installation that has been safe for numerous years is now in violation of the tap rules and declaired unsafe. A change in ownership associated with the sale of a suppler's installation to a customer would not change the safety of the former service conductors, now classified as tap conductors. Tap feeder conductors are sized to carry the load and protected at their load end, the same as all taps. Short circuit and ground fault protection is provided at the source of the feeder. The tap conductors would be protected better if the overcurrent protection were in multiple overcurrent devices instead of a single overcurrent device because of the diversity. Overload, short circuit or a ground fault on the load side of the smaller overcurrent device would have lesser effect on the tap conductors than if it were on the load side of a single, larger overcurrent device. The panel statement does not respond to these facts in its assertion that a single overcurrent device is necessary.

FREDERICKS, C.: Please see my explanation of negative vote on Proposal 10-24.

10-29 Log #2875 NEC-P10 **Final Action: Reject**

(240.21(C)(6)(1))

Submitter: Robert Padgham, Jacksonville, FL

Recommendation: Revise 240.21(C)(6)(1) as follows and add Table 240.21(C)(6)(1).

(1) The secondary conductors shall have an ampacity that is not less than the value of the primary-to-secondary voltage ratio multiplied by one-third of the rating of the overcurrent device protecting the primary of the transformer, or the secondary tap conductors are protected in accordance with Table 240.21(C)(6)(1) by the overcurrent device protecting the feeder conductors.

Table 240.21(C)(6)(1) Tap Conductor Short-Circuit Current Ratings. Tap conductors are considered to be protected under short-circuit conditons when their short-circuit temperature llimit is not exceeded. Conductor heating under short-circuit conditions is determined by (1) or (2):

(1) Short-Circuit Formula for Copper Conductors

$(I^2/A^2)\,t = 0.0297 \log_{10}((T_2 + 234)(T_1 + 234))$

(2) Short-Circuit Formula for Aluminum Conductors

$(I^2/A^2)\,t = 0.0125 \log_{10}((T_2 + 228)/(T_1 + 228))$

where

I = short-circuit current in amperes

A = conductor area in circular mils

t = time of short-circuit in seconds (for times less than or equal to 10 seconds)

T_1 = initial conductor temperature in degrees Celsius.

T_2 = final conductor temperature in degrees Celsius.

Copper conductor with paper, rubber, varnished cloth insulation T_2 = 200

Copper conductor with thermoplastic insulation T_2 = 150

Copper conductor wiht crosslinked polyethylene insulation T_2 = 250

Copper conductor with ethylene propylene rubber insulation T_2 = 250

Aluminum conductor with paper, rubber, varnished cloth insulation T_2 = 200

Aluminum conductor with thermoplastic insulation T_2 = 150

Aluminum conductor with crosslinked polyethylene insulation T_2 = 250

Aluminum conductor with ethylene propylene rubber insulation T_2 = 250

Substantiation: North American industry is in a daily struggle to compete with global competitors. As such, we need every possible chance to reduce costs, but with safety as the number one directive. That is the intent of this proposal.

The existing NEC requirements for these feeder taps dictate that the ampacity of the secondary tap conductors be at least 1/3 of the overcurrent device protecting the feeder conductor multiplied by the primary-to-secondary voltage ratio. At first, this sizing seems reasonable when considering that the feeder circuit device is being asked to provide short-circuit protection for the smaller tap conductors. But, this is often extremely conservative and frequently results in a conductor sized much larger than is actually required according to the laws of physics. By using formulas that have been widely utilized by IEEE, the Canadian Electrical Code, and the IEC, much smaller conductors can be installed. This will provide significant cost savings for electrical distribution systems, allowing North American manufacturers to be more competitive in the global marketplace.

An example would be helpful. Assume a feeder conductor is a 3/0 with an ampacity of 200 amperes, and protected with a 200 ampere overcurrent protective device. Also assume a one-to-one voltage ratio for simplicity. According to the 2005 NEC, the smallest 25 foot secondary tap conductor would be a 4 AWG with an ampacity of 85 amperes, even if it were only supplying a 10 ampere load. (Three times the ampacity of a 6 AWG, with an ampacity of 65 only gives 195 amperes, which doesn't meet the 200 ampere requirement.) According to the physics formula, and UL standards, a 200 ampere Class J fuse will protect a 10 AWG conductor for faults up to 200,000 amperes. (Maximum I^2t let-through of a 200 ampere Class J fuse at 600 volts with 200,000 amperes available is 300×10^3 ampere squared seconds, while the short-circuit withstand of a 10AWG copper conductor is 303×10^3 ampere squared seconds.) As we can imagine the cost savings here will be substantial, and within the safety umbrella of internationally accepted standard physics formulas.

The physics formulas submitted with this proposal are the accepted basis for conductor short-circuit temperatures throughout the world. They are found in the ANSI/IEEE Red, Gray, Buff, and Blue Books and in the Canadian Electrical Code. Similar versions of these formulas are found in IEC60204-1 (IEC Machinery Standard), SAE HS-1738 (Automotive Industry Machinery Standard), and IEC 60364-4-43 (IEC Installation Standard).

Let's give North American industry every possible (safe) option to be competitive in the global market by accepting this proposal.

Panel Meeting Action: Reject

Panel Statement: The panel continues to limit this allowance to supervised industrial installations. See 240.92.

The complexity of the calculation, along with the associated installation and maintenance issues, requires that this be limited to supervised industrial installations.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-30 Log #2759 NEC-P10 **Final Action: Reject**
(240.21(C)(6)(4))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new statement of the requirement that the primary conductors are protected from overcurrent to read as follows:
(4) The primary conductors are protected from overcurrent in accordance with 240.4(B) or (C) .
Substantiation: This section assumes the primary conductors are protected from overcurrent in accordance with 240.4, but there is no stated requirement that the conductors be protected.
Panel Meeting Action: Reject
Panel Statement: Section 240.21(C) addresses the conductors on the secondary of the transformer. Since the protection on the primary is addressed in other areas of the NEC, it is unnecessary to reiterate the need for this protection in the secondary conductor protection requirements.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-31 Log #693 NEC-P10 **Final Action: Reject**
(240.21(D))

Submitter: Don A. Hursey, Durham County Inspections Department
Recommendation: Revise as follows:
Service Conductors. Service-entrance conductors shall be permitted to be protected by overcurrent devices in accordance with 230.91. The provisions of 240.4(B) shall not be permitted for service conductors.
Substantiation: The 2005 no longer permits the tap conductors and transformer secondary conductors to use the provisions of 240.48. Service conductors should not be allowed to use 240.13.
Panel Meeting Action: Reject
Panel Statement: The panel understands the reference to be to 240.4(B) and not 240.48. The additional sentence did not change the requirement from the 2002 NEC. The additional sentence placed in 240.21(B) referencing 240.4(B) is somewhat redundant and may be unnecessary, since all of the tap rules require conductors to be sized “not less than” the overcurrent protection. However, it was added to assist with clarity. No substantiation has been presented that supports further restrictions within 240.21(D).
The submitter’s comment regarding 240.13 is in conflict with 230.95.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-32 Log #908 NEC-P10 **Final Action: Accept in Part**
(240.21(D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:
Service- ~~entrance-~~ conductors shall be ~~permitted to be~~ protected by overcurrent devices in accordance with 230.91.
Substantiation: Edit. The heading includes service-lateral conductors which should be included in the text. 230.91 is a requirement, not a “permitted” rule. The definition of Service-Entrance Conductors, Underground System indicates there may be no service-entrance conductors.
Panel Meeting Action: Accept in Part
The panel accepts the deletion of the word “entrance” and rejects the proposed deletion of “permitted to be.”
Panel Statement: The general rule in 240.21 requires conductors to be protected where they received their supply. 240.21(D) is permitting this protection to be provided in service conductors at a location other than the supply end of the conductors.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-33 Log #1672 NEC-P10 **Final Action: Reject**
(240.21(H))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: Add text to read as follows:
(H) Battery Conductors. Each set of battery conductors feeding separate loads shall be permitted to be connected to storage batteries, without overcurrent protection at the battery, as specified in 240.21(H)(1).
(1) Industrial Battery Conductors Not Over 7.5m (25 ft.) Long. For industrial installations, where the length of the battery conductors do not exceed 7.5m (25 ft) and complies with all of the following:
(1) T HE AMPACITY OF THE BATTERY CONDUCTORs is not less than the ampacity of the storage batteries and the sum of the ratings of the overcurrent devices does not exceed the ampacity of the battery conductors.
(2) All overcurrent devices are grouped.
(3) T he battery conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means from the battery terminals to the overcurrent device.
(4) W here multiple overcurrent devices are supplied from batteries, the number of overcurrent devices shall not exceed six circuit breakers or six sets of fuses.
(2) B attery Conductors From Chargers. Conductors from the battery charger to the batteries shall be protected from physical damage by being enclosed in an approved raceway or by other approved means. The conductors shall be protected by an overcurrent device rated not more than the ampacity of the conductors. The overcurrent device may be an integral part of the battery charger.
FPN: In some instances, the conductors from the batteries to the overcurrent device are the same conductors as those connected to the charger.
Substantiation: For many years taps and transformer secondary conductors have been addressed by the NEC. In industrial substations such as those for petrochemical facilities, there are UPS systems and station batteries that have conductors leaving the batteries feeding either a panelboard or an overcurrent device. There are currently no restrictions on how far these conductors may be routed without an overcurrent device and nothing specifically requires them to be physically protected.
These conductors are unique because not only are the batteries a source of power, they are also a load when they are charging. The conductors are usually protected by the battery charger in the case of the batteries being the load. However, protection should also be required when the batteries are the source.
This proposal is patterned after 2005 NEC 240.21(C)(3) and should suffice for battery installations as well.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the subtantiation that there are no restrictions. Section 480.3 subjects the wiring of batteries to the general requirements of the NEC.
This proposal would apply only to industrial locations, and some installations would be large enough to need more than 25 ft.
The submitter has not substantiated a length limitation.
The panel requests that the Technical Correlating Committee appoint a task group, comprised of members from Code-Making Panels 10 and 13, to review this issue and develop comments.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
ELDRIDGE, C.: I agree with Mr. Fredrick’s Explanation of Negative Vote.
FREDERICKS, C.: I’m voting against the panel action. The panel action is inconsistent in that it asserts the basic rule of 240.21 should apply to battery conductors, while at the same time acknowledging that allowing 25 feet to the first overcurrent device might not be enough for some larger installations.
The basic rule of 240.21 should not be applied to battery installations without any length allowances. Length allowances are presently accepted in 240.21 for conductors fed from both generators and from transformers.
It can be impractical and undesirable to place an overcurrent device near a vented storage battery bank, for reasons including possible exposure to a hazardous flammable atmosphere and also possible exposure to acid and corrosives.
The proposal should have been accepted in part in principle, creating new rules for all freestanding storage battery installations as follows:
(H) Battery Conductors. Each set of battery conductors feeding separate loads shall be permitted to be connected to storage batteries, without overcurrent protection at the battery, as specified in 240.21(H)(1) or 240.21(H)(2).
(1) Battery Conductors. Conductors from battery terminals shall be permitted to be protected from overload where the following conditions are met:
(1) The battery conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means, from the battery terminals to the overcurrent device. The positive and negative conductors may be enclosed in separate non-magnetic raceways.
(2) The ampacity of the battery conductors is not less than the design load and is also not less than the 60-minute rated discharge current of the storage batteries.
(3) Where multiple overcurrent devices are used, all overcurrent devices are grouped, and the number of overcurrent devices does not exceed six circuit breakers or six sets of fuses
(4) The sum of the ratings of the overcurrent devices does not exceed the ampacity of the battery conductors.
(2) Battery Conductors From Chargers. Conductors from the battery charger to the batteries shall be protected from physical damage by being enclosed in an approved raceway or by other approved means. The conductors shall be protected by an overcurrent device rated not more than the ampacity of the conductors. The overcurrent device may be an integral part of the battery charger.
FPN: In some instances, the conductors from the batteries to the overcurrent device are the same conductors as those connected to the charger.
The proposed text above is a revision of the submitter’s proposal and would apply to all storage battery installations, excluding those installations that are part of listed equipment and that typically employ valve-regulated or non-vented batteries.
A length limitation for the battery conductors is not shown in the proposed text. This because there is no incentive in design or in the field to make these conductors longer than necessary, and lengths that are readily justifiable for a larger battery installation might be too long for a smaller installation.

If the panel preferred to give a limitation for the battery conductors based on length, I believe it would be adequate to require a maximum voltage drop of 2% at design load for the battery conductors. This would be consistent with NEC guidance for feeders and would assure an adequate combination of conductor size and length. This was left out of the proposed text above, considering that this might be too much of a design consideration to make an NEC requirement.

Storage battery installations are generally ungrounded systems, so another option to reduce the probability of a short circuit in the battery conductors would be to require the positive and negative conductors to be routed separately in non-magnetic raceways. This was also seen as a design consideration, so not included in the proposed text above.

Comment on Affirmative:

KOVACIK, J.: In the case of storage batteries acting as a power source, there is concern not only for the conductors but also for the hazards presented by the batteries themselves. 480.3 governs wiring and equipment supplied from batteries and should continue to. Allowing a "tap rule" relaxation of the overcurrent requirements risks minimizing the hazard potentially created by the battery itself.

10-34 Log #416 NEC-P10 **Final Action: Reject**
(240.24)

Submitter: Darrel Pinkston, Bright Electric LLC
Recommendation: Would like to see a new (F) paragraph to read: "not located in bedrooms."
Substantiation: It seems to me that since arc-fault is required on all devices located in a bedroom that allowing overcurrent devices in bedrooms would seem to violate 210.12(B).
Panel Meeting Action: Reject
Panel Statement: Section 210.12 requires protection of the branch circuit supplying outlets in the bedroom have AFCI protection. Panelboards located in the bedroom would not be required to have AFCI devices installed for those branch circuits feeding outlets outside the bedroom. Code-Making Panel 2 has jurisdiction over the protected circuits.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-35 Log #1446 NEC-P10 **Final Action: Reject**
(240.24)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
240.24 Location in or on Premises.
(A) Accessibility.
(1) For busways, as provided in 368.12.
(2) For supplementary overcurrent protection ~~, as described in 240.10.~~
(3) For overcurrent devices, as described in 250.40 and 230.92.
(4) For overcurrent devices adjacent to utilization equipment that they supply, access shall be permitted to be by portable means.
Substantiation: With the addition of "supplementary overcurrent device" to Article 100 in the 2005 NEC, there is no reason to reference 240.10 anymore.
Panel Meeting Action: Reject
Panel Statement: The definition provides no guidance for location. The reference to 240.10 establishes location and accessibility.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-36 Log #3165 NEC-P10 **Final Action: Reject**
(240.24)

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Rewrite this Section to combine 240.24(C) and (D) into one Section as follows in underlined type to help streamline the Code. Please also note a change to the spelling of the word Ignitable above. This spelling differs from the use of *Ignitible* in the 2005 Code which appears to be a spelling error. Change the present 240.24(E) to 240.24(D) to compensate for this change if this proposal is accepted.
<u>(C) Not Exposed to Physical Damage. Overcurrent devices shall not be located where they will be exposed to physical damage, or in the Vicinity of Easily Ignitable Material such as in clothes closets.</u>
<u>FPN:See 110.11, Deteriorating Agents.</u>
Substantiation: This proposal will contribute to clarity and to streamlining the Code process, thus making the Code easier for users to understand.
Panel Meeting Action: Reject
Panel Statement: This is a proposed clarification without any intended technical changes; however, the panel does not see this proposal as adding clarity to this area of the NEC.

Two separate ideas are involved. 240.24(C) addresses physical damage that may occur to the overcurrent protective device. 240.24(D) addresses the fire hazard associated with the proximity of ignitible material to the overcurrent device.

Further, by having different headings, the Code will remain more user friendly.

According to the American Heritage© Dictionary of the English Language, Third Edition, both versions of ignitible are acceptable and have the same meaning.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-37 Log #2035 NEC-P10 **Final Action: Accept**
(240.24(B))

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
240.24(B) Occupancy. Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy <u>unless otherwise permitted in 240.24(B)(1) and (B)(2).</u>
<u>**(1) Service and Feeder Overcurrent Devices.**</u> ~~Exception No. 1:~~ Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the service overcurrent devices and feeder overcurrent devices supplying more than one occupancy shall be permitted to be accessible to only authorized management personnel in the following:
(1) Multiple-occupancy buildings
(2) Guest rooms or guest suites ~~of hotels and motels that are intended for transient occupancy~~
<u>**(2) Branch Circuit Overcurrent Devices.**</u> ~~Exception No. 2:~~ Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the branch circuit overcurrent devices supplying any guest rooms or guest suites <u>without permanent provisions for cooking</u> shall be permitted to be accessible to only authorized management personnel. ~~for guest rooms of hotels and motels that are intended for transient occupancy.~~
Substantiation: The proposed revision to 240.24(B) is primarily editorial in nature seeking to eliminate exceptions by using positive text to improve clarity. The qualifier "intended for transient occupancies" is deleted and the text in the proposed second level subdivision (B)(2) is modified to address "guest rooms" and "guest suites" with permanent provisions for cooking.

The exceptions are editorially eliminated and rolled into the positive text in two second level subdivisions.

The text in the present exceptions No. 1 & 2 which applies these rules to only guest rooms & guest suites "intended for transient occupancies" is deleted. These terms, "guest room" and "guest suite" are now defined in Article 100. There is no longer a need for the qualifier "intended for transient occupancy," due to the addition of these definitions in Article 100 and qualifying requirements for "guest rooms" and "guest suites" in Article 210.

In essence the only difference between a "guest room" or "guest suite" and a "dwelling unit" is a requirement for permanent provisions for cooking. Where a "guest room" or "guest suite" is provided with "permanent provisions for cooking," section 210.18 requires the following:

210.18 Guest Rooms and Guest Suites

Guest rooms and guest suites that are provided with permanent provisions for cooking shall have branch circuits and outlets installed to meet the rules for dwelling units.

This section, new in 2005, now requires that "guest rooms" and "guest suites" equipped with "permanent provisions for cooking" are treated the same as dwelling units in regard to the branch circuit requirements contained in Parts I, II, and III of Article 210. This includes small appliance branch circuits in 210.11(C)(1), laundry branch circuits in 210.11(C)(2) and bathroom branch circuits in 210.11(C)(3). This also includes AFCI protection in 210.12 for all branch circuits supplying bedroom outlets. Access to these overcurrent devices must be readily accessible to the occupant.

These "guest rooms" and "guest suites" with "permanent provisions for cooking" are capable of as well as intended for "extended stay" and will be used more like a dwelling unit than a "guest room" or "guest suite." Occupants will bring appliances and other loads with them, dramatically increasing the need for readily accessible overcurrent protective devices for their "extended stay."
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-38 Log #2936 NEC-P10 **Final Action: Reject**
(240.24(B))

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 240.24(B) as follows:
(B) Occupancy. Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy. <u>Enclosures housing electrical apparatus that are controlled by lock and key shall be considered accessible to qualified persons.</u>
Exceptions to remain unchanged.

Substantiation: This is a companion proposal to delete the rule from 110.26 and add it to 230.92 and 240.24(B). 110.26 deals with access to working space about electrical equipment and does not apply to access to the equipment itself. It seems the provisions on electrical apparatus controlled by a lock and key would more properly be located in 230.92 and 240.24(B).

Many locations come to mind where electrical equipment is locked to prevent unauthorized access. These include schools, colleges, health care facilities, airport terminals and office buildings that are open to the public. These buildings often have either panelboards with locking covers or electrical equipment located in locked rooms. Electrical inspectors recognize the security that is needed in these and other facilities. Locating this rule with the sections that cover locks on equipment will improve the usability of the Code.

Panel Meeting Action: Reject

Panel Statement: The introductory sentence to 240.24(B) focuses on accessibility by each occupant. The subsequent exceptions also focus on each occupant. It is inappropriate and confusing to add this sentence dealing with qualified persons. Further, deleting this accessibility permission from 110.26 and moving it to this article and 230.92 will place further restrictions on where a lock limits accessibility.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-39 Log #911 NEC-P10 **Final Action: Reject**

(240.24(D))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add "dormitories" after "dwelling units."

Substantiation: Edit. Dormitories without cooking facilities do not meet the definition of dwelling unit, and should be included.

Panel Meeting Action: Reject

Panel Statement: The recommendation is unclear, as the term "dwelling unit" does not exist in 240.4(D).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-40 Log #1633 NEC-P10 **Final Action: Reject**

(240.24(F))

Submitter: L. Keith Lofland, International Association of Electrical Inspectors

Recommendation: Add new text as follows:

<u>240.24(F) Not located in Stairways. Overcurrent devices shall not be located in the interior of a stairway.</u>

Substantiation: 110.26(A)(3) requires the work space to be clear and extend from the grade, floor, or platform to the height required by 110.26(E). Floors, platforms, and grade are all defined in the building code, and so is stairs. However, stairways are not mentioned in 110.26 of this section. Local Authorities Having Jurisdictions (AHJs) have prohibited panel boards form being installed in a stairway, but it seems that no clear Code language was present in 110.26 to support this stance. Stairways in the standing area of the required working space create a hazard, and are not a good practice, yet are not currently restricted.

240.24(A) requires overcurrent devices to be readily accessible and be installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft 7 in.) above the <u>floor or working platform</u> unless any of the provisions in 240.24(A)(1) through (4) apply. When a panelboard is installed in a stairway, where does one take this required measurements from to meet the requirements of 240.24(A)? Which stairway tread do you measure from? Allowing overcurrent devices to be installed in a stairway creates a hazard to electrical workers and occupants alike as a level working space is not provided.

Panel Meeting Action: Reject

Panel Statement: The panel requests that this proposal be referred to Code-Making Panel 1 for Comment.

Switches are permitted over steps. This appears to be broader than overcurrent protection.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

DOLLARD, JR., J.: We are voting negative to the panel action to reject proposal 10-40. Our comments are as follows:

The action taken on this proposal should have been to "Accept." In the statement to reject proposal 10-40, the panel states that the issue raised by the submitter appears to be broader than overcurrent protection. We agree that the issue may be broader than overcurrent protection. In the panel statement it is also noted that switches are permitted over steps. These statements may give the reader of the ROP the false impression that CMP-10 is of the opinion that overcurrent devices, in panelboards for example, may be mounted in stairways. We do not believe that CMP-10 would agree that the mounting of panelboards for example in stairways would be an acceptable practice. There is no practical reason to permit or allude to a perceived permission to allow overcurrent protective devices to be installed in stairways.

The installation of panelboards, or overcurrent protective devices of any type are prohibited in stairways by building codes in commercial and institutional occupancies. Electrical equipment is prohibited in stairways or egress corridors unless that equipment directly serves the stair or corridor such as emergency lighting, fire alarm tamper/flow switches and purge/pressurization fans. The installation of panelboards in the stairway of dwelling units however, may not be a violation of local building codes. The enforcement community needs this text to prohibit the installation of overcurrent protective devices in stairways. This is a serious safety issue. If a panelboard is mounted in a stairway, the installer, maintainer, inspector and occupant must stand in the stairway facing a side wall to access the panelboard. The initial installation, all additional work and all access to the panelboard to energize or deenergize circuits would be performed with the installer, maintainer, inspector or occupant standing in the middle of a stairway on a single tread. This may occur in the dark as the occupant attempts to reset a tripped lighting circuit.

KOVACIK, J.: Upon consideration, we are in agreement with the comments in the negative ballot provided by Mr. Dollard to Proposal 10-40. We agree for all of the reasons that Mr. Dollard presents that, "There is no practical reason to permit or allude to a perceived permission to allow overcurrent protective devices to be installed in stairways." In addition to the reasons provided by Mr. Dollard, we believe that the panel action to reject this proposal is contrary to the intent of NFPA 101, the Life Safety Code that requires that routes of egress not be impeded. Consequently, we are changing our vote from Affirmative to Negative to the Panel action.

Comment on Affirmative:

BORTHICK, M.: I support the panel action to reject this proposal. Section 110.26 requires that the working space permits safe operation and maintenance of equipment. Requiring someone to stand on two levels (such as on two risers of a stairway) to work on a panelboard seems to violate this requirement for safe operation and maintenance. Additionally, 110.26(B) requires that if panelboards are located in a passageway the working space, within the passageway, is to be suitably guarded when live parts are exposed. Since a stairway would be considered a passageway the working space required by 110.26 would have to be guarded while servicing the panelboard. The logistics of performing service on a panelboard installed in a stairway (or any passageway) discourages such installations. However, to mandate that absolutely no overcurrent devices be installed in a stairway would include supplemental OCPD's as well. It seems more appropriate that a proposal to clarify working space as being on one level be submitted to Code-making Panel 1.

10-41 Log #2887 NEC-P10 **Final Action: Reject**

(240.30(C))

Submitter: B. Wiltse, Mandeville, LA

Recommendation: Add a new 240.30(C) Marking.

<u>(C) Marking. Enclosures containing service, feeder, and branch circuit overcurrent protective devices shall be field marked with:</u>

<u>(1) The amount of available short-circuit current, or</u>

<u>(2) A note that the available short-circuit is 10,000 amperes or less.</u>

Substantiation: It is critical for the available short-circuit current to be marked on the enclosures containing overcurrent protective devices for two very critical reasons:

(1) The electrical inspector needs the information to assure compliance with 110.9.

(2) The worker needs the information in order to comply with OSHA and NFPA 70E for the proper PPE. Where the available short-circuit is less than 10,000 amperes, as might be found in single-family residences, enforcement of 110.9 and arc-flash are not an issue, so the exact available short-circuit current should not be a requirement.

Finally, this type of information must be field marked because the manufacturer won't know where their equipment will be installed.

Panel Meeting Action: Reject

Panel Statement: The substantiation indicates that marking the available fault current on overcurrent protection enclosures makes it easier for the inspector to review the job. However, the inspector must still ensure that any such marking be correct from plan review.

The second reason given for marking is for arc-flash protection. It should be noted that an arc-flash calculation, for the electrical enclosure that is going to be entered, is based on the overcurrent device ahead of that particular enclosure. The marking requirement for arc-flash is addressed in 110.16 and is outside the scope of Code-Making Panel 10.

The panel also disagrees with the submitter that a system delivering 10 kA or less is not an issue.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

DOLLARD, JR., J.: We are voting negative to the panel action to reject proposal 10-41. Our comments are as follows:

The panel statement on the action to reject this proposal contains the following sentence: "It should be noted that an arc-flash calculation, for the electrical enclosure that is going to be entered, is based on the overcurrent device ahead of that particular enclosure."

It is important to note that the amount of available short circuit current available, in addition to the characteristics of the overcurrent device ahead of an enclosure, must also be determined to calculate the incident energy or to apply the hazard risk categories in NFPA-70E. It is obvious that the intent of the submitter is to provide information for electrical workers to aid in the determination of the incident energy or the application of the hazard risk categories in NFPA-70E. The panel determined that marking the available short circuit current was not necessary. We disagree.

Perhaps the intent of the submitter could be met by accepting this proposal in principle. The intent of the submitter can be met by revising the proposed text to identify the upstream overcurrent protective device, as noted in the panel statement, instead of the available short circuit current as follows:

(C) Marking. Enclosures containing feeder and branch circuit overcurrent devices shall be field marked to identify the location, type, size or setting of the overcurrent protective device supplying the enclosure.

In the panel statement to Reject this proposal it is noted that the proposed text is outside of the scope of CMP-10, and is more appropriate in 110.16. We strongly disagree. The scope of Article 110 is limited to general requirements. The scope of Article 240 specifically includes "..general requirements for overcurrent protection and overcurrent protective devices.." All marking requirements for overcurrent protective devices are under the purview of CMP-10.

OCKULY, G.: This proposal should have been accepted knowing the available short-circuit current is absolutely necessary for determining compliance with numerous code requirements, especially 110.9.

This proposal, as written, has significant safety merit. The proposal stands on its own without the introduction of arc-flash energy as noted in (2) of the substantiation.

The panel statement brings up a good point about systems with 10 kA or less of available short-circuit current. This proposal would therefore be more appropriate if it did not allow for the elimination of the marking for situations where the available short-circuit current was less than 10 kA. It would then read:

(C) Marking. Enclosures containing service, feeder, and branch circuit overcurrent protective devices shall be field marked with the amount of available short-circuit current.

10-42 Log #2838 NEC-P10 **Final Action: Reject**
(240.34)

Submitter: Tracy Missey, Midlothian, VA
Recommendation: Add a new section 240.34

240.34 Marking. An enclosure, containing one or more overcurrent protective devices, shall be field marked with the available short-circuit current and the date on which that calculation was determined.

Exception: Marking the available short-circuit current and date of calculation shall not be required for enclosures containing overcurrent device(s):

(1) In feeders or branch circuits when the available short-circuit current at the service entrance equipment, or any upstream (line-side) enclosure, is 10,000 amperes or less, and the circuit voltage at the downstream (load-side) enclosure is the same as the circuit voltage at the service entrance equipment or upstream (line-side) enclosure, and

(2) The enclosure is field marked to indicate

a. that the available short-circuit current is 10,000 amperes or less, and

b. the date that the field label was installed.

Substantiation: Since knowledge of the available short-circuit current is required to

(1) determine the proper interrupting rating as required by 110.9 to,

(2) comply with requirements for component short-circuit current ratings in 110.10, 230.82(3), 409.110, 430.8, 440.4(B), and 670.3(A),

(3) Comply with requirements for selective coordination in 517.17, 620.62, 700.27, and 701.18,

(4) size equipment grounding conductors per 250.122 and,

(5) determine conductor protection per 240.100(C),

It is obvious that users of this Code must already be calculating the available short-circuit current (or should be calculating the available short-circuit current. Unfortunately, there is no requirement to mark this available short-circuit current on the equipment). There are two major problems with this current method. The first problem is that it is difficult for electrical inspectors to enforce those Sections described above. Matching equipment on the jobsite with short-circuit currents written on the plans is always time-consuming and often difficult to impossible to do. By placing the available short-circuit current on the equipment, it becomes a simple process for the inspector to compare the equipment rating with the available short-circuit current. The second problem arises when a worker needs the available short-circuit current to determine the arc-flash energy. If it is not marked on the equipment, the worker has no easy method to determine the level of protective clothing to ear. If the available short circuit current were marked on the equipment, the worker could utilize readily available printed materials or software to determine the PPE to wear.

The exception is needed for those circuits where the available short-circuit current is 10,000 amperes or less. In circuits of this type there are very few violations of the Code sections listed in(1) through (5) above and the arc-flash energies are of much less concern. Marking the enclosure with information that the available short-circuit current is less than 10,000 amperes provides some assurance that the system was analyzed, at least as of the date on the label.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 10-41.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:

DOLLARD, JR., J.: We are voting negative to the panel action to reject proposal 10-42. See our negative comment on proposal 10-41.

OCKULY, G.: The proposal would improve safety and assist the electrical inspector to enforce compliance with 110.9. I do not agree with the submitter's statement that enforcement of 110.9 is not an issue below 10,000 amperes. For example, a 5,000 AIC overcurrent protective device installed on a system capable of delivering 9,000 amperes is a potential hazard if the overcurrent protective device is required to interrupt a fault beyond the limits of its interrupting rating. See my Explanation of Negative Vote on Comment on 10-41.

10-43 Log #2844 NEC-P10 **Final Action: Reject**
(240.35)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for action in Article 110. This action will be considered by Code-Making Panel 1 as a public comment.

Submitter: Doug Eckelkamp, Bell Electric
Recommendation: Add a new 240.35.

240.35 Marking. An enclosure, in other than dwelling occupancies, containing overcurrent protective devices, shall be field marked with the available arc-flash energy and the flash protection boundary.

Substantiation: 110.16 requires an arc-flash warning label on specific types of equipment that might be worked while energized. This is an appropriate general requirement. However, the degree of the arc-flash hazard is always associated with an overcurrent protective device, specifically, the time that it takes for the overcurrent device to clear. Thus, it is appropriate that more specific requirements, such as those found in this proposal, be found in Article 240, covering the specific requirements for overcurrent protection.

NFPA 70E and OSHA require that a workman wear personal protective equipment that is adequate for the location and hazard at hand. The only way for a worker to pick the correct personal protective equipment is to first understand the degree of hazard. That degree of hazard is always associated with an overcurrent protective device. Thus, it makes sense to associate the hazard with the enclosure that houses the overcurrent protective device(s).

Panel Meeting Action: Reject
Panel Statement: This is outside of the scope of Panel 10 and should be referred to Code-Making Panel 1.

Marking the arc flash parameters is broader than overcurrent protection enclosures and should be addressed in 110.16.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:

DOLLARD, JR., J.: We are voting negative to the panel action to reject proposal 10-43. Our comments are as follows:

See our negative comment on proposal 10-41. In the panel statement to Reject this proposal it is noted that the proposed text is outside of the scope of CMP-10, and would be under the purview of CMP-1. We strongly disagree. The scope of Article 110 is limited to general requirements. The scope of Article 240 specifically includes "..general requirements for overcurrent protection and overcurrent protective devices.." All marking requirements for overcurrent protective devices are under the purview of CMP-10.

OCKULY, G.: I agree with the proposal as submitted, and take issue with the panel statement that this is outside the scope of Panel 10. The requirements for selecting overcurrent protective devices are contained in Article 240. The selection of overcurrent protective devices determines the arc-flash energy on the load side of the overcurrent protective device. As such, I believe that this is well within the scope of Article 240.

10-44 Log #2868 NEC-P10 **Final Action: Reject**
(240.37)

Submitter: Jamie Arnold, Tampa, FL
Recommendation: Add a new Part IV. Watthour Meters and a new 240.37 Short-Circuit Current Rating. Remember existing Parts IV through IX as V through X.

IV. Watthour Meters and Watthour Meter Sockets.

240.37 Short-Circuit Current Rating. Watthour meters and watthour meter sockets shall be marked with a short-circuit current rating and be protected from overcurrent so that the short-circuit current rating is not exceeded.

Substantiation: Current product standards require meter sockets to have a short-circuit current rating, but there is no requirement for that rating to be marked on the equipment by the NEC®. The bigger issue is that the watthour meters themselves are specifically exempted from the requirement to have a short-circuit current rating by the product standards. Thus, every electrical worker that installs or replaces a meter while energized is being put at significant risk of a serious burn injury or death whenever the available short-circuit current exceeds the short-circuit current rating of the meter. The way to

assure that the product standard is changed is to put the requirements into the NEC. Once the watthour meters are marked with a short-circuit current rating, installers and electrical inspectors can watch to see that the equipment is being installed within its short-circuit current rating.
Panel Meeting Action: Reject
Panel Statement: The substantiation is attempting to address a work practice issue with a short-circuit current rating. No substantiation has been presented that requiring such a marking will address the safety concern of the submitter. A meter and meter socket is not rated or recognized as a load break switch, nor will a short-circuit current rating protect a worker when installing or withdrawing a meter from a meter socket. It appears the intent of the submitter is to change the product standard. Here, it is noted that a product standard is changed through submitting a proposal to the organization responsible for the product standard. It should also be noted that this is a complex issue that received extensive industry/utility discussion during the mid-1980s on this very issue and the product equipment standard was revised to ensure appropriate safety.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-45 Log #1566 NEC-P10 **Final Action: Accept in Principle**
(240.50(A)(2))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 240.50(A)(2):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(2) Circuits supplied by a system having a grounded neutral <u>conductor</u> where the line-to-neutral voltage does not exceed 150 volts.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
"(2) Circuits supplied by a system having a grounded neutral <u>point</u> where the line-to-neutral voltage does not exceed 150 volts."
Panel Statement: The word "conductor" has been changed to "point" because a neutral conductor is not required on line-to-line loads, e.g., water heaters operating at 240 volts.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-46 Log #1654 NEC-P10 **Final Action: Reject**
(240.51)

Submitter: John Steinke, Reno, NV
Recommendation: Add second paragraph:
Plug fuses may be replaced by listed circuit breakers.
Substantiation: Mechanical Products manufacturers 15 and 20 amp circuit breakers for Edison base fuseholders. They are UL listed. Yet the NEC only speaks of plug fuses, and type "S" fuses; a strict reading of the text would suggest to some that the use of a circuit breaker is not allowed.
These fuse holders have long been recognized as subject to over-fusing. It is my belief that a resettable breaker reduces the temptation to simply put a larger fuse in, and can lead to load discipline (don't run microwave and hair dryer at same time) on the part of the occupant.
Circuit breakers also have the advantage of letting the occupant find the problem, and fix it, without making five trips to the hardware store.
Unfortunately, I am not aware of any such breakers made to fit in the type "S" adapters.
Panel Meeting Action: Reject
Panel Statement: 240.51 is dealing solely with Edison base fuses. There is nothing in the Code to prohibit the use of the circuit breakers that the submitter references where used as replacements only.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-47 Log #2867 NEC-P10 **Final Action: Reject**
(240.60(D))

Submitter: Jamie Arnold, Tampa, FL
Recommendation: Modify the requirements of 240.60(D) so as to prohibit the use of all Class H and K fuses instead of just Renewable Class H fuses. This can be accomplished by the following revised text:
<u>(D) Class H and K Fuses. Class H and K fuses shall not be permitted.</u>
Substantiation: When used within their ratings, Class H and K fuses have safely protected circuits for decades. Today however, utility systems are much stronger and now often deliver available short-circuit currents will in excess of the interrupting rating of these fuses. This becomes a safety issue for personnel that might try to install a Class H or K fuse on one of today's modern distribution systems. With this change, (1) the minimum interrupting rating of branch fuses would be 100,000 amperes, adequate for the majority of building distribution systems, (2) all branch-circuit rated fuses would be current-limiting under short-circuit conditions, providing for a greater degree of arc-flash protection and equipment short-circuit protection.
Panel Meeting Action: Reject
Panel Statement: Section 240.60(D) was added during the 2005 NEC cycle in order to address misapplication of "renewable" type fuses. Expanding the restriction to other fuse types based on increased available fault current from the utility would unnecessarily restrict such fuses from being used in other areas of the electrical system where they are appropriately rated.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-48 Log #2833 NEC-P10 **Final Action: Reject**
(240.83(C))

Submitter: Nathan Goff, AMF Electric
Recommendation: Delete the last sentence of this requirement.
~~The interrupting rating shall not be required t be marked on circuit breakers used for supplementary protection.~~
Substantiation: There are many supplementary circuit breakers on the market today that have the look and feel of branch-circuit circuit breakers. It is next to impossible for an electrical inspector to tell the difference between some branch-circuit breakers and the look-alike supplementary circuit breakers. With no interrupting rating marked on these supplementary circuit breakers, an inspector is likely to assume that they have a 5,000 ampere rating, when in fact they could have interrupting ratings much, much lower than that, as supported by the 200 ampere default rating in Table SB4.1 of UL 508A Supplement SB.
Requiring all types of circuit breakers to be marked will help inspectors enforce the important interrupting rating safety requirements.
Panel Meeting Action: Reject
Panel Statement: The requirements found within 240.83(C) specifically address circuit breakers, not supplementary protectors. Circuit breakers are used as supplementary protection in other areas of the NEC such as 424.22(B) and (C).
Section 424.22(C) requires the supplemental protection to be suitable for branch circuit protection, which requires a circuit breaker and not a supplementary overcurrent protective device as defined in Article 100. It should be recognized that a supplementary overcurrent protective device as defined in Article 100 carries a recognized component mark, not a listing mark.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-49 Log #2832 NEC-P10 **Final Action: Reject**
(240.83(C), FPN (New))

Submitter: Nathan Goff, AMF Electric
Recommendation: Add the following new FPN to 240.83(C):
<u>FPN: Circuit breakers that clear a short-circuit at or near their interrupting rating may require testing, servicing, or replacement, before being reset.</u>
Substantiation: Where a circuit breaker has experienced such a fault and is placed back into service without testing or replacement, serious implications may result, impacting the safety of the installer/maintainer as well as building occupants. The manufacturers fully agree with this approach as can be seen in the NEMA sponsored article, written by Vince Baclawski, that appeared in the January, 1995 issue of EC& M Magazine.
"After a high level fault has occurred in equipment that is properly rated and installed, it is not always clear to investigating electricians what damage has occurred inside encased equipment. The circuit breaker may well appear virtually clean, while its internal condition is unknown. For such situations, the NEMA AB4 "Guidelines for Inspection and Preventive Maintenance of MCCBs Used in Commercial and Industrial Applications" may be of help. Circuit breakers unsuitable for continued service may be identified by simple inspection under these guidelines. Testing outlined in the document is another

and more definite step that will help to identify circuit breakers that are not suitable for continued service."

The addition of this material will help warn workers that they should not simply reset a circuit breaker after it has tripped. And, they should be especially careful when the circuit breaker saw a short-circuit at or near its interrupting rating.

Panel Meeting Action: Reject

Panel Statement: The Code is an installation document not a maintenance document. NFPA 70B addresses the maintenance of electrical equipment. The practice of inspecting the entire electrical system may be necessary after a high fault condition and is not limited to the overcurrent protection device.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-50 Log #1958 NEC-P10 **Final Action: Reject**
(240.86)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Revise text to read as follows:

240.86 Series Ratings. Where a circuit breaker is used on a circuit having an available fault current higher than the marked interrupting rating by being connected on the load side of an acceptable overcurrent protection device having a higher rating, the circuit breaker shall meet the requirements specified in (A) ~~or (B) and (C)~~ and <u>(B)</u> .

~~(A) Selected under engineering supervision in existing installations. The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection should be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain, and operate the system. This series combination rating, including identification of the upstream device, shall be field marked on the end use equipment.~~

~~(B~~) <u>(A)</u> Tested Combinations. The combination of line-side overcurrent device and load-side circuit breaker(s) is tested and marked on the end use equipment, such as switchboards and panelboards.

~~(C)~~ <u>(B)</u> Motor Contribution. Series ratings shall not be used where

(1) Motors are connected on the load side of the higher rated overcurrent device and on the line side of the lower rated overcurrent device, and

(2) The sum of the motor full-load currents exceeds 1 percent of the interrupting rating of the lower-rated circuit breaker.

Substantiation: Series ratings involve the use of downstream circuit breakers that, operating alone, do not have the ability to interrupt the available fault current at the downstream location. At first glance, this is a departure from 110.9 of the Code that requires "Equipment intended to interrupt current at fault levels shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment". However, the code permits series ratings where, for fault currents above the downstream breaker rating, the interruption is aided by the simultaneous operation of an upstream device (circuit breaker or fuse) that is fully rated for the application. Safety is maintained by the correct operation of both the downstream and upstream devices, and UL 489 Section 7.12 contains extensive test requirements to ensure this safety. Devices that meet the requirements of UL 489 Section 7.12 are UL Recognized Components, and UL will only List an assembly (panelboard or switchboard) that contains these Recognized Components following UL's consideration of the interaction between the series rated components and the assembly. For tens of years, and from a safety standpoint, this has been the only code-permitted method of permitting circuit breakers to be used at circuit locations where the available fault current exceeds the circuit breaker's interrupting ability. This method is covered by 240.86(B) of the present code language and should be retained.

But 240.86 of the NEC 2005 now contain an alternative method for determining Series Ratings: (A) Selected under Engineering Supervision in Existing Installations. Here it is possible to depart from 110.9 of the Code provided the series rated combination is selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. However, from the standpoint of all circuit breaker manufacturers, this is a serious departure from electrical safety (1). If it were possible to select circuit breaker combinations or fuse/circuit breaker combinations on a reliable and safe basis, then circuit breaker manufacturers would have been pressing for this allowance for many years. Testing is expensive and time consuming. However, circuit breaker manufacturers have been unable to determine methods for combination-selection that ensure public safety. A further concern with the present code language is that there is absolutely no qualification on the devices that can be considered for selection. Thus the IEEE Representative, Dennis Darling provided an Affirmative Comment (ROC May 2004, page 780-140) that reads in part "Field selection of series combinations for existing breakers can only be done on breakers classified as passive devices that will not attempt to open instantly on high fault currents. All engineers who are field selecting series combinations for existing installations should be aware that all molded case circuit breakers and almost all power breakers not shipped with current limiting devices are active devices that attempt to interrupt the circuit instantly. This introduces dynamic arc impedance that will tend to lower fault available at the current limiting fuse. This is true even if the breakers do not have an instantaneous setting, and, therefore, should not be used in a series combination that is not tested as a combination device with a current limiting fuse". None of the qualifications and cautions addressed by the IEEE Representative appears in the present code language.

In addition, it must be stressed that untested combinations will have unknown performance. By having the engineering selection method in the NEC, users of the NEC assume that there is a solid basis for accepting them. But even if the upstream device clears the circuit, the damage at the downstream position can be significant in the event of a short circuit above the rating of the downstream circuit breaker. With unknown performance, does CMP-10 consider these ratings suitable for application under 110.9? With unknown results, are these considered "series ratings"?

If the desire is to have an allowance for a lesser requirement for existing installations that are unlikely to be upgraded for safety, these lesser requirements do not belong in the National Electrical Code that deals with safety requirements for new and upgraded installations.

1. "Engineered Series Ratings: Is it Practical?", NEMA Whitepaper, 2005

Panel Meeting Action: Reject

Panel Statement: The submitter has not supplied any new information to necessitate the removal of this provision.

The limited allowance for use of engineered systems as permitted in 240.86(A) is needed to provide safety alternatives in existing installations.

The panel understands the concerns expressed during review of this proposal. See panel action and statement on Proposal 10-50a (Log #CP1001).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

KIMBLIN, C.: NEMA considers that 240.86(A) dealing with the selection of series ratings under engineering supervision should be deleted. The additional wording of panel Proposal 10-50a (Log #CP1001) provides only one of the necessary safety parameters that would make an engineered series rating possible. The performance of the equipment bus and enclosure(s) also need to be considered. Thus, the entire assembly is considered in the test combination of 240.86(B). The interests of electrical safety are best served by overall deletion of 240.86(A), and series ratings selected under engineering supervision should be reserved for the special permissions granted by 90.4.

KOVACIK, J.: Allowing the determination of acceptable series combinations under engineering supervision is technically counter to the experience and expertise of the manufacturers of the affected downstream products (circuit breakers). It is important for the panel to keep the history of series ratings in mind. Years ago, systems were "engineered" to try to accomplish exactly what is being proposed. Manufacturers learned through field and laboratory experience that the "engineering" methods employed were flawed and could result in problems with the application of products in the field. Since learning of those issues, extensive testing programs under strict third party supervision have been developed to determine appropriate safe combinations of overcurrent devices. That testing program is the only accepted means available to the industry today. The panel is assuming that a "licensed professional engineer" can determine what is needed to engineer a safe system. Circuit breaker manufacturers have licensed engineers that are engaged every day in circuit breaker design and application and those engineers have not been able to establish an acceptable "engineering" method that can consistently and coherently be applied. If an acceptable safe method were available, circuit breaker manufacturers would use it to avoid expensive testing associated with establishing series ratings between circuit breaker combinations and fuse/circuit breaker combinations. The bottom line is that the code panel is allowing a code rule to exist that permits a product to be used in a manner that is directly counter to the instructions issued by the manufacturer and the listing of the product.

We believe that Code-Making Panel 10 has stepped outside of its scope in allowing engineering supervision as a means of series combination selection to remain. We believe that this attempts to redefine the safety performance of a product in a manner that is above and beyond its rating, directly counter to the product standard and counter to 110.3(B).

WILLIAMS, G.: There is no recognized standard that supports this method of engineering calculation and there is no means for the inspector to insure the engineering method used was correct.

Section 240.86(A) creates a false sense of security to the installer and anyone who services this type of installation; this causes great concern for the workers safety if there was a fault. Attending safety seminars instructed by OSHA and other recognized specialists showed that most faults occur when the person is working on equipment when it is energized.

To this day the only way to be sure that the combination of overcurrent devices is working properly is by controlled laboratory testing. I do not believe that NEMA has come up with any equipment that would be suitable to apply calculations to determine the adequacy of a series rating.

10-50a Log #CP1001 NEC-P10 **Final Action: Accept**
(240.86(A))

Submitter: Code-Making Panel 10,

Recommendation: In the existing Code text, add a new last sentence to 240.86(A) to read as follows:

"For calculated applications, the engineer shall ensure that the downstream circuit breaker(s) that are part of the series combination remain passive during the interruption period of the line side fully rated, current-limiting device."

Substantiation: This sentence is added to clarify the requirement for the licensed professional engineer.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
KOVACIK, J.: This recommendation, though a compromise effort falls short in that there is no reliable, foolproof method for an engineer to determine whether a circuit breaker, especially one that has been in service for some time will truly behave as a passive device during an interrupting event. We continue to maintain that the testing of series combinations remains the only consistently reliable method for ensuring safe performance and the reliable protection of conductors, equipment and individuals.

10-51 Log #562 NEC-P10 **Final Action: Reject**
(240.86(A))

Submitter: John W. Young, Siemens Energy & Automation
Recommendation: Revise text to read:
(A) Selected Under Engineering Supervision in Existing Installations. The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. the selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain, and operate the system. This series combination rating, including identification of the upstream device, shall be field marked on the end use equipment. <u>The name and identification of the engineer determining the rating shall be clearly marked on the end use equipment.</u>
Substantiation: The 2005 NEC was revised by CMP-10 to allow engineered series ratings to be determined by someone other than the manufacturer of the products. The revision did require that the rating be field marked on the end use equipment but it does not require that the engineer determining the rating and claiming the rating to be identified. This information should be marked on the product to clearly identify who determined the rating.
Panel Meeting Action: Reject
Panel Statement: The existing provisions in 240.86(A) provide adequate and specific requirements for design documentation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-52 Log #567 NEC-P10 **Final Action: Accept in Principle in Part**
(240.86(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for comment.
Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise as follows:
The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain, and operate the system. This series combination rating, <u>actual fault current, and</u> identification of the upstream device, shall be field marked on the end use equipment. <u>When the series combination rated line side overcurrent device is remotely located from the load side circuit breaker(s), identification of the line side series combination rated device shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating and shall indicate its series rating and replacement type.</u>
<u>CAUTION – SERIES COMBINATION RATED SYSTEM REPLACE WITH:</u>
<u>TYPE BREAKER</u>
<u>TYPE FUSE</u>
Substantiation: By marking the actual fault current on the end use equipment, this would identify what the minimum AIC rating of the circuit breaker(s) that may be installed and considered fully rated.
By requiring the field marking at the line side device of a remotely located series rated combination, this will identify this device as part of a series rated combination. As currently allowed by the NEC, the series rated load side device may be compromised by replacement of the line side series rated device with a device not identified as compatible with the series rated combination. This will also add clarity to 110.22 "...the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating." I would consider the term enclosure(s) with the (s) to mean where the line side overcurrent device is located remotely from the load side device; both enclosures shall be marked and readily visible. This clarity is needed to limit the confusion and promote consistency within the electrical inspection and installation communities.
Panel Meeting Action: Accept in Principle in Part
Revise the proposed wording to read as follows:
"The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain, and operate the system. This series combination rating, including identification of the upstream device, shall be field marked on the end use equipment.
The marking shall be readily visible and state the following:
CAUTION – SERIES COMBINATION SYSTEM
RATED _______ AMPERES. REPLACE WITH:
_________TYPE BREAKER
________TYPE FUSE"
Insert the text added by the action on Proposal 10-50a (Log #CP1001) here.
Panel Statement: The wording "actual fault current, and" has been deleted as a result of the panel actions and statements on Proposal 10-41 and 10-42.
The remainder of the proposal text has been modified to clarify that both line side and load side devices are required to be marked regardless of where they are located.
In addition, the panel requests that the Technical Correlating Committee forward this proposal to Code-Making Panel 1 for comment.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-53 Log #2686 NEC-P10 **Final Action: Reject**
(240.86(A))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise 240.86(A), as follows:
(A) Selected Under Engineering Supervision in Existing Installations. The series rated combination devices shall be selected by a person knowledgeable through experience and training in the design and maintenance of such electrical installations. The selection shall be documented and shall be available to those authorized to design, install, inspect, maintain, and operate the system. This series combination rating, including identification of the upstream device, shall be field marked on the end use equipment.
Substantiation: <u>Problem:</u> The existing text is too specific about the nature of the person making the design determination. The NEC is used in locations outside the United States that have different regulations regarding design work, and engineering regulations vary even within the United States.
<u>Substantiation:</u> There are many electrical design activities under the scope of the Code that are of similar complexity but do not have similar code text about the design and documentation. It should be sufficient here to require that the calculations be performed by a sufficiently qualified individual. Local and state laws governing electrical design and engineering already cover issues such as certification (document stamping) requirements for engineering work, and the NEC should not attempt to duplicate or rewrite these regulations, which again will vary from location to location.
It is felt that the proposed revision is functionally equal to or stronger than the original language, without being too specific about the credentials of the person performing the work or how the work is to be certified.
Panel Meeting Action: Reject
Panel Statement: The panel had significant discussions on this specific topic during the development of the 2005 NEC and concluded that in order to address the safety concerns of the panel it was deemed necessary to require a licensed professional engineer.
Section 90.4 provides the ability to permit alternate qualifications.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
FREDERICKS, C.: I'm voting against the panel action. I agree with the submitter's substantiation that there could be personnel well-qualified to perform this task who are not licensed professional engineers.

10-54 Log #3489 NEC-P10 **Final Action: Reject**
(240.86(A))

Submitter: Alan Manche, Square D Co.
Recommendation: Delete NEC **240.86(A) Selected Under Engineering Supervision in Existing Installations.**
~~**NEC 240.86(A) Selected Under Engineering Supervision in Existing Installations.** The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain, and operate the system. This series combination rating, including identification of the upstream device, shall be field marked on the end use equipment.~~
Substantiation: I have been asked to speak to a number of engineers, consultant, and inspectors across the country on this subject. Much confusion resides around this topic with numerous professional engineers, contractors and inspectors. The NEC provides absolutely no guidance on how to apply this section and the information available to the industry fails to demonstrate any clear procedure or confidence that a set of parameters exists to support applying this section. How can compliance with this section be assured and meet the level of performance necessary for a safe installation? The erroneous application of this section places people and facilities at risk; therefore it is prudent to delete this section.
Evident from Mr. Callanan's testimony at the NFPA Standards Council meeting on July 14, 2004, he takes a strong position on electrical safety for people and facilities that we all share. I along with my company share the same

goal in electrical safety and this section is unfortunately undermining electrical safety and being misapplied. We have leaned on the professional engineering community to solve a technical issue that goes well beyond their expertise. We have ask the contractor and inspection community to "trust" these engineering judgments. Do you "trust" the engineer or do you follow the manufacturer's instructions and ratings in accordance with 110.3(b)? By accepting the provision of this section of the NEC, the contractor and inspector are ask to violate NEC 110.3(b) and utilize the equipment outside the parameters for which it was designed.

Here are a few facts and testimony that should be reviewed:

1) Listed Molded Case Circuit Breakers (UL 489) are not passive devices. This NEC section should not be applied when Listed molded case circuit breakers are a component of the system under consideration for an engineered series rating.

Mr. Ockuly's testimony at the NFPA Standards Council meeting held on July 14, 2004 with regard to this issue indicates that this section of the NEC is not intended for installations that use molded case circuit breakers which exhibit dynamic impedance, it is intended for "installations out in the field where there are circuit breakers, many of them airframe circuit breakers, that do not even come under the standard that Mr. Gregory refers to as UL 489."

2) The series rating under consideration may not be limited to the first overcurrent device in the system. All overcurrent devices located in the system that are underrated must be included in the engineering evaluation. The performance of the overcurrent protective devices for a series rating would be considered acceptable if all of the following four criteria are met by the upstream overcurrent protective device:

(1) It reduces the let-through current to a value below the interrupting rating of the downstream circuit breaker.

(2) It clears the circuit at a time before the contacts of the downstream circuit breaker **begin** to open.

(3) Items (1) and (2) are true for all current levels from the rating of the downstream circuit breaker through the series rating of the combination (not just at the maximum current level of the system).

(4) It has an interrupting rating at or above the engineered series rating.

How does the professional engineer obtain the information to satisfy the necessary criteria in items 1 or 2 above? Test data is required on the circuit breaker in order to understand when the contacts begin to part not only at the maximum fault level but across the range of fault current the devices may see during the fault condition.

3) The ANSI/IEEE 37.13 document provides cautionary guidance on the application of series ratings with low voltage power circuit breakers that may have catastrophic results if inappropriately applied. It notes that fused Low Voltage Power Circuit Breakers may have additional contacts and heavier operating springs than the standard circuit breaker to allow them to withstand the higher current they will see when subjected to a short circuit above their rating. These design differences also address higher temperatures they experience when operated together with a fuse. ANSI/IEEE C37.13 recommends against the application of series ratings.

The proponents of this section of the NEC appear to recognize the extremely limited application of this section, however instead of utilizing 90.4 in a very special circumstance for an airframe breaker, this section has not only opened the door for misapplication but has the electrical community using it as justification for misapplying fuses, molded case circuit breakers and power circuit breakers. From committee member comments, the section was introduced as a "better" solution that what was available at this point. A "better" solution is a dangerous path for any electrical safety committee to embrace when the technology and equipment is and has been available for decades to address the safety issues in the section of the NEC. To further fuel the issue it is unfortunate that engineers and jurisdictions have attempted to use this section to justify installations based on the panel introducing this section which creates a more significant safety hazard that was attempting to be solved.

Permission in the NEC to utilize products beyond their ratings places our company, which manufactures these products, in an interesting position. How is our customer service department to respond? How are we to defend the proper application of our products with such product application in the NEC? The manufacturer is in the best position to understand and provide appropriate guidance for the application of product and yet the panel as well as the engineering community believes they have enough information to establish these ratings and understand this issue better than the manufacturer. This will result in the misapplication of product above its rating and the engineering community making a decision to apply products in accordance with the NEC against the recommendations for manufacturer.

I urge the committee to accept this proposal and delete permission for the selection of series ratings under engineering supervision.

Panel Meeting Action: Reject

Panel Statement: See panel actions and statements on Proposals 10-50 and Proposal 10-50a (Log #CP1001).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

KIMBLIN, C.: NEMA votes against the panel action. See the explanation of the negative vote on Proposal 10-50.

KOVACIK, J.: See my explanation of negative vote on Proposal 10-50.

10-55 Log #2977 NEC-P10 **Final Action: Reject**
(240.87)

Submitter: Paul A. Keleher, Paul Keleher Electrical Services

Recommendation: Add text to read as follows:

<u>240.87 Defined Instantaneous Trip (DIT) Circuit Breakers.</u>

<u>(A) Definitions. The nominal instantaneous trip current is 11 times the rated current of the circuit breaker. A standard circuit breaker manufactured with a fixed instantaneous pick-up setting shall open the circuit within 1/2 cycle of being subjected to the nominal instantaneous trip current or greater, with an acceptable variation in the listing test range of 130-210 amperes.</u>

<u>(B) Circuit Breakers Installed in Dwelling Units. Standard circuit breakers installed in a dwelling unit to protect branch circuits rated 20 amperes or less at 120 volts to ground shall be of the DIT type.</u>

<u>(C) Marking. Any standard circuit breaker installed in accordance with 240.87(B) shall be marked by the manufacturer such that the letters "DIT" will be clearly visible after installation.</u>

Substantiation: Overcurrent in a branch circuit can occur as a result of a current load placed on a circuit that exceeds the rating of the circuit, or from damage to one or more components or the insulation in the circuit that results in current flowing where it should not flow, a fault condition. The overcurrent protection means required by 240.21 in branch circuits should be required to provide specific protection from the hazardous effects of overcurrent from both overload conditions and from fault conditions. UL standard No. 489 requires that standard circuit breakers be tested to respond to decreasing time pick-up tests of 135 percent, 200 percent and 600 percent of the rated current of the circuit breaker as protection against excess loading of a circuit 1 ; however, no protective response to fault-level overcurrent is specified in the requirements for standard circuit breakers. The submitter suggests that the optimal fault-level overcurrent protection in a standard circuit breaker requires limiting the energy delivered from a fault that is capable of causing ignition to the greatest extent possible in order to mitigate the risk of fire. This can be easily achieved by incorporating an instantaneous trip setting that is as low as possible without incurring an undue risk of nuisance tripping from normal inrush and starting load currents. A UL investigation 2 and the long experience of circuit breaker manufacturers have demonstrated a sufficient understanding of the threshold required to eliminate nusiance tripping in residential environments to now safely require all standard circuit breakers rated 20 amperes or less installed in dwelling units to provided a defined instantaneous pick-up as protection against fault conditions in addition to their present requirements for long-time pick-up and other existing requirements.

The fact that the major manufacturers of standard circuit breakers commonly installed in dwelling units voluntarily provide an instantaneous response in their residential product lines, despite the fact that they are not required to do so, is implicit testimony that circuit breaker manufacturers must believe that an instantaneous response is necessary. The instantaneous pick-up setting of this voluntary response is set at the discretion of each manufacturer. Prior to the mid 1990's these settings ranged from 10-25 times the rated current of the circuit breaker resulting in a fault current as high as 450 amperes necessary to clear the overcurrent immediately. Underwriters Laboratories found in a fact-finding study conducted in 1993 that the average available short circuit current in 943 15-amp residential branch circuits studied is 300 amperes. 2 Following publication of this study, several several manufacturers of residential thermal/magnetic circuit breakers voluntarily reduced the instantaneous pick-up settings of their residential lines of 15 and 20-amp circuit breakers to self-defined settings that the UL study suggested would reduce the incidence of fire from the hazards of overcurrent. In addition, at least two manufacturers have consistently maintained and successfully implemented similar instantaneous pick-up settings for many years, reflecting their connviction of the positive value in keeping the instantaneous pick-up setting as low as possible in residential environments. The experience of these circuit breaker manufacturers with millions of circuit breakers in the field over a long period of time has demonstrated that an instantaneous pick-up setting in the range suggested by this study will not incur significant incidence of nuisance tripping in typical residential environments. In addition, the UL study referenced in footnote 2 conducted testing for nuisance tripping and concluded in summary that nuisance tripping does not occur in any circuit breaker with a nominal instantaneous trip setting higher than 105 amperes. A nominal instantaneous trip setting of 11 times the rated current of the breaker should provide ample margin for tolerance from nuisance tripping. Furthermore, this proposal should not require a significant deviation from current practice for breaker manufacturers, but rather will simply make an instantaneous trip setting that is close to current practice standardized and part of permanent practice. Without modification, the present standard will not prevent any manufacturer from reverting to a higher instantaneous pick-up setting or even eliminating it altogether if they should so choose. This proposal will merely bring the standards for requirements into line with existing practice. This proposal is directed toward standard circuit breakers since they make up the vast majority of overcurrent protection installed in residential circuits. This proposal is not intended to have any impact on the requirements for AFCI, GFCI or HACR circuit breakers, which are listed separately from standard circuit breakers.

The requirement for DIT rated circuit breakers is limited to dwelling units where inrush currents have been studied and similar instantaneous settings have been in regular use for many years. Non-resideníal commercial/industrial environments and heavier, 240-volts branch circuits ranging from 30A-60A have, therefore, been excluded from the requirements of this proposed article since those circuits are likely to contain appliance loads with a wider variety of inrush and starting currents than are found in typical residential environments.

The purpose of the proposed 240.87(C) is to facilitate the obligation of the Authority Having Jurisdiction to assure installation of a branch circuit breaker listed per 240.87 by requiring the manufacturer of DIT circuit breakers to clearly identify this performance characteristics on the exterior surface of the breaker where it will be visible after installation.

For a detailed explanation of the specific changes to UL489 that would be acceptable under this proposal, the submitter refers the code panel to a proposed revision to UL489 entitled SUPPLEMENT FOR MOLDED CASE CIRCUIT BREAKERS HAVING SPECIFIED INSTANTANEOUS TRIP LEVELS, pages A-1 through A-3, which is part of the Underwriters Laboratories, October 25, 1993 Fact-Finding Report on An evaluation of Branch Circuit Breaker Instantaneous Trip Levels, file E87837 cited elsewhere in this proposal and provided hereto by reference. The submitter offers that the above-cited Supplement to Standard UL489 is acceptable in its entirety with the following exception: The paragraph entitled, “PERFORMANCE/ Instantaneous Trip Test” be changed to read as follows: “A 15 or 20 ampere rated circuit breaker having a defined instantaneous trip shall trip in 1/2-cycle (or less) when tested in accordance with the following test procedure: A fault current in the range of 130-210 amperes shall be applied for a 1/2-cycle.”

1 Underwriters Laboratories standard: UL 489/10-31-1996; pp 33.35.36: Tests for Standard Circuit Breakers

2 Underwriters Laboratories, October 25, 1993 Fact-Finding Report on An evaluation of Branch Circuit Breaker Instantaneous Trip Levels, file E87837, Summary, pages 14-17

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel understands that the submitter’s intent is to limit the energy delivered from a fault condition “that is capable of causing ignition to the greatest extent possible in order to mitigate the risk of fire.” The “DIT” concept was presented to the NEC during the development of the 1996 NEC, and it was determined that such protection and technology would not provide the level of protection necessary. This is recognized by the submitter’s substantiation that protection would be “the greatest extent possible.” At that time, the panel also took into consideration UL Fact Finding Report E878837. The arc-fault circuit interruption technology was accepted as an answer to address the protection sought from the 1993 proposal and is a technology that will more comprehensively address the concern of the submitter.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-56 Log #2696 NEC-P10 **Final Action: Accept**

(240.91 (New))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to introducing a single subsection. This action will be considered by the Panel as a Public Comment.

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Add new 240.91, as follows:

240.91 Protection of Conductors. Conductors shall be protected in accordance with 240.4, unless otherwise permitted in 240.91(A).

(A) Devices Rated over 800 Amperes. Where the overcurrent device is rated over 800 amperes, the ampacity of the conductors it protects shall be equal to or greater than 95% of the rating of the overcurrent device defined in 240.6, where the conductor is protected within recognized time vs. current limits for all short circuit currents of up to 1000 seconds duration.

Substantiation: Problem: Existing NEC rules that effectively require large conductor overload protection at 100% of the ampacity by the overcurrent device are unnecessary and result in inefficient use of conductor materials in Supervised Industrial Installations.

Substantiation: The proposal introduces the equivalent of a “next standard size” exception for large conductors in Supervised Industrial Installations. In these installations, conductors are protected against overload by load calculation and by monitoring, and against short circuit by selection of the overcurrent device as part of an overcurrent coordination study. These factors make overload protection by the overcurrent protection device less critical for these installations. The proposed rule would allow standard conductor sizes to be more readily used with standard overcurrent device sizes in these installations.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

KIMBLIN, C.: This change is the relaxation of a safety rule that has been in place for over 40 years and NEMA does not accept the substantiation statement that the factors associated with Supervised Industrial Installations make overload protection by the overcurrent device selection less critical. No testing has been performed to show that a 95% ampacity rule permits the safe application of lower ampacity conductors for all currents above 800A. Here it is noted that a 5% reduction in conductor ampacity will be associated with a 10% increased heating load. Further, products such as circuit breakers and switches are evaluated with conductors of the correct ampacity. One reason is to determine acceptable temperature rises at device terminals. However, the substantiation does not address the product impact of these additional heating effects due to smaller conductors. It is noted that a similar Proposal, 10-9, dealt with a relaxation of ampacity protection requirements to 1600A. This proposal was rejected, and the panel statement reflects the panel’s reservations. The safety concerns expressed in that 10-9 panel statement are not resolved by permitting relaxed ampacity protection requirements in supervised industrial installations.

KOVACIK, J.: The issue here is virtually identical to that raised in Proposal 10-9, which the Panel rejected. Specifically, quoting from the Panel Statement on Proposal 10-9, “It is noted that the amount of heat generated in a conductor increases as the square of the current through that conductor, and the characteristics of overcurrent devices are such that overloads are tolerated for significant periods of time before the device operates. At the very least, a study should be conducted to demonstrate that the conductors and equipment would not sustain damage from carrying the current permitted by this proposal. For example, the proposer could approach UL through their open Standards Technical Panel process to address the listing requirements.”

SOBEL, R.: Submitter offers no technical substantiation. See panel statement for the rejection of Proposal 10-9.

10-57 Log #1564 NEC-P10 **Final Action: Accept**

(240.100(A)(1))

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 240.100(A)(1):

Change “neutral” to “neutral conductor.”

The revised text would appear as follows:

An overcurrent relay element, operated from a current transformer that links all phases of a 3-phase, 3-wire circuit, shall be permitted to replace the residual relay element and one of the phase-conductor current transformers. Where the neutral conductor is not regrounded on the load side of the circuit as permitted in 250.184(B), the current transformer shall be permitted to link all 3-phase conductors and the grounded circuit conductor (neutral).

Substantiation: This proposal was developed by the TCC Task Group on the definition of “Neutral Conductor.” Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word ”neutral” as a noun should be avoided. The terms “neutral conductor” or “neutral point” should be used wherever grammatically possible.

● The phrase “grounded circuit conductor (neutral)” should be avoided. The phrases “grounded circuit conductor” or “grounded circuit conductor or neutral conductor” should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-58 Log #1108 NEC-P10 **Final Action: Reject**

(240.100(A)(2))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

A fuse shall be connected in series with each ungrounded conductor and also the grounded conductor where fuses are used for overload protection .

Substantiation: This is required in 430.36. Fuses are permitted for overload protection in 430.225(B)(1) for over 600 volt motors.

Panel Meeting Action: Reject

Panel Statement: Fuses are not used for motor overload protection at high voltage. The reference to 430.36 in the submitter’s substantiation applies to corner grounded delta systems that are not utilized for high voltage motor applications.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

ARTICLE 250 — GROUNDING

5-48 Log #1540 NEC-P05 **Final Action: Accept**
(250)

TCC Action: The Technical Correlating Committee notes that in the proposal the text for 250.96(A) is incorrect in that it does not reflect the existing code text. The Technical Correlating Committee understands that the word "effectively" is to be deleted in 250.96(A). The Technical Correlating Committee directs that the panel reconsider the proposal and verify the action in 250.96(A). This action will be considered by the panel as a public comment.

The Technical Correlating Committee further directs that this proposal be referred to the the Technical Correlating Committee Task Group on Grounding and Bonding for comment.

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 250 and revise text as shown for the affected NEC sections.

250.52(A)(1): (1) Metal Underground Water Pipe. A metal underground water pipe in direct contact with the earth for 3.0 m (10 ft) or more (including any metal well casing ~~effectively~~ bonded to the pipe) and electrically continuous (or made electrically continuous by bonding around insulating joints or insulating pipe) to the points of connection of the grounding electrode conductor and the bonding conductors. Interior metal water piping located more than 1.52 m (5 ft) from the point of entrance to the building shall not be used as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system.

250.52(A)(7): (7) Other Local Metal Underground Systems or Structures. Other local metal underground systems or structures such as piping systems, underground tanks, and underground meCtal well casings that are not ~~effectively~~ bonded to a metal water pipe.

250.53(B): (B) Electrode Spacing. Where more than one of the electrodes of the type specified in 250.52(A)(5) or (A)(6) are used, each electrode of one grounding system (including that used for air terminals) shall not be less than 1.83 m (6 ft) from any other electrode of another grounding system. Two or more grounding electrodes that are ~~effectively~~ bonded together shall be considered a single grounding electrode system.

250.58 Two or more grounding electrodes that are ~~effectively~~ bonded together shall be considered as a single grounding electrode system in this sense.

250.92(A): (A) Bonding of Services. The non–current-carrying metal parts of equipment indicated in 250.92(A)(1), (A)(2), and (A)(3) shall be ~~effectively~~ bonded together.

250.96(A): (1) Supply Cord or Permanent Feeder. The green-colored insulated equipment grounding conductor ~~wire~~ in the supply cord or permanent feeder wiring shall be connected to the equipment grounding terminal bar ~~bus~~ in the distribution panelboard or disconnecting means.(2) Electrical System. In the electrical system, all exposed metal parts, enclosures, frames, lamp fixture canopies, and so forth shall be connected ~~effectively bonded~~ to the equipment grounding terminal bar or enclosure of the distribution panelboard.

250.136: 250.136 Equipment Considered ~~Effectively~~ Grounded. Under the conditions specified in 250.136(A) and (B), the normally non–current-carrying metal parts of the equipment shall be considered ~~effectively~~ grounded.

Substantiation: 250.52(A)(1): The term "effectively bonded" is undefined and is undefined in the NEC, vague, and not enforceable. The revision deletes the word "effective" without impact to the meaning or requirement in the rule.

250.52(A)(7): The term "effectively bonded" is undefined and is undefined in the NEC, vague, and not enforceable. The revision deletes the word "effective" without impact to the meaning or requirement in the rule.

250.53(B): The term "effectively bonded" is undefined and is undefined in the NEC, vague, and not enforceable. The revision deletes the word "effective" without impact to the meaning or requirement in the rule.

250.58: The term "effectively bonded" is undefined and is undefined in the NEC, vague, and not enforceable. The revision deletes the word "effective" without impact to the meaning or requirement in the rule.

250.92(A): The term "effectively bonded" is undefined and is undefined in the NEC, vague, and not enforceable. The revision deletes the word "effective" without impact to the meaning or requirement in the rule.

250.96(A): This section has been revised to be more prescriptive regarding the use of the term "equipment grounding conductor and connections to it.

The term "effectively bonded" is undefined and is undefined in the NEC, vague, and not enforceable. The revision deletes the word "effective" without impact to the meaning or requirement in the rule.

250.136: The definition is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-49 Log #1669 NEC-P05 **Final Action: Reject**
(250)

Submitter: Ben Jacks, Seattle, WA

Recommendation: Revise Article 250 Parts I thru IV 70-92 through 70-105 with new title:

Article 250 Electrical Ground Provisions

Substantiation: Eliminates context confusion between use of grounding and bonding and establishes clarity of an electrical "bond" as a connective joint application and "ground" as electrical conductive path relative to shared ground plane interfacing categories.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The existing article title and section titles are accurate in describing the content of the material. The suggested changes do not offer an improvement in clarity. The submitter makes numerous other proposed changes for which no substantiation was provided.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-50 Log #1775 NEC-P05 **Final Action: Reject**
(250)

Submitter: Ben Jacks, Seattle, WA

Recommendation: Revise Articles 250 Parts VI, VII, VIII, IX, and X to reflect changes of title and part numbering resequenced by relocating Part V as Article 251.

Substantiation: Changes are needed for sequential re-identification of the latter sections of Article 250.110 through 250.190.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided evidence that developing a new Article 251 from the current Part V of Article 250 is warranted. The proposed revision is not necessary and does not add clarity to Article 250.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-51 Log #444 NEC-P05 **Final Action: Reject**
(250.2)

Submitter: W. Creighton Schwan, Hayward, CA

Recommendation: In line 2, replace "permanent" with "reliable" so as to read:

An intentionally constructed, ~~permanent,~~ reliable, low-impedance electrically conductive path... (balance unchanged).

Substantiation: The Webster definition of "permanent" is, in part: "lasting, durable, intended to last or function indefinitely, not subject to removal."

The only connections in Article 250 that meet this definition are the irreversible compression-type connector and the exothermic welding process called for (plus bus bar connections) in 250.64(C). All of the others can be removed using appropriate tools.

Other methods of ground-fault current paths are recognized in 250.8 and 250.70 in particular, and in Parts V and VI of Article 250 in general.

Aside from the need for the NEC to be clear and specific in its requirements, there is the practical problem that the use of the word "permanent" where it is not intended may lead an unqualified inspector to make unreasonable requirements based on the literal wording.

Panel Meeting Action: Reject

Panel Statement: Section 3.2.4 of the NEC Style Manual recognizes the use of standard terms that have been established through accepted use or by definition. The proposed word "reliable" does not add clarity or improve usability in this section. The word "permanent" is generally understood as it relates specifically to the characteristics and integrity of the electrical installation and can more readily be applied by inspectors in practical application. The word "reliable" is subjective and less enforceable than the generally understood word "permanent" as used in this section.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-52 Log #1704 NEC-P05 **Final Action: Reject**
(250.2)

Submitter: Charles M. Trout, Maron Electric Company

Recommendation: Add new definition as follows:

Supplementary Grounding Electrode. A grounding electrode permitted to be installed, but not required to be installed.

Substantiation: There is considerable confusion in the field relating to the meaning of supplementary in Article 250. Webster's dictionary defines supplementary as forming a supplement. It defines supplement as something added to complete a thing or forming an addition to. Article 250 uses the term supplemental in 250.53(D)(2) requiring that a metal underground water pipe be supplemented by an additional electrode. Webster's dictionary defines additional as being supplementary.

Panel Meeting Action: Reject

Panel Statement: Defining supplementary grounding electrode is not necessary as the provisions for the installation are clearly stated in Section 250.54. The panel concludes that adding this definition will not add clarity.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-53 Log #1857 NEC-P05 **Final Action: Reject**
(250.2)

Submitter: Margarito Aragon, Jr., Santa Fe, NM

Recommendation: Add new text to 250.2 to read as follows:

<u>Objectionable Current. Current that flows through paths other than the intended grounded circuit conductors during normal operation of a system.</u>

Substantiation: Objectionable current is not defined in the NEC. ANSI/IEEE std 446-1987 has interpreted objectionable current, and states the following:

That neutral currents that flow through paths other than the intended grounded (neutral) circuit conductors during normal operation of a system will be deemed objectionable if they contribute to any of the following:

(1) Interference with the proper operation of equipment, devices, or systems that are sensitive to electromagnetic interference, such as electronic equipment, communications systems, computer systems, etc.

(2) Interference with the proper sensing and operation of ground-fault protection equipment.

(3) Arcing of sufficient energy to ignite flammable materials.

(4) Detonation of explosives during production, storage, or testing.

(5) Overheating due to heat generated in raceways, etc., as a result of stray current.

Panel Meeting Action: Reject

Panel Statement: The proposed definition does not match and is not supported by the submitter's substantiation. The definition is not appropriate, since it is not always feasible to avoid some current flow due to inductive and capacitive coupling within equipment and wiring systems.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-54 Log #3505 NEC-P05 **Final Action: Reject**
(250.2)

Submitter: Paul Dobrowsky, Holley, NY

Recommendation: Revise 250.2 as follows:

Effective ~~Ground~~ -Fault Current Path. An intentionally constructed, permanent, low-impedance electrically conductive path designed and intended to carry current under ~~ground-~~ fault conditions from the point of a ~~ground~~ fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground fault detectors on high-impedance grounded systems.

Substantiation: The word "ground" should be deleted from this definition. The ground (earth) is not an effective fault current path and should not be use in the definition.

Panel Meeting Action: Reject

Panel Statement: The term "fault" applies to both short circuits and to ground faults. Both types of faults are the result of a breakdown of the insulation medium to a point that current flows. In the case of short circuits this breakdown is between ungrounded conductors and other phase ungrounded conductors or the system grounded conductor. A ground fault is a breakdown of insulation between an ungrounded conductor and the normally non-current-carrying metal enclosures, raceways, the equipment grounding conductor, the grounding electrode conductor, all of which are ultimately connected to ground (earth) and the earth. The revised term would not lead to greater clarity and would add confusion by not identifying the type of fault being addressed. The term "ground-fault" is very widely used in the electrical industry and is also defined in the IEEE Dictionary of Terms from which the NEC definition was derived.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-55 Log #3506 NEC-P05 **Final Action: Reject**
(250.2)

Submitter: Paul Dobrowsky, Holley, NY

Recommendation: Revise text to read:

~~Ground-~~ Fault Current Path. An electrically conductive path from the point of a ~~ground~~ fault on a wiring system through normally non–current-carrying conductors, equipment, or the earth to the electrical supply source.

FPN: Examples of ~~ground-~~ fault current paths could consist of any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal water and gas piping, steel framing members, stucco mesh, metal ducting, reinforcing steel, shields of communications cables, and the earth itself.

Substantiation: The word "ground" should be deleted from this definition. The ground (earth) is not an effective fault current path and should not be use in the definition.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 5-54.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-56 Log #3599 NEC-P05 **Final Action: Accept in Principle**
(250.2)

Submitter: Douglas Hansen, Code Check

Recommendation: Add the words "or grounded circuit" as follows:

250.2 Ground Fault. An unintentional, electrically conducting connection between an ungrounded or grounded circuit conductor of an electrical circuit and the normally non–current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

Substantiation: A fault between a grounded conductor and an equipment grounding conductor downstream of a point where those conductors are intended for bonding is a ground fault, and allows objectionable current on equipment grounding conductors. In a circuit with GFCI protection, such a ground fault will activate the ground fault mechanism.

The addition of these words does not create any inconsistency with other uses of the term "ground fault" in the NEC. The multi-grounded neutral systems in 250.184(C) are intentional connections, not the unintentional connections described in this section.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-57.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-57 Log #190 NEC-P05 **Final Action: Accept**
(250.2. Ground Fault.)

NOTE: The following proposal consists of Comment 5-35 on Proposal 5-49 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 5-49 was:

Revise the definition of "Ground Fault" as follows:

Ground Fault. An unintentional, electrically conducting connection between an ungrounded <u>or grounded</u> conductor of an electrical circuit and the normally non–current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

The Technical Correlating Committee directs that Proposal 5-49 and Comment 5-35 be reported as "Hold".

The Technical Correlating Committee has recognized that the use of the term "ground fault" in other Articles such as 230 and 430 is inconsistent with the definition of "ground fault" proposed by Panel 5.

The Technical Correlating Committee will establish a Task Group to study this issue.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Accept the proposal in principle, but consider the following suggested wording:

Ground Fault. An unintentional, electrically conducting connection between ~~an ungrounded or grounded~~ a normally current carrying conductor of an electrical circuit , and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

Substantiation: The previously proposed words "an ungrounded or grounded conductor" are technically all inclusive. Everything is either ungrounded or grounded. It would be clearer and more specific to state between "normally current carrying" and "normally non-current carrying" conductors.

Panel Meeting Action: Accept

Panel Statement: This definition is located within Article 250.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-58 Log #1733 NEC-P05 **Final Action: Accept in Principle**
(250.2, FPN (New))

Submitter: Ronald J. Toomer, Toomer Electrical Company, Inc.

Recommendation: Add following:

FPN: Intentional or unintentional grounding connections to the grounded conductor on the load side of the service disconnecting means or the load side of a separately derived system, creates one type of ground fault condition addressed in the definition of ground fault.

Substantiation: The FPN informs users of one type of ground fault condition addressed in the definition of ground fault.

Panel Meeting Action: Accept in Principle

Remove the phrase "intentional or" so as to read as follows: FPN: Unintentional grounding connections to the grounded conductor on the load side of the service disconnecting means or the load side of a separately derived system, creates one type of ground fault condition addressed in the definition of ground fault.

This FPN should be placed after the definition of Ground Fault.

Panel Statement: The words "intentional or" were removed because Article 250 permits the grounded conductor to be regrounded in some cases, such as 250.32(B(2).

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-59 Log #551 NEC-P05 **Final Action: Accept**
(Table 250.3)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Add the following to Table 250.3:

Natural and Artificially Made Bodies of Water Article 682 Sections 682.30, 682.31, 682.32, 682.33

Substantiation: Article 682 was new for the 2005 NEC and includes Part III which is titled "Grounding and Bonding." Part III includes 682.30 and 680.31 which cover grounding, and 682.32 and 682.33 cover bonding. It seems appropriate to add the reference to Article 682 Part III to Table 250.3 for correlation.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-60 Log #488 NEC-P05 **Final Action: Accept**
(250.3 and Table 250.3)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read:

250.3 Application of Other Articles. In other articles applying to particular cases of installation of conductors and equipment, grounding and bonding requirements are identified in Table 250.3 that are in addition to, or modifications of, those of this article.

Table 250.3 Additional Grounding and Bonding Requirements

Substantiation: The title of Article 250 was revised from "Grounding" to "Grounding and Bonding" in the 2005 NEC to be reflective of what is covered by the article. The articles and sections in other articles that are referred to from Table 250.3 often include not only grounding rules but also include bonding rules. It is appropriate to revise the title of the table to "Additional Grounding and Bonding Requirements."

Examples: Communications Circuits Article 800. Section 800.100(D) Bonding of Electrodes. 800.106 Primary Protector Grounding and Bonding at Mobile Homes, Article 610 Cranes and Hoists.

There are several more articles and sections referred to by Table 250.3 that include bonding requirements in addition to grounding requirements.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-61 Log #1519 NEC-P05 **Final Action: Accept in Principle**
(250)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Revise Article 250 as described in the following:

Figure 250.4 Title: Revise Figure 250.4 (Title) to read as follows: **Figure 250.4 Grounding and Bonding**

250.6 Title: Revise title to read as follows:

250.6 Objectionable Current over Equipment Grounding Conductors

250.24(A)(1): Revise Section 250.24(A)(1) as follows:

(1) General. The grounding electrode conductor connection shall be made at any accessible point from the load end of the service drop or service lateral to and including the terminal or bus to which the grounded service conductor is connected at the service disconnecting means.

250.24(A)(2) Exception: Revise Section 250.24(A)(2) Exception as follows:

Exception: The additional grounding electrode conductor connection shall not be made on high-impedance grounded neutral systems. The system shall meet the requirements of 250.36.

250.24(A)(3): Revise Section 250.24(A)(3) as follows:

(3) Dual Fed Services. For services that are dual fed (double ended) in a common enclosure or grouped together in separate enclosures and employing a secondary tie, a single grounding electrode conductor connection to the tie point of the grounded conductor(s) from each power source shall be permitted.

250.24(A)(5): Revise Section 250.24(A)(5) as follows:

(5) Load-Side Grounding Connections. A grounded conductor shall not be connected to ground, normally non-current-carrying metal parts of equipment, or equipment grounding conductor(s) ~~A grounding connection shall not be made to any grounded conductor~~ on the load side of the service disconnecting means. except as otherwise permitted in this article.

250.30(A)(3) Exception No. 2: Revise Section 250.30(A)(3) Exception No. 2 as follows:

Exception No. 2: Where a separately derived system originates in listed equipment suitable as service equipment, the grounding electrode conductor from the service or feeder equipment to the grounding electrode shall be permitted as the grounding electrode conductor for the separately derived system, provided the grounding electrode conductor is of sufficient size for the separately derived system. Where the equipment ground ing terminal bus internal to the equipment is not smaller than the required grounding electrode conductor for the separately derived system, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.

250 Part IV Title: Revise the title of Part IV of Article 250 as follows:

IV. Enclosure, Raceway, and Service Cable Connections ~~Grounding~~

Substantiation: Figure 250.4 Title: The words "and Bonding" were added to the Figure title to be consistent with the title of Article 250 since this figure describes the contents of the entire article.

250.6 Title: The word "Equipment" was added to this title to more specifically describe the conductor and grounding path being referred to in this section.

250.24(A)(1): These changes clarify the present requirement in more prescriptive language. This revision adds the words "electrode conductor" to provide more specific wording that relates to a defined term "grounding electrode conductor" rather than a more general term "grounding."

250.24(A)(2) Exception: These changes clarify the present requirement in more prescriptive language. This revision adds the words "electrode conductor" in the exception to provide more specific wording that relates to a defined term "grounding electrode conductor" rather than a more general term "grounding."

250.24(A)(3): These changes clarify the present requirement in more prescriptive language. This revision adds the word "conductor" to provide more specific wording that relates to a defined term "grounding electrode conductor" rather than a more general term "electrode" connection.

250.24(A)(5): These changes clarify the present requirement in more prescriptive language. This proposed revision adds more specific restrictions of the grounded conductor connections to any ground connection on the load side of the service disconnect. No other technical changes to the section are proposed, just clarification.

250.30(A)(3) Exception No. 2: The revision in this section changes the term "equipment ground bus" to "equipment grounding terminal bus" to provide consistency with the same term used in various other code sections.

250 Part IV Title: This change clarifies the present requirement in more prescriptive language in the title of this part in Article 250.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Revise Article 250 as described in the following:

Item 1. Figure 250.4 Title: Revise Figure 250.4 (Title) to read as follows:

Figure 250.4 Grounding and Bonding

Item 2. Section 250.6 Title: Revise title to read as follows:

250.6 Objectionable Current ~~over~~ Equipment ~~Grounding Conductors~~

Item 3. Section 250.24(A)(1): Revise Section 250.24(A)(1) as follows:

(1) General. The grounding electrode conductor connection shall be made at any accessible point from the load end of the service drop or service lateral to and including the terminal or bus to which the grounded service conductor is connected at the service disconnecting means.

Item 4. Section 250.24(A)(2) Exception: Revise Section 250.24(A)(2) Exception as follows:

Exception: The additional grounding electrode conductor connection shall not be made on high-impedance grounded neutral systems. The system shall meet the requirements of 250.36.

Item 5. Section 250.24(A)(3): Revise Section 250.24(A)(3) as follows:

(3) Dual Fed Services. For services that are dual fed (double ended) in a common enclosure or grouped together in separate enclosures and employing a secondary tie, a single grounding electrode conductor connection to the tie point of the grounded conductor(s) from each power source shall be permitted.

Item 6. Section 250.24(A)(5): Revise Section 250.24(A)(5) as follows:

(5) Load-Side Grounding Connections. A grounded conductor shall not be connected to normally non-current-carrying metal parts of equipment, to equipment grounding conductor(s),or be reconnected to ground ~~A grounding connection shall not be made to any grounded conductor~~ on the load side of the service disconnecting means. except as otherwise permitted in this article.

Item 7. Section 250.30(A)(3) Exception No. 2: Revise Section 250.30(A)(3) Exception No. 2 as follows:

Exception No. 2: Where a separately derived system originates in listed equipment suitable as service equipment, the grounding electrode conductor from the service or feeder equipment to the grounding electrode shall be permitted as the grounding electrode conductor for the separately derived system, provided the grounding electrode conductor is of sufficient size for the separately derived system. Where the equipment ground ing bus internal to the equipment is not smaller than the required grounding electrode conductor for the separately derived system, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.

Item 8. Article 250, Part IV, Title: Revise the title of Part IV of Article 250 as follows:

IV. Enclosure, Raceway, and Service Cable Connections ~~Grounding~~

Panel Statement: The following itemized list is the substantiation for each itemized panel action that was changed from the proposal recommendation.

Item 2. Section 250.6 Title - Removed the words "over equipment grounding conductors" from the title to reflect what is covered in 250.6.

Item 6. Reorganized for clarity.

Item 7. Deleted "terminal" to be consistent with the product standards.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-62 Log #2104 NEC-P05 **Final Action: Accept in Principle**
(Figure 250.4)

Submitter: Rocco Prock, Efficient Electric

Recommendation: Revise the caption for Figure 250.4 as follows:

Figure 250.4 Grounding and Bonding .

Substantiation: The caption for Figure 250.4 Grounding should reflect what is included in the figure. Both grounding and bonding are represented in the figure.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-61.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-63 Log #1237 NEC-P05 **Final Action: Accept in Principle in Part**
(250.4(A)(2), (3) and (4))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text:

(2) Exposed noncurrent-carrying conductive material enclosing electrical conductors or equipment, or forming part of such equipment, where grounded, shall be connected to earth so as to limit the voltage to ground on these materials.

(3) Exposed noncurrent-carrying conductive materials enclosing electrical conductors or equipment or forming a part of such equipment, where grounded , shall be connected together and to the electrical supply source in a manner that establishes an effective ground-fault current path.

(4) Non-current-carrying electrically conductive materials...(remainder unchanged)..

Substantiation: Edit. Present wording does not allow for non-grounding of internal nonaccessible parts, double insulated equipment, or other Code provisions which exempt or prohibit grounding. The bonding requirements of (3) are not necessary where equipment is not grounded. Present wording of (4) includes conductors, which are conductive materials.

Panel Meeting Action: Accept in Principle in Part

Revise 250.4(A)(1) thru (A)(4) to read as follows:

(A) Grounded Systems

(1) Electrical System Grounding. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operation.

(2) Grounding of Electrical Equipment. Normally non–current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials.

(3) Bonding of Electrical Equipment. Normally non–current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the electrical supply source in a manner that establishes an effective ground-fault current path.

(4) Bonding of Electrically Conductive Materials and Other Equipment. Normally non-current carrying e lectrically conductive materials that are likely to become energized shall be connected together and to the electrical supply source in a manner that establishes an effective ground-fault current path.

Panel Statement: It is inappropriate to add the word "exposed" because the term, as defined in Article 100, would limit the performance concepts included in 250.4 in an unacceptable manner.

Adding "where grounded" is inappropriate, as doing so would limit the performance concepts in this section in an unacceptable manner.

Technical improvements are made to the language proposed for 250.4, (A)(2), (A)(3), and (A)(4) by adding the word "normally".

The panel does not accept the proposed changes to (2) and (3). The requirements of these sections apply to conditions where non-current-carrying parts are exposed or not. The Panel accepts the addition of non-current-carrying in (4), as it is accurate and adds clarity.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-64 Log #85 NEC-P05 **Final Action: Reject**
(250.4(A)(5))

Submitter: Joe Riley, City of Arlington

Recommendation: Revise as follows:

Electrical equipment and wiring and other electrically conductive material likely to become energized shall be ~~installed~~ effectively grounded in a manner that creates a permanent, low impedance circuit that will facilitate the operation of the overcurrent device or ground detector for high-impedance grounded systems.

Substantiation: The text "installed in a manner" does not imply its effectiveness whereas "effectively grounded in a manner" implies just that.

Panel Meeting Action: Reject

Panel Statement: The proposed wording is unnecessary. Providing a connection to ground (earth) has very little effect on facilitating the operation of overcurrent devices. The term "effectively" as related to a connection to ground is being deleted because the details of how to determine its meaning are not included in the NEC.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-65 Log #445 NEC-P05 **Final Action: Reject**
(250.4(A)(5))

Submitter: W. Creighton Schwan, Hayward, CA

Recommendation: In line 4, replace "permanent" with "reliable" so as to read:

(5) Effective Ground-Fault Current Path. Electrical equipment and wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a ~~permanent~~ reliable low-impedance circuit facilitating the operation of the overcurrent device... (balance unchanged).

Substantiation: The Webster definition of "permanent" is, in part: "lasting, durable, intended to last or function indefinitely, not subject to removal."

The only connections in Article 250 that meet this definition are the irreversible compression-type connector and the exothermic welding process called for (plus bus bar connections) in 250.64(C). All of the others can be removed using appropriate tools.

Other methods than these two are recognized in 250.8 and 250.70 in particular and in Parts V and VI of Article 250 in general.

Aside from the need for the NEC to be clear and specific in its requirements, there is the practical problem that the use of the word "permanent" where it is not intended may lead an unqualified inspector to make unreasonable requirements based on the literal wording.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 5-51.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-66 Log #3527 NEC-P05 **Final Action: Reject**
(250.4(A)(5))

Submitter: Steven R. Musial, II, CJL Engineering
Recommendation: Revise second sentence as follows:
"It shall be capable of carrying the maximum ground fault current likely to be imposed on it from any point on the wiring system where a ground fault may occur to the electrical supply source according to IEEE Std. 80-1989 which identifies the maximum withstand fault current a grounding conductor can carry."
Substantiation: Example: 250.66(A) states that the maximum size grounding electrode conductor required to be connected to a made electrode is a 6 AWG copper or 4 AWG aluminum. Unfortunately, a 6 AWG copper can only handle about 12,000 amps of short circuit current before melting through. If a service entrance switchboard is rated at 65 KAIC RMS symmetrical, a grounding electrode conductor capable of carrying 65 KAIC must be selected.
Panel Meeting Action: Reject
Panel Statement: The effective ground fault path, referenced in 250.4(A)(5), does not include the grounding electrode conductor. This path is the equipment grounding conductor back to the source, which is sized by Table 250.122. Table 250.122 takes into account the size of the fault current. The submitter's concern about the size of the grounding electrode conductor based on the available fault current is incorrect.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-67 Log #446 NEC-P05 **Final Action: Reject**
(250.4(B)(2))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: In line 5, replace "permanent" with "reliable" so as to read:
(2) Bonding of Electrical Equipment. Non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded equipment in a manner that creates a ~~permanent~~ reliable low-impedance path for ground-fault current... (balance unchanged).
Substantiation: The Webster definition of "permanent" is, in part: "lasting, durable, intended to last or function indefinitely, not subject to removal."
The only connections in Article 250 that meet this definition are the irreversible compression-type connector and the exothermic welding process called for (plus bus bar connections) in 250.64(C). All of the others can be removed using appropriate tools.
Other methods than these two are recognized in 250.8 and 250.70 in particular and in Parts V and VI of Article 250 in general.
Aside from the need for the NEC to be clear and specific in its requirements, there is the practical problem that the use of the word "permanent" where it is not intended may lead an unqualified inspector to make unreasonable requirements based on the literal wording.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-51.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-68 Log #447 NEC-P05 **Final Action: Reject**
(250.4(B)(3))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: In line 5, replace "permanent" with "reliable" so as to read:
(3) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials that are likely to become energized shall be connected together and to the supply system grounded equipment in a manner that creates a ~~permanent~~ reliable low-impedance path for ground-fault... (balance unchanged).
Substantiation: The Webster definition of "permanent" is, in part: "lasting, durable, intended to last or function indefinitely, not subject to removal."
The only connections in Article 250 that meet this definition are the irreversible compression-type connector and the exothermic welding process called for (plus bus bar connections) in 250.64(C). All of the others can be removed using appropriate tools.
Other methods than these two are recognized in 250.8 and 250.70 in particular and in Parts V and VI of Article 250 in general.
Aside from the need for the NEC to be clear and specific in its requirements, there is the practical problem that the use of the word "permanent" where it is not intended may lead an unqualified inspector to make unreasonable requirements based on the literal wording.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-51.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-69 Log #339 NEC-P05 **Final Action: Accept in Principle**
(250.4(B)(4))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(4) Path for Fault Current. Electrical equipment, wiring, and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low-impedence circuit from any point on the wiring system to the electrical supply source to facilitate the operation of overcurrent devices should a second fault occur on any other ungrounded conductor of the wiring system. ~~occur on the wiring system.~~ The earth shall not be considered as an effective fault-current path.
FPN No. 1: A second fault that occurs on any other ungrounded conductor supplied by the ungrounded system through the equipment enclosures and bonding is considered a ground fault.
FPN No. 2: See Figure 250.4 for information on the organization of Article 250.
Substantiation: The revision clarifies that the overcurrent device operates when a second phase to ground fault occurs on a different ungrounded phase conductor supplied by the system. The FPN was revised to be consistent with the language changed in the rule. The proposed change is intended to clarify how the performance of the overcurrent device is initiated.
Panel Meeting Action: Accept in Principle
First, revise text to read as follows:
(4) Path for Fault Current. Electrical equipment, wiring, and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low-impedence circuit from any point on the wiring system to the electrical supply source to facilitate the operation of overcurrent devices should a second ground fault from a different phase occur on the wiring system. The earth shall not be considered as an effective fault-current path.
Second, delete FPN No. 1.
Third, renumber existing FPN No. 2 to FPN.
Panel Statement: This revision is intended to combine the concepts from this proposal and proposal 5-71. Editorial and technical improvements are intended. The panel removed FPN No. 1 because the action taken in the revised text clarifies the facilitation of the operation of the overcurrent protection device.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-70 Log #448 NEC-P05 **Final Action: Reject**
(250.4(B)(4))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: In line 3, replace "permanent" with "reliable" so as to read:
(4) Path for Fault Current. Electrical equipment, wiring, and other electrically conductive material likely to become energized shall be installed in a manner that creates a ~~permanent~~ reliable low-impedance circuit from any point... (balance unchanged).
Substantiation: The Webster definition of "permanent" is, in part: "lasting, durable, intended to last or function indefinitely, not subject to removal."
The only connections in Article 250 that meet this definition are the irreversible compression-type connector and the exothermic welding process called for (plus bus bar connections) in 250.64(C). All of the others can be removed using appropriate tools.
Other methods than these two are recognized in 250.8 and 250.70 in particular and in Parts V and VI of Article 250 in general.
Aside from the need for the NEC to be clear and specific in its requirements, there is the practical problem that the use of the word "permanent" where it is not intended may lead an unqualified inspector to make unreasonable requirements based on the literal wording.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-51.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-71 Log #1900 NEC-P05 **Final Action: Accept in Principle**
(250.4(B)(4))

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: Add the phrase "from a different phase" after the phrase "second fault" in 250.4(B)(4) to read as follows:
"Electrical equipment, wiring, and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low-impedance circuit from any point on the wiring system to the electrical supply source to facilitate the operation of overcurrent devices should a second fault from a different phase occur on the wiring system. The earth shall not be considered as an effective fault-current path."

Substantiation: A second fault on the system from the same phase may not increase the fault current being sensed by the overcurrent protective device since the amount of impedance in the fault current path may be increased due to the arcing fault at the second point. A second fault in a different phase will certainly cause the operation of the overcurrent device since that fault now becomes a phase-to-phase fault.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-69.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-72 Log #487 NEC-P05 **Final Action: Accept in Principle in Part**
(250.4(B)(4) FPN and Figure 250.4)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
FPN No. 2: See Figure 250.4 for information on the organization of Article 250 <u>covering grounding and bonding requirements</u> .
Figure 250.4 <u>Organization of</u> grounding <u>and bonding requirements in Article 250</u> .
Substantiation: The title of Article 250 was revised from “Grounding” to “Grounding and Bonding” in the 2005 NEC. Figure 250.4 is still titled “grounding” and actually includes directly interrelated concepts of both grounding through the requirements of Article 250. The caption of the figure should reflect both concepts since parts of the Article include both grounding and bonding rules and one part of the article (Part V) is specific to just bonding requirements.
Panel Meeting Action: Accept in Principle in Part
Revise text to read:
FPN: See Figure 250.4 for information on the organization of Article 250 <u>covering grounding and bonding requirements</u> .
Panel Statement: Corrected the numbering of the FPN based on the action on Proposal 5-69.
The title change was rejected because the word “organization” was unnecessary. See panel action and statement on Proposal 5-61 for the title of Figure 250.4.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-73 Log #519 NEC-P05 **Final Action: Accept in Principle**
(250.4(B)(4) FPN 2 and Figure 250.4)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
FPN No. 2: See Figure 250.4 for information on the organization of Article 250 <u>covering grounding and bonding requirements</u> .
Figure 250.4 <u>Organization of</u> grounding <u>and bonding requirements in Article 250</u> .
Substantiation: The title of Article 250 was revised from “Grounding” to “Grounding and Bonding” in the 2005 NEC. Figure 250.4 is still titled “grounding” and actually includes directly interrelated concepts of both grounding through the requirements of Article 250. The caption of the figure should reflect both concepts since Parts of the Article include both grounding and bonding rules and one part of the article (Part V) is specific to just bonding requirements.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-72.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-74 Log #2603 NEC-P05 **Final Action: Accept**
(250.6)

Submitter: Joseph P. DeGregoria, Underwriters Laboratories Inc.
Recommendation: Revise text to read:
250.6 Objectionable Current Over Grounding Conductors.
(A) Arrangement to Prevent Objectionable Current. The grounding of electrical systems, circuit conductors, surge arresters, <u>surge protective devices</u> and conductive non-current-carrying materials and equipment shall be installed and arranged in a manner that will prevent objectionable current over the grounding conductors or grounding paths.
(B) Alterations to Stop Objectionable Current. If the use of multiple grounding connections results in objectionable current, one or more of the following alterations shall be permitted to be made, provided that the requirements of 250.4(A)(5) or (B)(4) are met:
(1) Discontinue one or more but not all of such grounding connections.
(2) Change the locations of the grounding connections.
(3) Interrupt the continuity of the conductor or conductive path interconnecting the grounding connections.
(4) Take other suitable remedial and approved action.
(C) Temporary Currents Not Classified as Objectionable Currents. Temporary currents resulting from accidental conditions, such as ground-fault currents, that occur only while the grounding conductors are performing their intended protective functions shall not be classified as objectionable current for the purposes specified in 250.6(A) and (B).
(D) Limitations to Permissible Alterations> The provisions of this section shall not be considered as permitting electronic equipment from being operated on ac systems or branch circuits that are not grounded as required by this article. Currents that introduce noise or data errors in electronic equipment shall not be considered the objectionable currents addressed in this section.
(E) Isolation of Objectionable Direct-Current Ground Currents. Where isolation of objectionable dc ground currents from cathodic protection systems is required, a listed ac coupling/dc isolating device shall be permitted in the equipment grounding path to provide an effective return path for ac ground-fault current while blocking dc current.
Substantiation: This is one of several related proposals affecting Articles 100, 230, 250, 280, 285, 501, and 502 based on the following:
1) UL intends to combine the categories of Surge Arresters (Article 280) and Transient Voltage Surge Suppressors (Article 285) into one category and Standard, UL 1449, renamed Surge Protective Devices(SPDs).
UL 1449 will include SPD designations Type 1 and Type 2 for permanently connected devices for use on circuits not exceeding 600 V.
The technology of both low voltage Surge Arresters and TVSSs are now basically the same, thereby justifying coverage under one Standard, UL 1449, and one test program with consideration given to the installation location on the line side (Type 1) or load side (Type 2) of the service disconnect overcurrent protection.
2) The Surge Arrester designation will only be retained for devices used in circuits of 1 kV and over and evaluated to IEEE C62.11-1999.
Panel Meeting Action: Accept
Panel Statement: The panel understands that only the phrase “surge protective devices” was added to Section 250.6(A) by the action of this proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
DOBROWSKY, P.: This proposal should probably have been accepted in principle. Additional action is taken on this section by proposal 5-75a (Log #CP500).

5-75 Log #3543 NEC-P05 **Final Action: Reject**
(250.6)

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Revise as follows:
250.6 Objectionable Current over <u>Equipment</u> Grounding Conductors <u>or Supplemental Grounding Electrode Conductors</u> .
(A) Arrangement to Prevent Objectionable Current. The grounding of electrical systems, circuit conductors, surge arresters, and conductive noncurrent-carrying materials and equipment shall be installed and arranged in a manner that will prevent objectionable current over the <u>equipment</u> grounding conductors or <u>supplemental</u> grounding ~~of the~~ electrode conductors.
(B) Alterations to Stop Objectionable Current. If the use of multiple grounding electrode connections results in objectionable current, one or more of the following alterations shall be permitted to be made, provided that the requirements of 250.4(A)(5) or (B)(4) are met:
(1) Discontinue one or more but...
Substantiation: As used currently in this article the terms “grounding conductors” and “grounding paths” are vague and nonspecific. The term “grounding conductor” as currently used in 250.6 does not conform to the definition provided in Article 100. The term “ground path” is not defined and conflicts with the term effective fault current path.
Specificity of language is crucial to facilitating compliance with the performance requirements of 250.4. I have concurrently submitted a definition for a supplemental grounding electrode conductor.
Panel Meeting Action: Reject
Panel Statement: The proposal would improperly limit the application of the section. There are additional grounding paths other than the two mentioned by the submitter that this section should cover. This proposal would unnecessarily eliminate them from being subject to the section.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-75a Log #CP500 NEC-P05 **Final Action: Accept**
(250.6(A))

Submitter: Code-Making Panel 5,
Recommendation: Revise 250.6(A) to read as follows:
(A) Arrangement to Prevent Objectionable Current. The grounding of electrical systems, circuit conductors, surge arresters, <u>surge protective devices,</u> and conductive <u>normally</u> non–current-carrying <u>metal parts</u> ~~materials~~ ~~and~~ <u>of</u> equipment shall be installed and arranged in a manner that will prevent objectionable current. ~~over the equipment grounding conductors or equipment grounding paths.~~
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections such as 250.6(A) to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. The panel added the words “normally” and changing the words “materials and” to “metal parts of” making the wording

consistent with the task group work. The words “equipment grounding conductors or equipment grounding conductor paths” were deleted to reflect that objectional current can be in all paths, including the equipment grounding conductor. The words “surge protective devices “ were added as a result of the action on Proposal 5-74.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-76 Log #1520 NEC-P05 **Final Action: Accept in Principle**
(250)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Revise Article 250 as described in the following, relative to the term bonding.

250.6(A): Revise 250.6(A) to read as follows:
(A) Arrangement to Prevent Objectionable Current. The grounding of electrical systems, circuit conductors, surge arresters, and conductive normally non–current-carrying metal parts ~~materials~~ ~~and~~ of equipment shall be installed and arranged in a manner that will prevent objectionable current over the equipment grounding conductors or equipment grounding paths.

250.24(C) and Exception: Revise Section 250.24(C) as follows:
(C) Grounded Conductor Brought to Service Equipment. Where an ac system operating at less than 1000 volts is grounded at any point, the grounded conductor(s) shall be run to each service disconnecting means and shall be connected ~~bonded~~ to each disconnecting means enclosure. The grounded conductor(s) shall be installed in accordance with 250.24(C)(1) through (C)(3).
Exception: Where more than one service disconnecting means are located in an assembly listed for use as service equipment, it shall be permitted to run the grounded conductor(s) to the assembly, and the conductor(s) shall be connected ~~bonded~~ to the assembly enclosure.

250.28(C): Revise Section 250.28(C) as follows:
(C) Attachment. Main bonding jumpers and system bonding jumpers shall be connected ~~attached~~ in the manner specified by the applicable provisions of 250.8.

250.30(A)(2): Revise Section 250.30(A)(2) as follows:
(2) Equipment Bonding Jumper Size. Where a n equipment bonding jumper of the wire type is run with the derived phase conductors from the source of a separately derived system to the first disconnecting means, it shall be sized in accordance with 250.102(C), based on the size of the derived phase conductors.

250.30(A)(3): Revise Section 250.30(A)(3) as follows:
(3) Grounding Electrode Conductor, Single Separately Derived System. A grounding electrode conductor for a single separately derived system shall be sized in accordance with 250.66 for the derived phase conductors and shall be used to connect the grounded conductor of the derived system to the grounding electrode as specified in 250.30(A)(7). This connection shall be made at the same point on the separately derived system where the system bonding jumper is connected ~~installed~~ .

250.30(A)(6): Revise Section 250.30(A)(6) as follows:
(6) Bonding. Structural steel and metal piping shall be ~~bonded~~ connected to the grounded conductor of a separately derived system in accordance with 250.104(D).

250.30(A)(8): Revise Section 250.30(A)(8) as follows:
(8) Grounded Conductor. Where a grounded conductor is installed and the system bonding jumper connection is not located at the source of the separately derived system, 250.30(A)(8)(a), (A)(8)(b), and (A)(8)(c) shall apply.

250.32(A) Exception: Revise Section 250.32(A) Exception as follows:
Exception: A grounding electrode shall not be required where only a single branch circuit supplies the building or structure and the branch circuit includes an equipment grounding conductor for grounding the ~~conductive~~ normally non–current-carrying metal parts of equipment. For the purpose of this section, a multiwire branch circuit shall be considered as a single branch circuit.

250.32(B): Revise Section 250.32(B) as follows:
(B) Grounded Systems. For a grounded system at the separate building or structure, the connection to the grounding electrode, the ~~and~~ grounding and ~~or~~ bonding of equipment, structures, or frames required to be grounded and ~~or~~ bonded shall comply with either 250.32(B)(1) or (B)(2).

250.32(B)(1): Revise Section 250.32(B)(1) as follows:
(1) Equipment Grounding Conductor. An equipment grounding conductor as described in 250.118 shall be run with the supply conductors and connected to the building or structure disconnecting means and to the grounding electrode(s). The equipment grounding conductor shall be used for grounding ~~or~~ and bonding of equipment, structures, or frames required to be grounded and ~~or~~ bonded. The equipment grounding conductor shall be sized in accordance with 250.122. Any installed grounded conductor shall not be connected to the equipment grounding conductor or to the grounding electrode(s).

250.32(B)(2): Revise Section 250.32(B)(2) as follows:
(2) Grounded Conductor. Where (1) an equipment grounding conductor is not run with the supply to the building or structure, (2) there are no continuous metallic paths ~~bonded~~ connected to the grounding system in each building or structure involved, and…

250.32(B)(3): Revise Section 250.32(B)(3) as follows:
(3) ground-fault protection of equipment has not been installed on the supply side of the feeder(s), the grounded conductor run with the supply to the building or structure shall be connected to the building or structure disconnecting means and to the grounding electrode(s) and shall be used for grounding and ~~or~~ bonding of equipment, structures, or frames required to be grounded and ~~or~~ bonded. The size of the grounded conductor shall not be smaller than the larger of either of the following:

250.32(D)(1): Revise Section 250.32(D)(1) as follows:
(1) The connection of the grounded conductor to the grounding electrode, normally non-current-carrying metal parts of equipment, or equipment grounding conductor at a separate building or structure shall not be made.

250.32(D)(2): Revise Section 250.32(D)(2) as follows:
(2) An equipment grounding conductor for grounding and bonding any normally non–current-carrying metal parts of equipment, interior metal piping systems, and building or structural metal frames is run with the circuit conductors to a separate building or structure and ~~bonded~~ connected to existing grounding electrode(s) required in Part III of this article, or, where there are no existing electrodes, the grounding electrode(s) required in Part III of this article shall be installed where a separate building or structure is supplied by more than one branch circuit.

250.32(D)(3): Revise Section 250.32(D)(3) as follows:
(3) The connection between ~~Bonding~~ the equipment grounding conductor and ~~to~~ the grounding electrode at a separate building or structure shall be made in a junction box, panelboard, or similar enclosure located immediately inside or outside the separate building or structure.

250.34(A)(2): Revise Section 250.34(A)(2) as follows:
(2) The normally non–current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are connected ~~bonded~~ to the generator frame.

250.34(B)(3): Revise Section 250.34(B)(3) as follows:
(3) The normally non–current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are connected ~~bonded~~ to the generator frame.

250.34(C): Revise Section 250.34(C) as follows:
(C) Grounded Conductor Bonding. A system conductor that is required to be grounded by 250.26 shall be connected ~~bonded~~ to the generator frame where the generator is a component of a separately derived system.

250.36(F): Revise Section 250.36(F) as follows:
(F) Grounding Electrode Conductor Location. The grounding electrode conductor shall be connected ~~attached~~ at any point from the grounded side of the grounding impedance to the equipment grounding connection at the service equipment or first system disconnecting means.

250.68(B): Revise 250.68(B) as follows:
250.68(B) Effective Grounding Path. The connection of a grounding electrode conductor or bonding jumper to a grounding electrode shall be made in a manner that will ensure a permanent and effective grounding path. Where necessary to ensure the grounding path for a metal piping system used as a grounding electrode, effective bonding shall be provided around insulated joints and around any equipment likely to be disconnected for repairs or replacement. Bonding ~~conductors~~ jumpers shall be of sufficient length to permit removal of such equipment while retaining the integrity of the ~~bond~~ grounding path.

250.84: Revise 250.84 as follows:
250.84 Underground Service Cable or Raceway.
(A) Underground Service Cable. The sheath or armor of a continuous underground metal-sheathed or armored service cable system that is connected ~~bonded~~ to the grounded ~~underground~~ system conductor on the supply side shall not be required to be connected to the grounded system conductor at the building or structure. The sheath or armor shall be permitted to be insulated from the interior conduit or piping.
(B) Underground Service Raceway Containing Cable. An underground metal service raceway that contains a metal-sheathed or armored cable bonded to the grounded underground system conductor shall not be required to be connected to the grounded system conductor at the building or structure. The sheath or armor shall be permitted to be insulated from the interior raceway or piping.

250.97 Exception: Revise the exception of Section 250.97 as follows:
Exception: Where oversized, concentric, or eccentric knockouts are not encountered, or where a box or enclosure with concentric or eccentric knockouts is listed to provide a permanent, reliable ~~electrical bond~~ bonding connection , the following methods shall be permitted: …

250.102(D) 2nd paragraph: Revise Section 250.102(D) second paragraph as follows:
A single common continuous equipment bonding jumper shall be permitted to ~~bond~~ connect two or more raceways or cables where the bonding jumper is sized in accordance with Table 250.122 for the largest overcurrent device supplying circuits therein.

250.112(M): Revise Section 250.112(M) as follows:
Where a submersible pump is used in a metal well casing, the well casing shall be ~~bonded~~ connected to the pump circuit equipment grounding conductor.

250.184(B)(5): Revise 250.184(B)(5) as follows:

(5) An equipment ~~bonding~~ grounding conductor shall be provided to each building, structure, and equipment enclosure.

Substantiation: 250.6(A): Adding the words "normally" and changing the words "materials and" to "metal parts of" makes the wording consistent with the proposed definition of the term "Equipment Grounding Conductor" which is the grounding path being described here. The word "equipment" was added in two locations to more specifically describe the conductor and grounding path being referred to in this section.

250.24(C) and Exception: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section and the exception. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

250.28(C): These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section and the exception. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

250.30(A)(2): These changes clarify the present requirement in more prescriptive language. This proposed revision just adds the word "equipment" to this section to match its title.

250.30(A)(3): These changes clarify the present requirement in more prescriptive language. This section is revised to reflect a location of a "connection" point to be more specific than an "installation" point.

250.30(A)(6): These changes clarify the present requirement in more prescriptive language and adds more specifics as to what conductor the steel and water is required to be bonded to.

250.30(A)(8): These changes clarify the present requirement in more prescriptive language. Revised to reference a connection point.

250.32(A) Exception: These changes clarify the present requirement in more prescriptive language. Revised to add the words "normally" and "metal" to provided consistency with proposed revisions to the definition of equipment grounding conductor.

250.32(B): These changes clarify the present requirement in more prescriptive language. Revisions are to include both grounding and bonding rather than a choice of either by the use of the word "or" in this section.

250.32(B)(1): These changes clarify the present requirement in more prescriptive language. Revisions are to include both grounding and bonding rather than a choice of either by the use of the word "or" in this section.

250.32(B)(2): The phrase "… shall be connected…" is the preferred requirement. Revised to reference a connection point.

250.32(B)(3): The phrase "… shall be connected…" is the preferred requirement. Revisions are to include both grounding and bonding rather than a choice of either by the use of the word "or" in this section.

250.32(D)(1): The phrase "… shall be connected…" is the preferred requirement. Revised to add the words "normally" and "metal" to provided consistency with proposed revisions to the definition of equipment grounding conductor.

250.32(D)(2): The phrase "… shall be connected…" is the preferred requirement.

Grounding and bonding functions are required here. The proposed revision adds bonding to this language.

Revised to add the words "normally" and "metal" to provided consistency with proposed revisions to the definition of equipment grounding conductor.

250.32(D)(3): The phrase "… shall be connected…" is the preferred requirement. This section is referring to a connection rather than the process of bonding as the definition has been revised.

250.34(A)(2): The phrase "… shall be connected…" is the preferred requirement. Adding the word "normally" provides consistency with where it was inserted at other locations where the term "non-current-carrying metal parts" is used.

250.34(B)(3): The phrase "… shall be connected…" is the preferred requirement.

250.34(C): The phrase "… shall be connected…" is the preferred requirement. The proposed word "connection" is more specific than the word "bonded."

250.36(F): The phrase "… shall be connected…" is the preferred requirement. The proposed word "connection" is more specific than the word "attached" and is also consistent with other sections where the word "connected" or "connection" is used.

250.68(B): Bonding jumper is a defined term. The term "grounding path" is the portion of the circuit that requires integrity.

250.84: The word "connected" is the preferred requirement and is also consistent with other sections where the word "connected" or "connection" is used.

250.97 Exception: The phrase "… reliable bonding connection" is the preferred requirement.

250.102(D) 2nd paragraph: The phrase "… shall be permitted to connect…" is the preferred requirement.

250.112(M): The phrase "… shall be connected…" is the preferred requirement.

250.184(B)(5): The term "bonding" was replaced by the term "grounding" to consistently and specifically describe conductor and grounding path being referred to in this section.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the term "bonded (bonding)" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

250.6(A), Accept in Principle
250.24(C), Accept
250.28(C) Accept
250.30(A)(2), Accept
250.30(A)(3) Accept
250.30(A)(6), Accept
250.30(A)(8), Accept
250.32(A) Exception, Accept
250.32(B) Accept in Principle
250.32(B)(1) Accept in Principle
250.32(B)(2) Accept in Principle
250.32(B)(3) Accept
250.32(D)(1) Accept in Principle
250.32(D)(2) Accept
250.32(D)(3) Accept
250.34(A)(2) Accept
250.34(B)(3) Accept
250.34(C) Accept
250.36(F) Accept
250.68(B) Accept in Principle
250.84(A) Accept
250.84(B) Accept in Principle
250.97 Exception Accept in Principle
250.102(D) Accept
250.112(M) Accept
250.184(B)(5) Accept

Panel Statement: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections such as 250.6(A) to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC.

250.6(A), See panel Proposal 5-75a (Log #CP500), 5-61 and 5-74
250.32(B), See panel Proposal 5-121a (Log #CP503) and 5-119
250.32(B)(1), See panel Proposal 5-121a (Log #CP503) and 5-119
250.32(B)(2), See panel Proposal 5-121a (Log #CP503) and 5-119
250.32(D)(1), See panel Proposal 5-125a (Log #CP504)
250.68(B), See panel Proposal 5-213a (Log #CP505)
250.84(B), See panel Proposal 5-217a (Log #CP506) and 5-217
250.97, Exception, See panel Proposal5-224a (Log #CP510) and 5-224

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

MELLO, C.: Accept the panel actions on all items except for the action on 250.24(C) and the exception to 250.24(C). The revised text would literally now require the grounded circuit conductor to be connected to the service disconnecting means enclosure. This could easily be interpreted as being "directly" connected which is not a proper installation. The proper termination point for the service grounded conductor is to the grounded conductor terminal or bus intended and identified for the termination of this conductor. The main bonding jumper is in fact the conductor that connects the service grounded conductor terminal or bus to the service equipment enclosure (green screw, strap, bus, or wire type MBJ). Similarly in the exception, the grounded conductor would appear to be required to be connected to the assembly enclosure and not to the service grounded conductor terminal(s) or bus provided for that purpose. The grounded conductor is to be connected to that terminal or bus and the main bonding jumper then connects that terminal or bus to the assembly enclosure. Under the definition in the 2005 code using the word "bonded" allowed the correct installation of terminating on the lug or bus, but then some mean of "bonding" of this terminal or bus was provided. The following text is suggested as an alternative to resolve this situation and continue to use the term "connected" as intended by the Task Group.

250.24(C) and Exception: Revise Section 250.24(C) and exception as follows:

(C) Grounded Conductor Brought to Service Equipment. Where an ac system operating at less than 1000 volts is grounded at any point, the grounded conductor(s) shall be run to each service disconnecting means and shall be connected ~~bonded~~ to each disconnecting means grounded conductor(s) terminal or bus . A main bonding jumper shall connect the grounded conductor(s) to each service disconnecting means enclosure. The grounded conductor(s) shall be installed in accordance with 250.24(C)(1) through (C)(3).

Exception: Where more than one service disconnecting means are located in a ~~n~~ single assembly listed for use as service equipment, it shall be permitted to run the grounded conductor(s) to the assembly common grounded conductor(s) terminal or bus . The assembly shall have a main bonding jumper for connecting the grounded conductor(s) ~~and the conductor(s) shall be connected b onded~~ to the assembly enclosure.

5-77 Log #1521 NEC-P05 **Final Action: Accept in Principle**
(250)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Revise Article 250 as described in the following, relative to the term grounding.

250.6(B) through (E) Revise 250.6(B) through (E) to read as follows:

(B) Alterations to Stop Objectionable Current. If the use of multiple ~~grounding~~ connections to ground results in objectionable current, one or more of the following alterations shall be permitted to be made, provided that the requirements of 250.4(A)(5) or (B)(4) are met:

(1) Discontinue one or more but not all of such ~~grounding~~ connections to ground .

(2) Change the locations of the ~~grounding~~ connections to ground .

(3) Interrupt the continuity of the conductor or conductive path causing the objectionable current over the equipment grounding conductors or equipment grounding paths. ~~interconnecting the grounding connections~~ .

(4) Take other suitable remedial and approved action.

(C) Temporary Currents Not Classified as Objectionable Currents. Temporary currents resulting from accidental conditions, such as ground-fault currents, that occur only while the equipment grounding conductor (s) are performing their intended protective functions shall not be classified as objectionable current for the purposes specified in 250.6(A) and (B).

(D) Limitations to Permissible Alterations. The provisions of this section shall not be considered as permitting electronic equipment from being operated on ac systems or branch circuits that are not connected to an equipment grounding conductor ~~grounded~~ as required by this article. Currents that introduce noise or data errors in electronic equipment shall not be considered the objectionable currents addressed in this section.

(E) Isolation of Objectionable Direct-Current Ground Currents. Where isolation of objectionable dc ground currents from cathodic protection systems is required, a listed ac coupling/dc isolating device shall be permitted in the equipment grounding conductor path to provide an effective return path for ac ground-fault current while blocking dc current.

250.30 (A) Grounded Systems. A separately derived ac system that is grounded shall comply with 250.30(A)(1) through (A)(8). Except as otherwise permitted in this article, a grounded conductor shall not be connected to ground normally non-current-carrying metal parts of equipment, or equipment grounding conductor(s) ~~grounding connection shall not be made to any grounded circuit conductor~~ on the load side of the point of grounding of the separately derived system . ~~except as otherwise permitted in this article.~~

250.32(B): Revise 250.32(B) as follows:

250.32(B) … ~~grounded~~ connected to the equipment grounding conductor …

250.80 and 250.80 Exception: Revise 250.80 and its exception as follows:

250.80 Service Raceways and Enclosures. Metal enclosures and raceways for service conductors and equipment shall be connected to the grounded system conductor if the electrical system is grounded or to the grounding electrode conductor for electrical systems that are not grounded .

Exception: A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 450 mm (18 in.) to any part of the elbow shall not be required to be ~~grounded~~ connected to the grounded system conductor or grounding electrode conductor .

250.86 and 250.86 Exception Nos. 1, 2, and 3: Revise entire 250.86 and its exceptions as follows:

250.86 Other Conductor Enclosures and Raceways. Except as permitted by 250.112(I), metal enclosures and raceways for other than service conductors shall be connected to the equipment grounding conductor ~~grounded~~ .

Exception No. 1: Metal enclosures and raceways for conductors added to existing installations of open wire, knob and tube wiring, and nonmetallic-sheathed cable shall not be required to be connected to the equipment grounding conductor ~~grounded~~ where these enclosures or wiring methods comply with (1) through (4) as follows:

(1) Do not provide an equipment ground

(2) Are in runs of less than 7.5 m (25 ft)

(3) Are free from probable contact with ground, grounded metal, metal lath, or other conductive material

(4) Are guarded against contact by persons

Exception No. 2: Short sections of metal enclosures or raceways used to provide support or protection of cable assemblies from physical damage shall not be required to be connected to the equipment grounding conductor ~~grounded~~ .

Exception No. 3: A metal elbow shall not be required to be connected to the equipment grounding conductor ~~grounded~~ where it is installed in a nonmetallic raceway and is isolated from possible contact by a minimum cover of 450 mm (18 in.) to any part of the elbow or is encased in not less than 50 mm (2 in.) of concrete.

250.110 and 250.110 Exception No. 3: Revise first paragraph of 250.110 and 250.110 Exception No. 3 as follows:

250.110 Equipment Fastened in Place or Connected by Permanent Wiring Methods (Fixed). *Exposed non–current-carrying metal parts of fixed equipment likely to become energized shall be ~~grounded~~ connected to the equipment grounding conductor under any of the following conditions: …*

Exception No. 3: Listed equipment protected by a system of double insulation, or its equivalent, shall not be required to be ~~grounded~~ connected to the equipment grounding conductor . Where such a system is employed, the equipment shall be distinctively marked.

250.112 Revise the first paragraph of 250.112 and 250.113 items (K) and (M) as follows:

250.112 Fastened in Place or Connected by Permanent Wiring Methods (Fixed) — Specific. Exposed, non–current-carrying metal parts of the kinds of equipment described in 250.112(A) through (K), and non–current-carrying metal parts of equipment and enclosures described in 250.112(L) and (M), shall be ~~grounded~~ connected to the equipment grounding conductor regardless of voltage. …

(K) Skid Mounted Equipment. Permanently mounted electrical equipment and skids shall be ~~grounded~~ connected to the ~~with an~~ equipment grounding ~~bonding~~ conductor ~~jumper~~ sized as required by 250.122. …

(M) Metal Well Casings Where a submersible pump is used in a metal well casing, the well casing shall be ~~bonded~~ connected to the pump circuit equipment grounding conductor.

250.114 and 250.114 Exceptions: Revise first paragraph of 250.114 and all 250.114 Exceptions as follows:

250.114 Equipment Connected by Cord and Plug. Under any of the conditions described in (1) through (4), exposed non–current-carrying metal parts of cord-and-plug-connected equipment likely to become energized shall be ~~grounded~~ connected to the equipment grounding conductor .

Exception: Listed tools, listed appliances, and listed equipment covered in (2) through (4) shall not be required to be ~~grounded~~ connected to the equipment grounding conductor where protected by a system of double insulation or its equivalent. Double insulated equipment shall be distinctively marked. …

Exception No. 1: Motors, where guarded, shall not be required to be ~~grounded~~ connected to the equipment grounding conductor .

Exception No. 2: Metal frames of electrically heated appliances, exempted by special permission, shall not be required to be ~~grounded~~ connected to the equipment grounding conductor , in which case the frames shall be permanently and effectively insulated from ground. …

Exception: Tools and portable handlamps likely to be used in wet or conductive locations shall not be required to be ~~grounded~~ connected to the equipment grounding conductor where supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.

250.116 and 250.116 FPN: Revise 250.116 and its FPN as follows:

250.116 Nonelectric Equipment. The metal parts of nonelectric equipment described in this section shall be connected to the equipment grounding conductor ~~grounded~~ .

FPN: Where extensive metal in or on buildings may become energized and is subject to personal contact, connecting to the equipment grounding conductor ~~adequate bonding and grounding~~ will provide additional safety.

250.118: Revise 250.118 and add FPN No. 1 as follows:

250.118 Types of Equipment Grounding Conductors. The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following:

FPN No. 1: For effective ground-fault current path see 250.2 Definition.

(1) A copper, aluminum, or copper-clad aluminum conductor. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a busbar of any shape.

(2) Rigid metal conduit.

(3) Intermediate metal conduit.

(4) Electrical metallic tubing.

(5) Listed flexible metal conduit meeting all the following conditions:

a. The conduit is terminated in fittings listed ~~for grounding~~ for use in the effective ground-fault current path.

b. The circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.

c. The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 1.8 m (6 ft).

d. Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.

(6) Listed liquidtight flexible metal conduit meeting all the following conditions:

a. The conduit is terminated in fittings listed ~~for grounding~~ for use in the effective ground-fault current path.

b. For metric designators 12 through 16 (trade sizes through ½), the circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.

c. For metric designators 21 through 35 (trade sizes ¾ through 1¼), the circuit conductors contained in the conduit are protected by overcurrent devices rated not more than 60 amperes and there is no flexible metal conduit, flexible metallic tubing, or liquidtight flexible metal conduit in trade sizes metric designators 12 through 16 (trade sizes through ½) in the grounding path.

d. The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 1.8 m (6 ft).

e. Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.

(7) Flexible metallic tubing where the tubing is terminated in fittings listed ~~for grounding~~ for use in the effective ground-fault current path and meeting the following conditions:

a. The circuit conductors contained in the tubing are protected by overcurrent devices rated at 20 amperes or less.

b. The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 1.8 m (6 ft).

(8) Armor of Type AC cable as provided in 320.108.

(9) The copper sheath of mineral-insulated, metal-sheathed cable.

(10) Type MC cable where listed and identified ~~for grounding~~ for use in the effective ground-fault current path in accordance with the following:

a. The combined metallic sheath and grounding conductor of interlocked metal tape–type MC cable

b. The metallic sheath or the combined metallic sheath and grounding conductors of the smooth or corrugated tube type MC cable

(11) Cable trays as permitted in 392.3(C) and 392.7.

(12) Cablebus framework as permitted in 370.3.

(13) Other listed electrically continuous metal raceways and listed auxiliary gutters.

(14) Surface metal raceways listed ~~for grounding~~ for use in the effective ground-fault current path .

250.132: Revise 250.132 as follows:

250.132 Short Sections of Raceway. Isolated sections of metal raceway or cable armor, where required to be grounded, shall be ~~grounded~~ connected to an equipment grounding conductor in accordance with 250.134.

250.134 and 250.134(A) and (B): Revise 250.134 as follows:

250.134 Equipment Fastened in Place or Connected by Permanent Wiring Methods (Fixed) — Grounding

Unless grounded by connection to the grounded circuit conductor as permitted by 250.32, 250.140, and 250.142, non–current-carrying metal parts of equipment, raceways, and other enclosures, if grounded, shall be ~~grounded~~ connected to an equipment grounding conductor by one of the following methods.

(A) Equipment Grounding Conductor Types. By connecting to any of the equipment grounding conductors permitted by 250.118.

(B) With Circuit Conductors. By connecting to an equipment grounding conductor contained within the same raceway, cable, or otherwise run with the circuit conductors.

250.136(A) and (B): Revise 250.136 (A) and (B) as follows:

250.136 (A) Equipment Secured to Grounded Metal Supports. Electrical equipment secured to and in electrical contact with a metal rack or structure provided for its support and ~~grounded~~ connected to an equipment grounding conductor by one of the means indicated in 250.134. The structural metal frame of a building shall not be used as the required equipment grounding conductor for ac equipment.

(B) Metal Car Frames. Metal car frames supported by metal hoisting cables attached to or running over metal sheaves or drums of elevator machines that are ~~grounded~~ connected to an equipment grounding conductor by one of the methods indicated in 250.134.

250.138: Revise the first paragraph of 250.138 and 250.138(B) as follows:

250.138 Cord-and-Plug-Connected Equipment. Non–current-carrying metal parts of cord-and-plug-connected equipment, if grounded, shall be ~~grounded~~ connected to an equipment grounding conductor by one of the methods in 250.138(A) or (B). …

(B) By Means of a Separate Flexible Wire or Strap. By means of a separate flexible wire or strap, insulated or bare, connected to an equipment grounding conductor, and protected as well as practicable against physical damage, where part of equipment.

250.140 and 250.140 Exception: Revised 250.140 and 250.140 Exception as follows:

250.140 Frames of Ranges and Clothes Dryers. Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and outlet or junction boxes that are part of the circuit for these appliances shall ~~be grounded~~ connected to the equipment grounding conductor in the manner specified by 250.134 or 250.138.

Exception: For existing branch circuit installations only where an equipment grounding conductor is not present in the outlet or junction box, the frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and outlet or junction boxes that are part of the circuit for these appliances shall be permitted to be ~~grounded~~ connected to the grounded circuit conductor if all the following conditions are met.

(1) The supply circuit is 120/240-volt, single-phase, 3-wire; or 208Y/120-volt derived from a 3-phase, 4-wire, wye-connected system.

(2) The grounded conductor is not smaller than 10 AWG copper or 8 AWG aluminum.

(3) The grounded conductor is insulated, or the grounded conductor is uninsulated and part of a Type SE service-entrance cable and the branch circuit originates at the service equipment.

(4) Grounding contacts of receptacles furnished as part of the equipment are bonded to the equipment.

250.142 Exception No. 1: Revise 250.142(B) Exception No. 1 as follows:

250.142 (B) *Exception No.1: The frames of ranges, wall-mounted ovens, counter-mounted cooking units, and clothes dryers under the conditions permitted for existing installations by 250.140 shall be permitted to be ~~grounded~~ connected ~~by a~~ to the grounded circuit conductor.*

250.144: Revise 250.144 as follows:

250.144 Multiple Circuit Connections. Where equipment is required to be grounded and is supplied by separate connection to more than one circuit or grounded premises wiring system, a n ~~means for grounding~~ equipment grounding conductor shall be provided for each such connection as specified in 250.134 and 250.138.

250.146(D): Revise 250.146 (D) as follows:

250.146 **(D) Isolated Receptacles.** Where required for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. The receptacle grounding terminal shall be ~~grounded~~ connected ~~by~~ to an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor shall be permitted to pass through one or more panelboards without connection to the panelboard grounding terminal as permitted in 408.40, Exception, so as to terminate within the same building or structure directly at an equipment grounding conductor terminal of the applicable derived system or service.

FPN: Use of an isolated equipment grounding conductor does not relieve the requirement for grounding the raceway system and outlet box.

250.148 and 250.148(C): Revise first paragraph of 250.148 and 250.148(C) as follows:

250.148 Continuity and Attachment of Equipment Grounding Conductors to Boxes

Where circuit conductors are spliced within a box, or terminated on equipment within or supported by a box, any equipment grounding conductor(s) associated with those circuit conductors shall be ~~spliced or joined~~ connected within the box or to the box with devices suitable for the use in accordance with 250.148(A) through (E). …

(C) Metal Boxes. A connection shall be made between the one or more equipment grounding conductors and a metal box by means of a grounding screw that shall be used for no other purpose, equipment listed for grounding, or a listed grounding device.

250.170: Revise 250.170 as follows:

250.170 Instrument Transformer Circuits. …shall be ~~grounded~~ connected to the equipment grounding conductor …

250.172: Revise 250.172 as follows:

250.172 Instrument Transformer Cases. …shall be ~~grounded~~ connected to the equipment grounding conductor …

250.174: Revise 250.174 as follows:

250.174 Cases of Instruments, Meters and Relays Operating at Less Than 1000 Volts. …shall be ~~grounded~~ connected to the equipment grounding conductor …

250.174(A): Revise 250.174(A) as follows:

250.174(A) Not on Switchboards. …shall have the cases and other exposed metal parts ~~grounded~~ connected to the equipment grounding conductor …

250-174(B): Revise 250.174(B) as follows:

250.174(B) On Dead-Front Switchboards. …shall have the cases ~~grounded~~ connected to the equipment grounding conductor …

250.174(C): Revise 250.174(C) as follows:

250.174(C) On Live-Front Switchboards. …shall not have their cases ~~grounded~~ connected to the equipment grounding conductor …

250.176: Revise 250.176 as follows:

250.176 Cases of Instruments, Meters, and Relays – Operating Voltage 1 kV and Over. Their cases shall not be ~~grounded~~ connected to the equipment grounding conductor …

250.178: Revise 250.178 as follows:

250.178 Instrument Grounding Conductor. The equipment grounding conductor for the secondary circuits …and no additional equipment grounding conductor shall be required.

250.184(C)(2): Revise 250.184(C)(2) as follows:

(2) The multigrounded neutral conductor shall be ~~grounded~~ connected at each transformer and at other additional locations ~~by connection~~ to a ~~made or existing~~ grounding electrode.

250.190: Revise last paragraph of 250.190 as follows:

Equipment g ~~G~~ rounding conductors not an integral part of a cable assembly shall not be smaller than 6 AWG copper or 4 AWG aluminum.

Substantiation: 250.6(B) through (E): The wording in (B)(3) was changed to more prescriptively specify the path being referred to in this subsection.

The word "equipment" was added to more specifically describe the conductor and grounding path being referred to in (C).

The wording was changed to more prescriptively specify the grounding path being referred to in (D).

The word "conductor" was added to more specifically describe the conductor and grounding path being referred to in (E).

250.30(A): These changes clarify the present requirement in more prescriptive language. This proposed revision adds more specific restrictions of the grounded conductor connections to any ground connection on the load side of the service disconnect. No other technical changes to the section are proposed, just clarification.

250.32(B): These changes clarify the present requirement in more prescriptive language.

250.80 and 250.80 Exception: These changes clarify the present requirement in more prescriptive language.

250.86 and 250.86 Exception Nos. 1, 2, and 3: These changes clarify the present requirement in more prescriptive language.

250.110 and 250.110 Exception No. 3: These changes clarify the present requirement in more prescriptive language.

250.112: These changes clarify the present requirement in more prescriptive language.

250.114 and 250.114 Exceptions: These changes clarify the present requirement in more prescriptive language.

250.116 and 250.116 FPN: These changes clarify the present requirement in more prescriptive language.

250.118: The term “listed for grounding” is very important to require the fittings and raceways to be lsited for the purpose; however, this change complies with Section 3.3.1.1 of the NEC Style Manual.

250.132: These changes clarify the present requirement in more prescriptive language.

250.134 and 250.134(A) and (B): These changes make the text consistent with those changes proposed in 250.110, 112, and 114.

250.136(A) and (B): These changes clarify the present requirement in more prescriptive language.

250.138: These changes clarify the present requirement in more prescriptive language.

250.140 and 250.140 Exception: These changes clarify the present requirement in more prescriptive language.

250.142 Exception No. 1: These changes clarify the present requirement in more prescriptive language.

250.144: These changes clarify the present requirement in more prescriptive language.

250.146(D): These changes clarify the present requirement in more prescriptive language.

250.148 and 250.148(C): These changes clarify the present requirement in more prescriptive language.

250.170: These changes clarify the present requirement in more prescriptive language.

250.172: These changes clarify the present requirement in more prescriptive language.

250.174: These changes clarify the present requirement in more prescriptive language.

250.174(A): These changes clarify the present requirement in more prescriptive language.

250.174(B): These changes clarify the present requirement in more prescriptive language.

250.174(C): These changes clarify the present requirement in more prescriptive language.

250.176: These changes clarify the present requirement in more prescriptive language. The use of the term “grounded” is appropriate within the text of the Exception.

250.178: These changes clarify the present requirement in more prescriptive language.

The use of the term “grounded” in this clause is appropriate.

250.184(C)(2): The proposed wording more prescriptively describes the action required and is more consistent with the style implemented last cycle concerning made or existing electrodes.

250.190: These changes clarify the present requirement in more prescriptive language.

The use of the term “grounded” in this clause is appropriate.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms “grounded” and “equipment grounding conductor” in Article 100 relative to this Task Group’s recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

250.6(B) to (E), Accept in principle
250.30(A), Accept in principle
250.32(B), Accept
250.80 and 250.80 Exception, Accept
250.86 and 250.86 Exception Nos. 1, 2, and 3, Accept
250.110 and 250.110 Exception No. 3, Accept
250.112, Accept in principle
250.114, Accept in principle
250.116 Accept in principle
250.118, Accept in principle
250.132, Accept
250.134 and 250.134(A) and (B), Accept
250.136(A) and (B), Accept
250.138, Accept
250.140 and 250.140 Exception, Accept
250.142 Exception No. 1, Accept
250.144, Accept in principle
250.146(D),Accept in principle
250.148 and 250.148(C), Accept
250.170, Accept in principle
250.172, Accept
250.174, Accept
250.174(A), Accept
250.174(B), Accept
250.174(C), Accept
250.176, Accept
250.178, Accept
250.184(C)(2), Accept in Principle
250.190, Accept

Panel Statement: 250.6(B) to (E), See panel Proposal 5-77a (Log #CP 501) and Proposal 5-74

250.30(A), See panel Proposal 5-102a (Log #CP 502)
250.112, See panel Proposal 5-247a (Log #CP 507) and Proposal 5-248
250.114, See Panel Proposal 5-252a (Log # CP 515)
250.116 See Panel Proposal 5-252b (Log #CP 508)
250.118, See Panel Proposal 5-253a (Log #CP 509) and Proposal 5-254
250.144, See Panel Proposal 5-294a (Log #CP 511) and Proposal 5-295
250.146(D),See panel Proposal 5-301a (Log #CP 514) and Proposals 5-302 and 5-303
250.170, See Panel Proposal 5-313a (Log #CP 512) and Proposal 5-314
250.184(C)(2), See Panel Proposal 5-329a (Log #CP 516) and 5-330

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

HARDING, G.: I agree with the panel action of Accept in Principle, however, the individual action on item 250.32(B) should have been to revert back to the language of the 2005 NEC referring to Proposal 5-119 for revisions to this section.

5-77a Log #CP501 NEC-P05 **Final Action: Accept**
(250.6(B), (B)(1), (B)(2), (B)(3), (C))

Submitter: Code-Making Panel 5,

Recommendation: Revise to read as follows:

(B) Alterations to Stop Objectionable Current. If the use of multiple grounding connections results in objectionable current, one or more of the following alterations shall be permitted to be made, provided that the requirements of 250.4(A)(5) or (B)(4) are met:
(1) Discontinue one or more but not all of such grounding connections.
(2) Change the locations of the grounding connections.
(3) Interrupt the continuity of the conductor or conductive path causing the objectionable current. ~~interconnecting the grounding connections~~ .
(4) Take other suitable remedial and approved action.

(C) Temporary Currents Not Classified as Objectionable Currents. Temporary currents resulting from accidental conditions, such as ground-fault s, ~~currents, that occur only while the equipment grounding conductor (s) are performing their intended protective functions~~ shall not be classified as objectionable current for the purposes specified in 250.6(A) and (B).

(D) Limitations to Permissible Alterations. The provisions of this section shall not be considered as permitting electronic equipment from being operated on ac systems or branch circuits that are not connected to an equipment grounding conductor ~~grounded~~ as required by this article. Currents that introduce noise or data errors in electronic equipment shall not be considered the objectionable currents addressed in this section. (E) Isolation of Objectionable Direct-Current Ground Currents. Where isolation of objectionable dc ground currents from cathodic protection systems is required, a listed ac coupling/dc isolating device shall be permitted in the equipment grounding conductor path to provide an effective return path for ac ground-fault current while blocking dc current.

Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections of 250.6(B) thru (C) to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC.

Changes to Proposal from Grounding and Bonding Task Group:

(B)	Reverted to 2005 NEC text.
(B)(1)	Reverted to 2005 NEC text.
(B)(2)	Reverted to 2005 NEC text.

(B)(3) Accepted the strikeout at the end of the sentence from GB Task Group, revised the proposed additional text to delete “over the equipment grounding conductors or equipment grounding paths.”

(C) Revised text to remove, “ ~~currents, that occur only while the equipment grounding conductor (s) are performing their intended protective functions”~~ .

(D) and (E) remains as in the original proposal.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-78 Log #191 NEC-P05 **Final Action: Accept in Principle**
(250.8)

NOTE: The following proposal consists of Comment 5-40 on Proposal 5-57 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 5-57was:

Revise Section 250.8 as follows:

250.8 Connection of Grounding and Bonding Equipment.

Grounding conductors and bonding jumpers shall be connected by exothermic welding, listed pressure connectors, listed clamps, or other listed means. Connection devices or fittings that depend solely on solder shall not be used. Sheet metal screws shall not be used to connect <u>terminals or</u> grounding conductors to enclosures.

The Technical Correlating Committee directs that the Panel Action on Comment 5-40 only be reported as "Hold" consistent with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects. The comment adds new material that has not had adequate public review. The action on Proposal 5-57 stands as shown in the Report on Proposals.

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Accept the proposal in principle. Revise the last sentence to read as follows:

"Where screws are used to make field connections of grounding conductors or grounding terminals to enclosures, machine screws or thread-forming screws with machine threads shall be used."

Substantiation: The disallowance of sheet metal screws for this purpose is appropriate, but the wording has raised three questions: what about metal-to-metal connections in listed enclosures, where the continuity has been evaluated by the testing laboratory (presumably OK), and on field connections, what about other screws, such as wood screws that are even less suitable than sheet-metal screws? What about "teck" thread forming screws that result in machine threads, but that are often referred to as a type of sheet metal screw? This comment answers those questions. The real technical issue addressed in this requirement is the poor mechanical advantage offered by a conventional sheet metal screw with its very coarse threads. The submitter is aware that this comment may need to be held in accordance with 4-4.6.2.2(a) of the Regulations, but wanted to bring the issues to the attention of CMP 5.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-84.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-79 Log #1656 NEC-P05 **Final Action: Accept in Principle**
(250.8)

Submitter: John Steinke, Reno, NV

Recommendation: Delete last sentence, beginning with "Sheet metal screws...".

Substantiation: This provision does not belong here, for three basic reasons:

1) It may conflict with 110.14(A); 2) Connection requirements ought to apply to all wire connections, and not just grounding wires; and, 3) This sentence has opened a host of other issues.

110.14(A) makes reference to wire-binding heads. The common machine screw, often cited as the preferred fastener, has a rather narrow head, which may not grip the wire firmly. The common "Teks" screw, which is often used to illustrate the violation of 250.8, has a "washer" head, which approximates a binding head with its' large diameter. Moreover, the Teks screw, by drilling it's own hole, cannot help but have a good connection- which is not the case of a common sheet metal screw that is placed into an opening too large for the threads to effectively grip. (Remember, that was the original intent of this sentence). I submit that a wood screw, put through a large hole, with a washer on it, can effectively connect a grounding wire- provided that the screw/washer combination holds the wire firmly in contact with the box.

Why should this provision apply only to grounding wires? As now in the code, I can legally attach lugs to the neutral buss with a sheet metal screw; I think we can agree that a good connection is even more critical there!

Finally, this sentence has opened the door to endless debate of what is a sheet metal screw, what to do where older equipment lacks prepared holes, what size screw is necessary, need it be green, etc. This is the NEC, not "Machinery's Manual," for pete's sake!

Perhaps we would be better served were 110.14(A) to include a statement to the effect that 'connectors will be used in the manner for which they are intended, on materials for which they are designed, and tightened sufficiently.'

Since it IS in 250, however, it is only proper for this committee to work it out with the 110 committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-84.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-80 Log #1854 NEC-P05 **Final Action: Reject**
(250.8)

Submitter: Wayne Treamer, Goffstown, NH

Recommendation: Revise as follows:

~~Sheet metal screws shall not~~ (<u>Only listed screws shall)</u> be used to connect grounding conductors or connection devices to enclosures.

Substantiation: Specifying sheet metal screws only allows the use of many other types of hardware to connect devices to enclosures. Requiring only listed screws assures the connectivity of the device.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 5-84. Screws are not listed.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-81 Log #1855 NEC-P05 **Final Action: Accept in Principle**
(250.8)

Submitter: Margarito Aragon, Jr., Santa Fe, NM

Recommendation: Add new text in third sentence of 250.8 to read as follows:

Grounding conductors and bonding jumpers shall be connected by exothermic welding, listed pressure connectors, listed clamps, or other listed means. Connection devices or fittings that depend solely on solder shall not be used. <u>Screws with threads similar to</u> sheet metal screws shall not be used to connect grounding conductors or connection devices to enclosures.

Substantiation: This revision will clarify that the advancing spiral type of threads is what is being prohibited not the sheet metal screw, but any screw with a corkscrew (advancing spiral) like threads.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-84.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-82 Log #2225 NEC-P05 **Final Action: Accept in Principle**
(250.8)

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise as follows:

250.8 Connection of Grounding and Bonding Equipment. Grounding conductors and bonding jumpers shall be connected by exothermic welding, listed pressure connectors, listed clamps, or other listed means. Connection devices or fittings that depend solely on solder shall not be used. ~~Sheet metal screws shall not be used to connect grounding conductors or connection devices to enclosures~~ . <u>Screws used to connect grounding conductors or connection devices shall be machine screws with a minimum of two threads engaged in the enclosure or secured on the back side with a nut.</u>

Substantiation: The current rule only prohibits the use of "sheet metal" screws for this purpose. There are any number of screw types that are not suitable for this purpose. The code needs to specify what type of screw that can be used, not just prohibit a single type of inappropriate screw. The existing wording would permit the use of drywall screws as it only prohibits the use of sheet metal screws.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-84.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-83 Log #2254 NEC-P05 **Final Action: Accept in Principle**
(250.8)

Submitter: Bryan P. Holland, Holland Electric

Recommendation: Revise the last sentence in this section to read:

"Sheet metal screws shall not be used to connect grounding conductors, <u>bonding conductors</u> , or connection devices to enclosures."

Substantiation: The title and most content of this section include the term "bonding" but then neglects to include the term in the last sentence. If sheet metal screws are neither adequate nor suitable for the connection of grounding conductors, they would not be suitable for bonding conductors or connection devices. It is common to see bonding lugs attached to pool cages by means of a sheet metal screw and without the proper wording in 250.8 this practice may continue without proper enforcement.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-84.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-84 Log #3365 NEC-P05 **Final Action: Accept in Principle**
(250.8)

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Revise text to read:
250.8 Connection of Grounding and Bonding Equipment. Grounding conductors and bonding jumpers shall be connected by devices listed as grounding and bonding equipment, or by the exothermic welding process. Connection devices or fittings that depend solely on solder shall not be used. Only machine screw type fasteners shall be permitted and shall engage not less than two threads.
Exception. Devices that are part of a listed assembly such as terminals in panelboards, self tapping screws, shall not be required to be specifically listed as grounding and bonding equipment if they are included in overall product listing.
~~Grounding conductors and bonding jumpers shall be connected by exothermic welding, listed pressure connectors, listed clamps, or other listed means. Connection devices or fittings that depend solely on solder shall not be used. Sheet metal screws shall not be used to connect grounding conductors or connection devices to enclosures.~~
Substantiation: This section needs to be clarified. Devices that are used for grounding and bonding need to comply with the requirements of the product standard that is applicable (UL 467) unless thay are evaluate as part of the entire product. Existing text prohibits sheet metal screws but does not prohibit drywall or wood screws. Providing two threads of engagement either in a tapped hole or by using a nut will help specify what is required.
Panel Meeting Action: Accept in Principle
250.8 Connection of Grounding and Bonding Equipment.
(A) Permitted Methods. Grounding conductors and bonding jumpers shall be connected by one of the following means:
(1) listed pressure connectors
(2) terminal bars
(3) pressure connectors listed as grounding and bonding equipment
(4) the exothermic welding process
(5) machine screw-type fasteners that engage not less than two threads or are secured with a nut
(6) thread-forming machine screws that engage not less than two threads in the enclosure
(7) Connections that are part of a listed assembly
(8) Other listed means
(B) Methods Not Permitted. Connection devices or fittings that depend solely on solder shall not be used.
Panel Statement: The panel action on this proposal intends to incorporate acceptable concepts included in other proposals on this section. The panel also incorporated language from Comment 5-40 (log #2137) of the 2004 Report on Comments, which is Propoasl 5-78 in this Report on Proposals.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-85 Log #2996 NEC-P05 **Final Action: Accept in Principle**
(250.8(a) through (d))

Submitter: Kevin Swotek, Goodwin Tucker Group
Recommendation: Added text to 250.8:
250.8
(a) Penetrations or studs that are made or used to allow fastening of listed pressure connectors, listed clamps and other listed means shall be made the same diameter as the diameter of the stud size of the mounting holes of the listed pressure connectors, listed clamps or other listed means to be mounted.
(b) Unless listed mechanical fasteners are used to fasten the listed pressure connectors, listed clamps and other listed means. The mechanical fasteners fastening the listed pressure connectors, listed clamps and other listed means to Penetrations of (6 mm) 1/4 in. or greater shall be fastened with Hex head bolts and nuts. Mechanical fasteners shall have the same diameter as the penetration holes used to allow the mounting of the listed pressure connectors, listed clamps and other listed means. Lock washers and washers shall be permitted to be installed.
(c) Preformed surface mounting holes used to mount listed pressure connectors, listed clamps or other listed means. The mechanical fasteners shall adequately match any preformed threads of any surface mounting holes or the mechanical fasteners shall at least be the same diameter or greater of any preformed surface mounting holes. Any use of any self tapping mechanical fasteners shall be listed for the purpose and shall be green in color. Mounting holes of any listed pressure connectors, listed clamps or other listed means shall not be enlarged.
(d) Mechanical fasteners shall be made up wrench tight to secure the listed pressure connectors, listed clamps and other listed means to the mounting surface. The installation of listed pressure connectors, listed clamps and other listed means shall comply with 250.12.
Substantiation: My reason for this proposal is to resolve problems commonly found with the installation of listed pressure connectors, listed clamps or other listed means. As the above example can be commonly found fastened in place with sheet metal screws, and specifically 6-32 and 8-32 machine screws and nuts. Please note that the common stud size opening is 1/4 in. and larger depending on the connector size. These connectors are commonly found loose due to the use of small fasteners being used and the small fastener not being able to be adequate torque so it properly fastens connector.
Problems that have been founded with this type of installation are ground faults not causing the tripping of the circuit breaker due to loose connections. And, also where a ground fault occurs and trips the circuit breaker but burns off the small size fastener that is fastening the connector and this allows the circuit breaker to be reset and the fault energizes the equipment or enclosure without further tripping of the overcurrent protection and leaving frame energized and creating a hazard.
This common type of installation is not addressed by NEC which allows this type of installations to be done with some very inadequate fastening means.
The first suggestion (a) would cause the use of a more adequate size of mechanical fastener to be used to fasten the connector in place and certainly not allow the installer to use sheet metal screws or smaller fasteners that are not adequate.
The second suggestion (b) would be effective in making sure that the type of mechanical fastener used could be adequate torque to insure adequate fastening of the connector.
The third suggestion (c) would allow the use of listed equipment with prethreaded holes or predrilled mounting holes to allow installation of connectors and specifying that a small mechanical fastener shall not be used. Also, this would specifically not allow the use of sheet metal screws. Also, this would not allow a too small of a connector to be modified and being not adequate for the intended purpose to be installed by modification.
The fourth suggestion (d) would insure good installation integrity.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-84.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-86 Log #1856 NEC-P05 **Final Action: Accept in Principle**
(250.8, FPN (New))

Submitter: Margarito Aragon, Jr., Santa Fe, NM
Recommendation: Add new text in the form of a FPN to 250.8 read as follows:
FPN: It is not the intent of this section to prohibit only the use of sheet metal screws, but to prohibit any screw that has the advancing spiral (corkscrew) type of threads to connect grounding conductors or connection devices to enclosures.
Substantiation: The intent of this proposal is to clarify the restriction of not using only sheet metal screws. The requirement is to prohibit the use of any screw with threads similar to sheet metal screws. Any connection means that are listed, that are part of listed equipment, or that are exothermically welded.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-84.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-87 Log #269 NEC-P05 **Final Action: Reject**
(250.10)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Ground clamps or other fittings shall be approved for general use without protection or shall be protected from ~~physical~~ damage as indicated in (1) or (2).
Substantiation: The word is superfluous. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: Protection against physical damage is a special term recognized by the NEC Style manual in Section 3.2.5.5.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-88 Log #1759 NEC-P05 **Final Action: Reject**
(250.14)

Submitter: Percy E. Pool, Verizon NS
Recommendation: Add new 250.14 as follows:
250.14 Routing. Bonding and grounding conductors shall not be any longer than necessary to complete the connection without disturbing the permanent parts of the installation and shall avoid unnecessary bends and loops.
Substantiation: 250.4(A)(1) and 250.4(B)(1) state: "…shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines …". This is not enforceable or inspectable.

One of the functions of the bonding and grounding conductors is to reduce potential differences between metallic parts. The ability to reduce potential differences is degraded if conductor has unneeded loops or bends. The proposed change will provide guidance to the installer and facilitate enforcement. The phrase "without disturbing the permanent parts of the installation" clarifies that this requirement is not intended to force drilling through concrete, walls, etc.
Panel Meeting Action: Reject Panel Statement: The requirements in the proposal are too subjective and would be difficult to implement. This text may be more suitable as a fine print note.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-89 Log #1889 NEC-P05 **Final Action: Reject**
(250.14)

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Add new 250.14 as follows:
250.14 Routing. Bonding and grounding conductors shall not be any longer than necessary to complete the connection without disturbing the permanent parts of the installation and shall avoid unnecessary bends and loops.
Substantiation: One of the functions of the bonding and grounding conductors is to reduce potential differences between metallic parts. For example, Sections 250.4 (A)(1) and 250.4 (B)(1) state: Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operation.

This ability to reduce potential differences is degraded if conductor has unneeded loops or bends. The proposed change will provide guidance to the installer facilitate enforcement. The phrase "without disturbing the permanent parts of the installation" emphasizes that this requirement is not intended to force drilling through concrete, walls, etc.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-88.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-90 Log #3389 NEC-P05 **Final Action: Accept**
(250.14 (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Insert a new Section 250.14 as follows:

250.14 Continuity of Grounded Conductors. The continuity of a grounded conductor shall not depend on a connection to a metallic enclosure, raceway, or cable armor.
Substantiation: There are instances where a grounded conductor is permitted to be connected to a metallic enclosure, as in the case of a main bonding jumper installed within service equipment. If that service equipment supplies a downstream panel that includes grounded circuits, the feeder will include a grounded circuit conductor. Nothing in the present NEC prohibits the unsound practice of terminating that grounded circuit conductor on an equipment grounding terminal on a separate equipment grounding busbar within the service equipment enclosure. The grounded conductor termination meets all the restrictions in 250.24 because it occurs within the service equipment. The wire or busbar limitation in 250.24(A)(4) addresses grounding electrode conductor connections, not this problem. No rules in Article 200 nor 300.13 address this problem either.

Nevertheless, under the conditions stated, a metal enclosure would now be employed as a grounded circuit conductor, with the circuit path running over the enclosure between the termination and the main bonding jumper. It is highly doubtful that what is essentially an equipment grounding connection would function as intended after it carries routine current, perhaps in the hundreds of amperes, over the life of the installation. This practice stands on its head the outstanding work done by CMP 5 over recent code cycles to fully divorce equipment grounding connections from applications that routinely carry load current. Routine load currents on grounded circuit conductors should be confined to conductors recognized in Article 310, or busbars, etc. This practice must be clearly prohibited. This proposal locates the prohibition in Part I because it is a potential issue any time a grounded/grounding interconnection is permitted within an enclosure, including 250.30(A)(1) and 250.32(B)(2).
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

MELLO, C.: The panel should have rejected this proposal. The intent is correct but the requirements are in the wrong Article. The grounded conductor is permitted or required to be connected to the grounding system under specific conditions in Article 250 so as to provide for the grounded conductor to also serve an equipment grounding function or to establish which conductor is the grounded conductor for a system. The example of the main bonding jumper being called a "grounded conductor" is a clear misapplication of terms and creates confusion. The connection of the grounded conductor in and out of any enclosure must be on a suitable conductor, as indicated in the proposal's substantiation, and not use the metal enclosure for the current carrying path.

5-91 Log #3645 NEC-P05 **Final Action: Accept in Part**
(250.20)

Submitter: Sergio Panetta, IPC Resistors.com
Recommendation: Amend 250.20 to read:

Alternating-Current grounded systems to Be Grounded.

Alternating-Current systems shall be grounded as provided for in 250.20(A), (B), (C), (D), **or (E)** ...
Substantiation: (E) is listed as a suitable form of grounding but excluded from the text.
Panel Meeting Action: Accept in Part

Revise Section 250.20, first sentence to read as follows:

Alternating-current systems shall be grounded as provided for in 250.20(A), (B), (C), (D), or (E) .
Panel Statement: There is no technical substantiation to change the title.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-92 Log #1107 NEC-P05 **Final Action: Accept in Principle**
(250.20(A)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add "or structure".
Substantiation: Edit. All structures are not deemed "buildings".
Panel Meeting Action: Accept in Principle
Revise 250.20(A)(3) to read as follows:

(3) Where installed outside as overhead conductors ~~outside of buildings~~
Panel Statement: This revision meets the intent of the submitter. The revised text resolves the issue of being outside of a building or structure.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

RAPPAPORT, E.: Deletion of buildings will expand the application of this requirement substantially without any specific public proposal or need. The submitter was looking for the addition of "structures" not the deletion of "buildings". "Overhead" is not defined in the NEC and does not necessarily mean "bare overhead conductors". As amended by the panel, all overhead conductors will be required to be grounded. This will include lighting systems operating at 30 volts or less as covered in Article 411.

Lighting operating at 30 volts or less sometimes requires overhead conductors. 411.5(A) mandates "Secondary circuits shall not be grounded". This is in conflict with 250.20(A). Also, this will prohibit the use of listed tools operated at 12 volts, ungrounded, for safety inside the vessels and tanks. Conductors to such vessels are routed overhead from the transformer to the vessels and tanks to avoid damage. As previously written, this requirement applied to only overhead conductors outside the buildings.

250.20(A) should either be deleted or amended to replace "shall be grounded" by "shall be permitted to be grounded". Primary intent of this requirement in 250.20(A) is for personnel safety. Contact with voltages below 50 volts is not considered to be a hazard even by OSHA. OSHA 1910.303(g)(2) requires guarding of live parts over 50 volts only for safety. Comments by users of the National Electrical Code are solicited to determine pros and cons of deletion or amending of 250.20(A), thereby not requiring mandatory grounding of systems below 50 volts.

5-93 Log #1582 NEC-P05 **Final Action: Accept**
(250.20(B)(2))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.20(B)(2):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(2) Where the system is 3-phase, 4-wire, wye connected in which the neutral conductor is used as a circuit conductor.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-94 Log #340 NEC-P05 **Final Action: Accept in Principle**
(250.20(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:

(D) Separately Derived Systems. Separately derived systems, as covered in 250.20(A) or (B), shall be grounded as specified in 250.30 (A) .

Substantiation: Grounded systems are required to be grounded in accordance with the requirements of 250.30(A). 250.30(B) provides the rules for ungrounded systems. This revision provides a more specific reference to the rules for grounded systems in 250.30(A) rather than referencing all of 250.30.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-95.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-95 Log #341 NEC-P05 **Final Action: Accept in Principle**
(250.20(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:

(D) Separately Derived Systems. Separately derived systems, as covered in 250.20(A) or (B), shall be grounded as specified in 250.30. Where an alternate source such as an on site generator is provided with transfer equipment that includes a grounded conductor that is not solidly interconnected to the service supplied grounded conductor, the alternate source (derived system) shall be grounded in accordance with 250.30(A).

FPN No. 1: An alternate ac power source such as an on-site generator is not a separately derived system if the grounded conductor neutral is solidly interconnected to a service-supplied system grounded conductor ~~neutral~~ . An example of such situations is where alternate source transfer equipment does not include a switching action in the grounded conductor and allows it to remain solidly connected to the service supplied grounded conductor when the alternate source is operational and supplying the load served.

FPN No. 2: For systems that are not separately derived and are not required to be grounded as specified in 250.30, see 445.13 for minimum size of conductors that must carry fault current.

Substantiation: This proposal is an effort to roll information contained in the fine print note into affirmative text to provide clear direction in the form of a rule where systems that meet this criteria are installed. It always seems to be a questionable item in the field where generators and transfer switches are installed and used. Having more concise and clear language in the rule and the additional text in FPN No. 1 will provide better direction for Code users. The proposed language may need to be adjusted editorially.

Panel Meeting Action: Accept in Principle

250.20(D) Separately Derived Systems. Separately derived systems, as covered in 250.20(A) or (B), shall be grounded as specified in 250.30 (A) . Where an alternate source such as an on site generator is provided with transfer equipment that includes a grounded conductor that is not solidly interconnected to the service supplied grounded conductor, the alternate source (derived system) shall be grounded in accordance with 250.30(A).

FPN No. 1: An alternate ac power source such as an on-site generator is not a separately derived system if the grounded conductor ~~neutral~~ is solidly interconnected to a service-supplied system grounded conductor ~~neutral~~ . An example of such situations is where alternate source transfer equipment does not include a switching action in the grounded conductor and allows it to remain solidly connected to the service supplied grounded conductor when the alternate source is operational and supplying the load served.

FPN No. 2: For systems that are not separately derived and are not required to be grounded as specified in 250.30, see 445.13 for minimum size of conductors that must carry fault current.

Panel Statement: "(A)" was added editorially after 250.30 in the first sentence from Proposal 5-94 and the word neutral in FPN No. 1 was struck through.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

TOOMER, R.: The usage 'an example is where' in FPN No. 1 is awkward and non-standard. It would be clearer if the two sentences were combined as "An alternate ac power source such as an on-site generator is not a separately derived system if the grounded conductor is solidly interconnected to a service-supplied system grounded conductor and is not disconnected by the switching action of alternate source transfer equipment."

5-96 Log #1583 NEC-P05 **Final Action: Reject**
(250.20(D), FPN 1)

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.20(D) FPN No. 1:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

FPN No. 1: An alternate ac power source such as an on-site generator is not a separately derived system if the neutral conductor is solidly interconnected to a service-supplied system neutral conductor .

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-95, which removed the word "neutral" from the FPN.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-97 Log #672 NEC-P05 **Final Action: Reject**
(250.21)

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:

250.21 Exception: Systems of less than ~~120 volts to ground~~ 150 volts phase to phase as permitted by this Code shall not be required to have ground detectors.

Substantiation: The requirement is for non-grounded systems in a non-grounded system theoretically there are zero volts to ground.

Panel Meeting Action: Reject
Panel Statement: Accepting this change would permit ungrounded 120 volt circuits without ground detection. The definition of Voltage to ground indicates that for ungrounded circuits, the voltage to ground is the greatest voltage between the given conductor and any other conductor of the circuit.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-98 Log #3391 NEC-P05 **Final Action: Accept in Principle**
(250.21)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the exception following the concluding paragraph; revise the concluding paragraph as follows:

Ungrounded alternating current systems operating at 120 volts to 1000 volts to ground shall have ground detectors installed on the system.

Substantiation: This is an editorial proposal aimed at simplifying what should be a simple requirement. This wording incorporates the exception, and leaves the control circuit ground detector requirement intact, that applies regardless of voltage.

Panel Meeting Action: Accept in Principle

Proposed Revised Text:

250.21 Alternating-Current Systems of 50 Volts to 1000 Volts Not Required to Be Grounded.

<u>(A) General.</u> The following ac systems of 50 volts to 1000 volts shall be permitted to be grounded but shall not be required to be grounded:

(1) Electric systems used exclusively to supply industrial electric furnaces for melting, refining, tempering, and the like

(2) Separately derived systems used exclusively for rectifiers that supply only adjustable-speed industrial drives

(3) Separately derived systems supplied by transformers that have a primary voltage rating less than 1000 volts, provided that all the following conditions are met:

a. The system is used exclusively for control circuits.

b. The conditions of maintenance and supervision ensure that only qualified persons service the installation.

c. Continuity of control power is required.

~~d. Ground detectors are installed on the control system.~~

(4) Other systems that are not required to be grounded in accordance with the requirements of 250.20(B).

~~Where an alternating-current system is not grounded as permitted in 250.21(1) through (4), ground detectors shall be installed on the system.~~

~~Exception: Systems of less than 120 volts to ground as permitted by this Code shall not be required to have ground detectors.~~

<u>(B) Ground Detectors. Ungrounded alternating current systems as permitted in 250.21(A)(1) through (A)(4) operating at 120 Volts to 1000 Volts to ground shall have ground detectors installed on the system.</u>

Panel Statement: The additional reference in 250.21(3)(d) for ground detectors is deleted since this is now a universal requirement when the voltage of the system is above 120 volts. The proposed text is modified to ensure the cross reference back to those systems as permitted under this section having the requirement for ground detectors. The exception was changed into positive text. The section was renumbered and titles were added to conform to the NEC Style Manual.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-99 Log #2908 NEC-P05 **Final Action: Reject**

(250.22(2))

Submitter: Peter D. Noval, Jr., Philadelphia, PA

Recommendation: Revise text to read as follows:

(2) Circuits in health care facilities as provided in ~~517.61~~ <u>517.62</u> and 517.160.

Substantiation: The exception to 517.62 directly addresses circuits not to be grounded. 517.61 makes no such reference.

Panel Meeting Action: Reject

Panel Statement: Section 517.61(A)(1) specifically addresses power circuits in the flammable anesthetizing location and requires isolation from the supply distribution system. The reference from 517.61 to 517.160 provides the user the necessary requirement that these circuits are not permitted to be grounded.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-100 Log #1205 NEC-P05 **Final Action: Accept**

(250.22(5) (New))

Submitter: James Tente, City of Naperville

Recommendation: Add new text to read as follows:

(5) Secondary circuits of lighting systems as provided in 680.23(A)(2).

Substantiation: Items specified in 250.22(1) through (4) are referenced to sections in Chapters 5 and 6. Ungrounded secondary circuit requirements for swimming pool lighting in Chapter 6 as well. If these referenced in 250.22 were included for usability,then this new reference helps usability also.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-101 Log #127 NEC-P05 **Final Action: Reject**

(250.24(A)(3))

Submitter: Wayne Webb, Town of Prescott Valley, Arizona

Recommendation: Revise as follows:

For multiple services that are "freestanding" and independent of each other and dedicated to separate equipment located in close proximity to each other, the grounding electrode systems of all systems shall be connected or shared.

Substantiation: In the case of multiple, separate services installed in close proximity, there can be a possibility of step voltage occurring between separately grounded services. This would reduce this possibility. I have encountered this circumstance in relation to separate Telco and cellular services placed near each other and grounded independently. Gradient fault currents could potentially be present in an event, and this would prevent or reduce the possibility of injury or death.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided substantiation for step potential concerns.

The phrase "in close proximity" is vague and would be difficult to enforce.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-102 Log #2393 NEC-P05 **Final Action: Reject**

(250.24(A)(5), FPN)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise text to read:

250.24 Grounding Service-Supplied Alternating-Current Systems.

(A) System Grounding Connections. A premises wiring system supplied by a grounded ac service shall have a grounding electrode conductor connected to the grounded service conductor, at each service, in accordance with 250.24(A)(1) through (A)(5).

(5) Load-Side Grounding Connections. A grounding connection shall not be made to any grounded conductor on the load side of the service disconnecting means except as otherwise permitted in this article.

FPN: See 250.30(A) for separately derived systems ~~, 250.32 for connections at separate buildings or structures~~ , and 250.142 for use of the grounded circuit conductor for grounding equipment.

Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this FPN will need to be revised as well.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 5-119. The reference to 250.32 is still appropriate.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-103 Log #1707 NEC-P05 **Final Action: Accept**

(250.24(D))

Submitter: Danny Thomas, Henderson, NC

Recommendation: Add a new sentence at the end of the first paragraph to read as follows:

<u>This conductor shall be sized in accordance with 250.66.</u>

Substantiation: 250.24(B) tells us where to go to size the "main bonding jumper" and 250.24(C)(1) and (2) tells us how to size the "grounded conductor", therefore, I feel that alerting the code user to how we size the grounding electrode conductor early on in Article 250 makes the Code much more user friendlier.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-104 Log #1238 NEC-P05 **Final Action: Reject**

(250.24(E))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Insert "rigid" ahead of "metal" in the last sentence.

Substantiation: Edit. 230.43 permits flexible metal enclosures for service conductors, which are not suitable.

Panel Meeting Action: Reject

Panel Statement: Use of the term "rigid" is not approprate for all enclosures that are applicable for this section.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-105 Log #2189 NEC-P05 **Final Action: Reject**

(250.26)

Submitter: Dann Strube, Strube Consulting

Recommendation: Relocate 250.26 as 250.21 and renumber 250.21 and 250.22 as needed.

Substantiation: This change places 250.26 next to the section where it is used.

Panel Meeting Action: Reject

Panel Statement: Sections 250.21 and 250.22 both refer to systems not to be grounded. Section 250.24 initiates discussion on how to ground. The next logical step is which conductor to ground. Therefore, the panel concludes that 250.26 is in the appropriate location and should continue to directly follow 250.24.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

DOBROWSKY, P.: The proposal should be accepted. Relocating this section immediately following 250.20 make sense as this is the section it relates to. If you are not grounding the system then which conductor "would be used" if the system was grounded does not matter.

5-106 Log #910 NEC-P05 **Final Action: Reject**
(250.26(5))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:
"Multiphase systems in which one phase is used as in (2) - the ~~neutral~~ mid-phase connected conductor.
Substantiation: Edit. In a 4-wire delta connected system the voltage between the grounded conductor and the phase conductors are not equal; can this conductor be called a neutral?
Panel Meeting Action: Reject
Panel Statement: This proposal is not editorial. The proposed changes do not add clarity to or improve usability of this section. A new term (mid-phase connected) is introduced to users that might not be clearly understood. The current language used in this section clearly indicates which conductor of high-leg systems is required to be grounded. Also, see panel action and statement on Proposal 5-36.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-107 Log #2012 NEC-P05 **Final Action: Accept in Principle**
(250.28(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(D) Size. Main bonding jumpers and system bonding jumpers shall be sized in accordance with 250.28(D)(1) through (D)(3) .
(1) Main bonding jumpers and system bonding jumpers shall not be smaller than the sizes shown in Table 250.66. Where the supply conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum, the bonding jumper shall have an area that is not less than 12 1/2 percent of the area so the largest phase conductor except that, where the phase conductors and the bonding jumper are of different materials (copper or aluminum), the minimum size of the bonding jumper shall be based on the assumed use of phase conductors of the same material as the bonding jumper and with an ampacity equivalent to that of the installed phase conductors.
(2) Where a service consists of more than a single enclosure as permitted in 230.71(A), the main bonding jumper for each enclosure shall be sized in accordance with 250.28(D)(1) based on the largest ungrounded service conductor serving that enclosure.
(3) Where a separately derived system supplies more than a single enclosure, the system bonding jumper for each enclosure shall be sized in accordance with 250.28(D)(1) based on the largest ungrounded service conductor serving that enclosure or a single system bonding jumper shall be installed at the source and sized in accordance with 250.28(D)(1) based on the equivalent size of the largest supply conductor determined by the largest sum of the areas of the corresponding conductors of each set.
Substantiation: This proposal adds language to help clarify sizing requirements for main bonding jumpers and system bonding jumpers where the service disconnecting means or the first system overcurrent device for separately derived systems consists of more than a single enclosure. The proposal provides users with clear criteria to use for determining the minimum sizes where multiple enclosures are used for either situation.
Panel Meeting Action: Accept in Principle
Revise text of the recommendation to read as follows:
(D) Size. Main bonding jumpers and system bonding jumpers shall be sized in accordance with 250.28(D)(1) through (D)(3) .
(1) Main bonding jumpers and system bonding jumpers shall not be smaller than the sizes shown in Table 250.66. Where the supply conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum, the bonding jumper shall have an area that is not less than 12 1/2 percent of the area so the largest phase conductor except that, where the phase conductors and the bonding jumper are of different materials (copper or aluminum), the minimum size of the bonding jumper shall be based on the assumed use of phase conductors of the same material as the bonding jumper and with an ampacity equivalent to that of the installed phase conductors.
(2) Where a service consists of more than a single enclosure as permitted in 230.71(A), the main bonding jumper for each enclosure shall be sized in accordance with 250.28(D)(1) based on the largest ungrounded service conductor serving that enclosure.
(3) Where a separately derived system supplies more than a single enclosure, the system bonding jumper for each enclosure shall be sized in accordance with 250.28(D)(1) based on the largest ungrounded feeder conductor serving that enclosure or a single system bonding jumper shall be installed at the source and sized in accordance with 250.28(D)(1) based on the equivalent size of the largest supply conductor determined by the largest sum of the areas of the corresponding conductors of each set.
Panel Statement: The panel changed the word "service" to "feeder" in the first sentence of (3) to correct an error.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-107a Log #CP502 NEC-P05 **Final Action: Accept**
(250.30(A))

Submitter: Code-Making Panel 5,
Recommendation: Revise to read as follows:
250.30(A) Grounded Systems. A separately derived ac system that is grounded shall comply with 250.30(A)(1) through (A)(8). Except as otherwise permitted in this article, a grounded conductor shall not be connected to ~~ground,~~ normally non-current carrying metal parts of equipment, ~~or~~ to equipment grounding conductors, or be reconnected to ground ~~A grounding connection shall not be made to any grounded conductor~~ on the load side of the point of grounding of a separately derived system ~~except as otherwise permitted in this article~~ .
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified section 250.30(A) to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. These panel changes clarify the present requirement in more prescriptive language. This proposed revision adds more specific restrictions of the grounded conductor connections to any ground connection on the load side of the service disconnect. No other technical changes to the section are proposed, just clarification. Correlated with the text in 250.24(A)(5) from Proposal 5-61. Revisions were made to ensure consistency between the rules for services and separately derived systems.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-108 Log #2394 NEC-P05 **Final Action: Reject**
(250.30(A))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
250.30 Grounding Separately Derived Alternating-Current Systems.
(A) Grounded Systems. A separately derived ac system that is grounded shall comply with 250.30(A)(1) through (A)(8). A grounding connection shall not be made to any grounded circuit conductor on the load side of the ~~point of grounding~~ system bonding jumper of the separately derived system except as otherwise permitted in this article.
FPN: See ~~250.32 for connections at separate buildings or structures, and~~ 250.142 for use of the grounded circuit conductor for grounding equipment.
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this FPN will need to be revised as well. This change also correlates the code language of the existing text with new term "system bonding jumper", introduced in the 2005 cycle.
Panel Meeting Action: Reject
Panel Statement: The existing language correctly indicates the panel's intent for grounding connection not to be made on the load side of the point of grounding. See panel action and statement on Proposal 5-119. The reference to 250.32 is still appropriate.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-109 Log #1441 NEC-P05 **Final Action: Reject**
(250.30(A)(4))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
(4) Remain unchanged
Exception No. 1: Remain unchanged
Exception No. 2: Remain unchanged
(a) Common Grounding Electrode Conductor Size. The common grounding electrode conductor shall not be smaller than 3/0 AWG copper or 250 kcmil aluminum
Exception: The common grounding electrode conductor shall be permitted to be sized in accordance with 250.66(A), (B) or (C), as applicable .
(b) Remain unchanged.
Substantiation: As written, the common grounding electrode conductor would have to be 3/0 AWG, regardless of the type of electrode employed. The allowances in 250.66(A), (B), and (C) should be permitted, depending upon the type of electrode used for the separately derived systems.
Panel Meeting Action: Reject
Panel Statement: There is no technical substantiation to eliminate Section 250.30(A)(4)(c).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:
BOKSINER, J.: While, I agree with Panel Statement regarding the entire proposal, the proposed exception is consistent with the sizing requirements in 250.66 and should be accepted.
BRETT, JR., M.: I do not believe it was the intent of the submitter to delete 250.30(A)(4)(c), therefore, I believe the panel statement is incorrect. However, the submitter is correct that there is no technical substantiation for requiring that the grounding electrode conductor be larger than required by 250.66.

RAPPAPORT, E.: The proposal should have been Accepted.

The panel statement does not technically address the submitter's proposal. The submitter's substantiation is correct. It is not technically defensible to require a larger grounding electrode conductor for separately derived systems than would be required for a service. The same requirements that apply to a grounding electrode conductor in 250.66(A), (B), and (C) are applicable to 250.30(A)(1) and (2) but not for (C). For instance, what is the technical basis for requiring a 3/0 AWG copper grounding electrode conductor for connection to a concrete encased electrode in 250.30(A) when 250.66(B) for connection based on Service Entrance conductor states that "...shall not be required to be larger than 4 AWG copper wire"? If a #4 AWG copper connection to a concrete encased electrode is acceptable based on Service Entrance conductors [250.66(B)], it should also be acceptable for a separately derived system defined in 250.30(A).

When this provision (requiring 3/0 AWG for multiple separately derived systems) was originally introduced, it was argued that: What if...? What if more separately derived systems are added onto the common grounding electrode conductor? Will the grounding electrode conductor be large enough? The answer is that the common grounding electrode conductor needs to be large enough for the largest separately derived system connected to it - not the sum of all system capacities. The reason is that the purpose of the grounding electrode conductor is for system grounding - not ground fault current. System grounding provides for stabilization of voltage, for lightning current discharge to ground, and for fault current path in the event of a transformer failure due to secondary conductor contact with a higher voltage system. All of these items are singular in nature because it is not probable that a lightning strike or a high voltage contact to secondary conductors will occur on more than one system at a time. System stabilization requires very minimal current. It, therefore, follows that the common grounding electrode conductor should be sized for the largest separately derived system to be connected to it. In addition, since the grounding electrodes referencedin 250.66(A), (B), and (C) have limited current carrying capability as evidenced by the maximum required conductor connection, it also follows that any grounding electrode conductor, whether from a service or a separately derived system, should also be bound by the same rules.

5-110 Log #1649 NEC-P05 **Final Action: Accept**
(250.30(A)(4))

Submitter: Jim Davis, Electrical Education Services, LLC
Recommendation: Add new text as follows:

250.30(A)(4) Grounding Electrode Conductor, Multiple Separately Derived Systems. Where more than one separately derived system is installed, it shall be permissible to connect a tap from each separately derived system to a common grounding electrode conductor. Each tap conductor shall connect the grounded conductor of the separately derived system to the common grounding electrode conductor. The grounding electrode conductors and taps shall comply with 250.31(A)(4)(a) through (A)(4)(c). <u>This connection shall be made at the same point on the separately derived system where the system bonding jumper is installed.</u>

Substantiation: The 2005 NEC provides guidance on where to make the GEC connection for SINGLE SEPARATELY DERIVED SYSTEMS in 250.30(A)(3), but does not do so for multiple separately derived systems anywhere in 250.30(A)(4). The addition of this text will provide such needed guidance and reduce possible confusion for code users.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-111 Log #449 NEC-P05 **Final Action: Reject**
(250.30(A)(4),(c) (1))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: Revise to read:

(1) A listed <u>irreversible compression-type</u> connector.

Substantiation: This change will assure compliance with 250.30(A)(5) and the referral therein to 250.64(C)(1) where the irreversible compression-type or the exothermic welding type of connections are required.
Panel Meeting Action: Reject
Panel Statement: Many listed connectors that are specifically listed for grounding and bonding are available as non-irreversible types.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

DOBROWSKY, P.: I support the panel's action on this proposal but believe other sections need to be modified also. Connectors that are specifically listed as grounding and bonding devices should be suitable for grounding electrode "splices" even if they are not irreversible.

5-112 Log #1972 NEC-P05 **Final Action: Reject**
(250.30(A)(4)(c)(1))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise as follows:

250.30(A)(4)(c) Connections. All tap connections to the common grounding electrode conductor shall be made at an accessible location by one of the following methods:

1. A <u>n</u> ~~listed~~ <u>irreversible compression</u> connector <u>listed as grounding and bonding equipment</u> .

Substantiation: During the 2005 cycle, the phrase "listed for the purpose" was removed. The code making panel failed to include this in the rewrite of the section. In addition, there was no technical substantiation provided that allows any type connector to be used. Irreversible compression connectors are more permanent than mechanical connectors, which was the rationale for this requirement. Grounding electrode conductors are expected to carry short time, high current due to exposed lightning. A listed connector is not tested to perform a short time, high current test to be listed. This revision makes this requirement the same as the 2002 NEC, before the rewrite.
Panel Meeting Action: Reject
Panel Statement: The panel determined that standard listed connectors have served this purpose inside of switchboards and panelboards for years as well as split bolt-type connectors for service grounding electrode conductor taps. Listed connectors should be required and not the restrictive connectors listed for grounding and bonding. In addition, the proposed text would now become even more restrictive where the connector would have to be a listed irreversible compression-type connector where there are other than irreversible compression-type connectors listed for grounding and bonding.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:

BRENDER, D.: It was pointed out by one Panel member, who is a manufacturer of these devices, that there is a difference between "listed irreversible compression connector" and "listed as grounding and bonding equipment", in that the latter must pass a high current test to be listed, while the former does not.

BRETT, JR., M.: I agree with the other explanations of negative votes.

STEINMAN, G.: Common grounding electrode conductors are expected to carry lightning induced current and fault current. Listed electrical connectors are not evaluated to carry short-time high current. Connectors listed as grounding and bonding equipment are evaluated to UL 467, Bonding and Grounding Equipment, which includes a short-time high current test. Irreversible compression type connectors are more permanent than mechanical type connectors. Because irreversible compression type connectors limit the installation variables when installed, it provides a more reliable connection.
Comment on Affirmative:

DOBROWSKY, P.: See my comment on 5-111.

5-113 Log #1078 NEC-P05 **Final Action: Reject**
(250.30(A)(4)a.)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:

(a) COMMON GROUNDING ELECTRODE CONDUCTOR SIZE . The common grounding electrode conductor shall ~~not be smaller than 3/0 AWG copper or 250 kcmil aluminum~~ <u>be sized in accordance with 250.66 based on the sum of the total circular mil area of the largest derived phase conductors from each separately derived system connected to the common grounding electrode conductor.</u>

Substantiation: Substantiation for a 3/0 or 250 cmil conductor seemed to be based primarily on the possibility of added systems, with no data indicating multiple system additions, or that previous size requirements were not being enforced. 90.1(B) indicates Code provisions are not necessarily for future expansions which this section obviously covers. Present requirement has no relationship to capacities. Two separately derived systems from two 1 kVA transformers would require a common 3/0 or 250 kcmil bonding conductor to other electrodes per 250.53, 250.58, and 250.104(D)(5). This rule does not correlate with 250.66(A) of reconnection to rod, pipe, or plate electrodes where the grounding electrode conductor does not have to be larger than 6 AWG copper or 4 AWG aluminum.
Panel Meeting Action: Reject
Panel Statement: The panel affirms its actions on this proposal through its actions and statements on Proposal 5-78 and Comment 5-61 in the 2005 NEC cycle. See panel action and statements to Comment 5-61 on page 70-150 of the 2004 NEC Report on Comments publication.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

DOBROWSKY, P.: The proposal should be accepted. Common grounding electrode conductors should be sized based on what is actually installed, not on some perceived expected future need.

5-114 Log #2190 NEC-P05 **Final Action: Reject**
(250.30(A)(7) Exception)

Submitter: Dann Strube, Strube Consulting
Recommendation: Add new text as follows:
Where the source of the separately derived system is located outside the building, at least one additional grounding connection shall be made from the derived grounded conductor to a grounding electrode, either at the source of the separately derived system or elsewhere outside the building.
Exception: The additional grounding connection shall not be made on high-impedance grounded neutral systems. The system shall meet the requirements of 250.36.
Substantiation: This proposal is an extension of my Proposal 5-88 (Log #1508) for the 2005 NEC. The language is derived from 250.24 for services.
The major purpose for a second electrode is to deal with lightning introduced into the system between the source and the building. If this is an issue for a service it is also an issue here.
The panel statement for my rejected 2005 proposal was full of defective logic. Some, but not all services are run in steel raceways providing an equipment grounding conductor. The same is true of derived systems. It is not true that all derived system have a grounding conductor between the source and the building. In fact, 250.142 deals with this quite well.
The panel statement indicates that an outdoor transformer is a structure. A transformer is not a structure. It is, in fact,equipment. Chapter 4 covers equipment for general use and Article 450 is part of Chapter 4. While a transformer may meet the definition of structure, it also clearly meets the definition of equipment.
The panel statement indicated that bonding at two points is limited to cases where a parallel path is not created. The fact is it is not necessary to bond in order to connect the neutral to earth.
If you persist with the concept that a transformer is a structure, you raise a major issue with Article 225. 225.32 covers the location of disconnects and, therefore, it would require a disconnect at each outdoor transformer. Since the disconnect cannot be inside the transformer, it will need to be mounted on the outside of the transformer case.
The rule for derived system must be the same as the rule for service. In both installations, there may be parallel paths established. The real question here is not parallel paths. The question is do I want lightning or high-voltage crossovers or do I put up with the parallel path?
Panel Meeting Action: Reject
Panel Statement: The panel determined that mandatory connection of the grounded conductor at the outside transformer would unnecessarily restrict the options provided in 250.30 on grounding of separately derived systems.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
BRENDER, D.: The proposal should have been accepted as the substantiation is correct. The ownership of many existing electrical installations is being transferred to property owners as electric utilities move back toward the property line. The rules in 250.24(A)(2) for the installation of services mandate the installation of a grounding electrode(s) if a transformer is located outdoors. Why shouldn't the rules for the owner's premises wiring system offer identical safety rules?
DOBROWSKY, P.: The proposal should be accepted. Some interpret an outside transformer as a structure and some do not.

5-115 Log #2191 NEC-P05 **Final Action: Reject**
(250.30(A)(7) Exception No. 1)

Submitter: Dann Strube, Strube Consulting
Recommendation: Change Exception No. 1 back into 250.3(A)(7) List Item 3. Renumber Exception No. 2.
Substantiation: This returns the section to the format used in the 2002 NEC. As an exception, the "near as practicable" condition of the main rule would not apply to these other electrodes. In the old format, the "near as practicable" condition would still apply to other electrodes. An alternate solution would be to add the "near" language to the existing exception.
Panel Meeting Action: Reject
Panel Statement: The panel reaffirms its actions on Proposal 5-78 (Log #1725) in the 2005 NEC cycle. The proposal does not add clarity or improve usability of this section. The work of the task group on revising Section 250.30(A) in the 2005 NEC cycle should be upheld. As near as practicable, it applies to Exception No. 1 as well.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: The proposal should be accepted. The submitter has a point and the proposed language is clearer.

5-116 Log #932 NEC-P05 **Final Action: Reject**
(250.30(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:
(B) The <u>exposed noncurrent-carrying metal parts of enclosures, raceways, cables, and</u> equipment of an ungrounded separately derived system <u>supplied by a stand-alone power source such as an engine-generator, or wind-driven generator</u> , shall be grounded as specified in 250.30(B)(1) and (B)(2).
Revise last sentence of (1):
This connection shall be made at ~~any point on~~ the source of the separately derived system. ~~From the source to the first system disconnecting means.~~
Substantiation: The unmodified word "equipment" is too general, including material, conductors, devices, fuses, etc., which cannot be grounded, and equipment which has no exposed metal parts. If an EGC is connected at the first system disconnecting means which is supplied and grounded by conductors in a metal raceway or cable approved for grounding or by a separate grounding conductor, it is no different than a connection anywhere on the system.
Panel Meeting Action: Reject
Panel Statement: This proposal lessens the current requirements without substantiation. The submitter provided no technical or practical substantiation to support why grounding non-current-carrying metal parts should be a requirement limited to those that are exposed. They should be grounded whether exposed or not. No substantiation has been provided to require the grounding conductor connection to the electrode to be limited to being made only at the source enclosure.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-117 Log #1114 NEC-P05 **Final Action: Reject**
(250.30(B)(1)and Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence of (1):
This connection shall be made at ~~any point on~~ the source of the separately derived system ~~from the source to the first system disconnecting means.~~
<u>Exception: Where the separately derived system power source is supped by a circuit originating in the same building or structure and is grounded in accordance with (250.118) (Part IV), a grounding electrode conductor shall not be required</u> . Alternate choices in parentheses.
Substantiation: If the GEC is connected at the first (separate) system disconnect which is supplied by conductors in a metal raceway or cable approved for grounding or by a separate wire-type equipment grounding conductor, this would be no different than a connection anywhere to a metal enclosure in the system and no different from grounding the source metal by an equipment grounding conductor run with the supply circuit to a transformer. Equipment grounding is already required by Part IV. This GEC does not stabilize any voltage or minimize transient voltages. Other purposes of the GEC to protect from lightning or contact with higher voltage systems are not unique to separately derived systems. If a transformer for a separately derived system is installed two feet from a primary disconnecting means in a service equipment panelboard there are essentially two GEC for the same equipment. A 500 va transformer (ungrounded system per 411.5) with 12 AWG conductors requires a No. 8 AWG copper EGC even though the transformer enclosure is grounded with an equipment grounding conductor in the supply circuit. If two such transformers are connected to a common GEC it has to be 3/0 copper or 250 kcmil aluminum. Three phase 3-wire delta systems are not required to be grounded even if possibly subject to lightning or transient overvoltages.
Panel Meeting Action: Reject
Panel Statement: The proposed change lessens the current minimum requirements of this section. The submitter provided no technical substantiation to remove the requirement for a grounding electrode for a separately derived system that is ungrounded. The reference in the submitter's substantiation provides a reference to Section 250.118 which covers the types of acceptable equipment grounding conductors. Equipment grounding is required for equipment supplied by separately derived systems whether they are grounded systems or not in accordance with Parts IV and VI of Article 250. This equipment grounding conductor connection does not relieve the requirement for eliminating the required grounding electrode and grounding electrode conductor for an ungrounded system.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-118 Log #1329 NEC-P05 **Final Action: Accept in Principle**
(250.32)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
250.32 Buildings or Structures Supplied by Feeder(s) or Branch Circuit(s).
(A) Grounding Electrode. Building(s) or structure(s) supplied by feeder(s) or branch circuit(s) shall have a grounding electrode or grounding electrode system installed in accordance with 250.50. The grounding electrode conductor(s) shall be connected in accordance with 250.32(B) or (C). Where there is no existing grounding electrode, the grounding electrode(s) required in 250.50 shall be installed.
Exception: A grounding electrode shall not be required where only a single branch circuit, either 2-wire or multiwire , supplies the building or structure and the branch circuit includes an equipment grounding conductor for grounding the conductive non–current-carrying parts of equipment. ~~For the purpose of this section, a multiwire branch circuit shall be considered as a single branch circuit.~~
Substantiation: Article 100 clearly indicates that a multiwire Branch Circuit is to be considered a single circuit, even if this single circuit supplies multiple loads, as is the case with a 3 wire branch circuit supplying two lighting loads. Since a multiwire branch circuit is always considered a single circuit, the last sentence of 250.32 exception is not needed.
Panel Meeting Action: Accept in Principle
Revise only the exception to 250.32(A) to read as follows:
Exception: A grounding electrode shall not be required where only a single branch circuit, including a multiwire branch circuit, supplies the building or structure and the branch circuit includes an equipment grounding conductor for grounding the conductive non–current-carrying parts of equipment. ~~For the purpose of this section, a multiwire branch circuit shall be considered as a single branch circuit.~~
Panel Statement: The revised wording adds clarity to the code.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-119 Log #2395 NEC-P05 **Final Action: Accept in Principle**
(250.32)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
250.32 Buildings or Structures Supplied by Feeder(s) or Branch Circuit(s).
(A) Remain unchanged.
(B) Grounded Systems. For a grounded system at the separate building or structure, the connection to the grounding electrode and grounding or bonding of equipment, structures, or frames required to be grounded or bonded shall comply with ~~either~~ 250.32(B)(1) ~~or (B)(2)~~ .
(1) Equipment Grounding Conductor. An equipment grounding conductor as described in 250.118 shall be run with the supply conductors and connected to the building or structure disconnecting means and to the grounding electrode(s). The equipment grounding conductor shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded. The equipment grounding conductor shall be sized in accordance with 250.122. Any installed grounded conductor shall not be connected to the equipment grounding conductor or to the grounding electrode(s).
~~(2) Grounded Conductor. Where (1) an equipment grounding conductor is not run with the supply to the building or structure, (2) there are no continuous metallic paths bonded to the grounding system in each building or structure involved, and (3) ground fault protection of equipment has not been installed on the supply side of the feeder(s), the grounded conductor run with the supply to the building or structure shall be connected to the building or structure disconnecting means and to the grounding electrode(s) and shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded. The size of the grounded conductor shall not be smaller than the larger of either of the following:~~
~~(1) That required b y 220.61.~~
~~(2) That required by 250.122.~~
Substantiation: There are many, many issues that need to be addressed in this Code allowance. First, the allowance itself is very restrictive, when you look at the parameters that must be followed in order to use this allowance. Consider item (2), which requires that no continuous metal paths are installed between the structures. This is too difficult to enforce, when this permission has been used, only to have another tradesperson install such a metal path after the original installation. While I understand that Panel 5 cannot predict future violations, I think some proactive thinking is in order here. Panel 5 exercised good judgment last code cycle when it set forth the sizing requirements for a common grounding electrode conductor for multiple separately derived systems, based on the possibility of a future change to premises wiring system [250.30(A)(4)(a)]. Such logic should be used once again for this code rule, which is not only difficult to enforce, but also could create very significant hazards.
In addition to the enforcement issues, let us examine the safety issues that might result from this rule:
Multiple neutral-to-ground connections, that would occur if parallel continuous metallic paths are installed at a later date, create a condition where neutral current and ground-fault current will flow through conductive metal parts of a building or electrical system. This current flow can cause death from electric shock and property damage from fires. Preventing these two issues is the very purpose of the Code, as set forth in 90.1(A).
Electric Shock - Electric shock can occur if the feeder grounded conductor to a separate structure is open because the allowed neutral-to-ground connection permits neutral current to flow onto the metal parts of the electrical system.
Electric Shock from No Safety Ground. If the feeder grounded conductor is open, the low-impedance path used to clear ground-fault current is lost. Under this condition, a ground-fault will not be cleared and all metal parts of the electrical system will be energized to line-voltage.
Fire. A fire is created when heat is sufficient to cause ignition. In electrical systems, heat is generated whenever current flows. The temperature rise is dependent on the square of the current flow (I) and the resistance of the material (R), as well as the duration of the current flow (12R). A neutral-to-ground connection (even if it meets the NEC requirements) can cause a fire, and sometimes an explosion, due to an electric arc if the grounded conductor is open.
When the grounded conductor is open, neutral current flows onto the metal parts of the electrical system because a neutral-to-ground connection is allowed within the structure disconnect enclosure. When the grounded conductor is opened in wood frame construction, neutral current seeking a return path to the power supply travels into the moist wood members. After many years, the wood is converted into charcoal (wood with no moisture) because of the heat generated from the current flow. The ignition temperature of the wood is decreased and the temperature of the wood is increased because of neutral current.
For the purposes of correlation, companion proposals have been submitted to the following sections:
250.134, 250.24, 250.30, 250.142, 338.10(B), 450.5, 501.30, 502.30, 503.30, 505.25, 506.25, 547.9, 550.33, and 551.76.
Panel Meeting Action: Accept in Principle
Revise 250.32(B)(2) into an exception to read as follows:
Exception: For existing premises wiring systems only, new or existing buildings or structures only, the grounded conductor run with the supply to the building or structure shall be permitted to be connected to the building or structure disconnecting means and to the grounding electrode(s) and shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded where all the requirements of (1), (2), and (3) are met:
(1) An equipment grounding conductor is not run with the supply to the building or structure,
(2) There are no continuous metallic paths bonded to the grounding system in each building or structure involved, and
(3) Ground-fault protection of equipment has not been installed on the supply side of the feeder(s),
Where the grounded conductor is used for grounding in accordance with the provision of this exception, ~~T~~ t he size of the grounded conductor shall not be smaller than the larger of either of the following:
(1) That required by 220.61
(2) That required by 250.122
Panel Statement: The panel does not accept the concept of deleting Section 250.32(B)(2) from the NEC. There are instances where this method of grounding for a separate building or structure is warranted and can be accomplished by compliance with the current provisions of the Code. The panel does accept the concept of continuation of migrating away from the use of the grounded circuit conductor for grounding as emphasized clearly by the submitter. By changing provisions in 250.32(B)(2) to an exception to a base rule in 250.32(B)(1), the code can continue to include requirements that would be applicable to existing buildings or structures grounded in this manner, and at the same time strengthen the requirement in 250.32(B)(1) as the main rule with having to qualify to use the method provided in the exception [former 250.32(B)(2)] which is more restrictive. This change as suggested by the submitter would help reduce the number of designs that purposely invite the possibilities of inappropriate neutral-to-ground connections that can and often do happen at a later date, which is uncontrollable by any code rule. Revise the proposed changes to retain the text of 250.32(B)(2), but incorporate those provisions into an exception to Section 250.32(B)(1). The change is consistent with they way the Code currently addresses the grounding of frames of existing dryers and ranges as provided in Sections 250.140 Exception, and 250.142, which is by exception. This action promotes code text that is consistent with Section 3.1.1 of the NEC Style Manual by removing a mandatory section that conflicts with another mandatory section.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
TOOMER, R.: Deletion of this provision in the code, which has been successfully used for many years, is not warranted by the submitter's substantiations. No specific safety incidents or evidence has been provided to warrant this major change.

5-120 Log #1298 NEC-P05 **Final Action: Accept**
(250.32(A))

Submitter: Joseph Whitt, JW Electric
Recommendation: Revise text to read:
250.32 Buildings or Structures Supplied by Feeder(s) or Branch Circuit(s).
(A) Grounding Electrode. Building(s) or structure(s) supplied by feeder(s) or branch circuit(s) shall have a grounding electrode or grounding electrode system installed in accordance with ~~250.50~~ Part III of 250 . The grounding electrode conductor(s) shall be connected in accordance with 250.32(B) or (C). Where there is no existing grounding electrode, the grounding electrode(s) required in 250.50 shall be installed.
Substantiation: As now worded, 250.32(A) only states that this grounding electrode is required to conform to the provisions of 250.50 and nowhere in 250.50 does it refer to 250.53(D) nor 250.56.
As an instructor of both electrical contractors and inspectors in the state of North Carolina, the most asked questions on grounding are about 250.32(A).
The questions I am always asked are:
What are the requirements for the grounding electrode system at a building or structure fed by a feeder? If a water pipe that is in contact with the earth for more than ten feet and then it is connected to a nonmetallic pipe is used as the grounding electrode is it required to conform with 250.53(D)?
If a ground pipe or rod is used as the electrode, is it required to conform to 250.56?
By adding that 250.32(A) must comply to Part III of 250 would be all encompassing and include the supplementary addition of another electrode outlined in 250.53(D)(2) and the resistance to ground of a rod, pipe, or plate found in 250.56. There would be conformity to the grounding electrode system between a feeder that supplies another building or structure and at a service.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-121 Log #3338 NEC-P05 **Final Action: Reject**
(250.32(A) Exception)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise the Exception to read as follows:
Exception: A grounding electrode at a separate building or structure shall not be required where no branch circuits originate at that building or structure. The branch circuit(s) shall include an equipment grounding conductor for grounding the noncurrent-carrying parts of all equipment.
Substantiation: This rewrite differs from the 2005 NEC in that a second building fed with branch circuits from another could be wired without a grounding electrode if there were none available. The 1996 NEC, without any published technical substantiation, removed the prior provision that an electrode had to be provided only if the second building itself supplied the multiple branch circuits (i.e., was supplied with a feeder.) This proposal assures that a suitable enclosure (usually a panelboard) is available to make the connection.
This proposal restores the allowance to omit the provision of a grounding electrode and GE conductor in those cases where there are multiple branch circuits, but they originate in the first building. This is very common in dwellings with detached garages. Although the 2005 NEC improved the situation somewhat, by allowing a multwired branch circuit under this allowance, it does not go far enough. A 20A receptacle circuit and a 15A lighting circuit, for example, are unlikely to have been multiwired. In addition, some detached buildings have even more circuits supplying them, all without a suitable enclosure for a grounding electrode connection.
Remember, for the usual case of grounding electrodes run outside raceways (or armored cable assemblies) the minimum size conductor is 6 AWG, and an installer must generally terminate this in a device box. Note that if a qualified grounding electrode is available, however, it must be used. That was required in the 1993 NEC and would be unchanged under this proposed revision.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposals 5-118. See also Section 225.30. The fundamental rule is a single branch circuit or a single feeder unless special conditions exist.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-121a Log #CP503 NEC-P05 **Final Action: Accept**
(250.32(B))

Submitter: Code-Making Panel 5,
Recommendation: Revise Section 250.32(B) as follows:
(B) Grounded Systems. For a grounded system at the separate building or structure, the connection to the grounding electrode, the ~~and~~ grounding and ~~or~~ bonding of equipment, structures, or frames required to be grounded and ~~or~~ bonded shall comply with either 250.32(B)(1) or (B)(2)
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. These panel changes clarify the present requirement in more prescriptive language. Revisions are to include both grounding and bonding rather than a choice of either by the use of the word “or” in this section. This action is correlated with Proposal 5-119.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-122 Log #2552 NEC-P05 **Final Action: Accept in Principle**
(250.32(B)(2))

Submitter: Edward Mitchell, City of Los Angeles, CA
Recommendation: Delete the following text:
~~(2) Grounded Conductor. Where (1) and equipment grounding conductor is not run with the...shall not be smaller than the larger of the following:~~
~~(1) That required by 220.61~~
~~(2) That require by 250.122~~
Substantiation: This section becomes more awkward with every code cycle and should be deleted for several reasons. It defies 250.24(A)(5) which prohibits a grounding connection to any grounded conductor on the load side of a service disconnecting means. A panelboard or a disconnect does not know if it exists in a “separate” building, so why are there separate rules? The very principle of electrical safety depends upon the grounding and grounded conductors being bonded only at the service (or separately derived system) and to be isolated from each other at all other times. When a building or structure is supplied by a feeder or branch circuit, run an equipment grounding conductor!!!
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-119.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
TOOMER, R.: See my Explanation of Negative for Proposal 5-119.

5-123 Log #1274 NEC-P05 **Final Action: Accept in Principle**
(250.32(B)(2))

Submitter: Jim Davis, Electrical Education Services, LLC
Recommendation: Revise as follows:
“ In existing installation w (~~W~~)here (1) an equipment grounding conductor is not run with the supply to the building or structure, (2) there are no continuous metallic paths bonded to the grounding system in each building or structure involved, and (3) ground-fault protection of equipment has not been installed on the supply side of the feeder(s), the grounded conductor run with the supply to the building or structure shall be connected to the building or structure disconnecting means and to the grounding electrode(s) and shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded.”
Substantiation: This proposed change intends to resolve conflict with the NEC Style Manual as well as within this section of the NEC, and to reduce confusion in the electrical industry. According to 3.1.1 of the 2003 NEC Style Manual, the use of the word “shall” indicates a mandatory NEC rule. As used in 250.32(B)(1), the word “shall” seems to REQUIRE the installation of an equipment grounding conductor to be run with the supply conductors to a separate building or structure. This requirement conflicts with present wording in 250.32(B)(2), which allows for installations without an EGC under certain circumstances, with some believing there is simply a choice of two allowed methods in new electrical installations.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-119.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
TOOMER, R.: See my Explanation of Negative for Proposal 5-119.

5-124 Log #1018 NEC-P05 **Final Action: Reject**
(250.32(B)(2)(2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Where there are no continuous metallic paths bonded to the grounding system in each building or structure involved, including grounded conductors or grounding conductors .
Substantiation: Edit. In addition to metallic paths provided by metal piping for example, it may be overlooked that grounded or grounding conductors at the supply source and the building supplied can provide a parallel path.
Panel Meeting Action: Reject
Panel Statement: The current language in this section covers all metallic paths. The proposal does not add clarity or improve the requirements of this section.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-125 Log #1282 NEC-P05 **Final Action: Accept**
(250.32(D))

Submitter: Mark R. Hilbert, State of New Hampshire
Recommendation: Add the following underlined text to the main paragraph:
(D) Where one or more disconnecting means supply one or more additional buildings or structures under single management, and where these disconnecting means are located remote from those buildings or structures in accordance with the provisions of 225.32, Exceptions 1 and 2, 700.12(B)(6), 701.10(B)(5) or 702.11 all of the following conditions shall be met:
Substantiation: The addition of this new text will correlate the important grounding and bonding conditions contained in 250.32(D) with the allowances to locate the building disconnecting means remote from the building or structure in 700.12(B)(6), 701.10(B)(5) and 702.11. The permission in these sections to locate the disconnecting means remote from the building or structure creates essentially the same condition that results from applying Exceptions 1 and 2 to 225.32. The inclusion of these sections into 225.32 will provide guidance as to how the grounding and bonding is to be performed when the disconnecting means for the alternate system is located remote from the building or structure. See the drawing I have provided.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Panel Statement: Editorially correct the reference from 701.10(B)(5) to 701.11(B)(5).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-125a Log #CP504 NEC-P05 **Final Action: Accept**
(250.32(D)(1))

Submitter: Code-Making Panel 5,
Recommendation: Revise Section 250.32(D)(1) as follows:
(1) The connection of the grounded conductor to the grounding electrode, to normally non-current-carrying metal parts of equipment, or to the equipment grounding conductor at a separate building or structure shall not be made.
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC.
Changes to Proposal from Grounding and Bonding Task Group:
The phrase "… shall be connected…" is the preferred requirement. Revised to add the words "normally" and "metal" to provided consistency with proposed revisions to the definition of equipment grounding conductor. Add the word "to" twice in the recommended text for clarity.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-126 Log #962 NEC-P05 **Final Action: Reject**
(250.34)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete present wording and substitute the following:
(A) PORTABLE AND VEHICLE-MOUNTED ALTERNATING CURRENT GENERATORS . The frame of a portable or vehicle- mounted generator shall not be required to be connected to a grounding electrode as defined in 250.52 for a system that is required or permitted to be grounded by 250.20 and supplied by the generator and shall be considered grounded under the following conditions:
(1) The generator supplies only equipment mounted on the generator or vehicle, cord-and-plug connected equipment through receptacles mounted on the generator or vehicle, or both, and
(2) The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame, and
(3) A system supply conductor specified in 250.26 shall be bonded directly to the generator frame ahead of any disconnecting means or overcurrent device(s) with a conductor in accordance with 250.28(A), (B), and (C) and sized in accordance with Table 250.66 for the derived phase conductors.
(4) A vehicle-mounted generator is bonded to the vehicle frame.
(B) PORTABLE AND VEHICLE-MOUNTED DIRECT-CURRENT GENERATORS . The frame of a vehicle-mounted direct-current generator shall not be required to be connected to a grounding electrode as defined in 250.52 for a system that is required or permitted to be grounded in 250.20, and supplied by the generator, and shall be considered grounded under the following conditions:
(1) the generator supplies only equipment mounted on the generator or vehicle, cord- and plug-connected equipment through receptacles mounted on the generator or vehicle, or both, and
(2) The non current-carrying exposed metal parts of equipment and the receptacle terminals for the connection of the equipment bonding conductor are bonded to the generator frame;
(3) A system negative polarity or neutral conductor is directly bonded to the generator frame ahead of any disconnecting means and overcurrent device(s) with a conductor sized in accordance with 250.166(A) and (B).
Substantiation: Unless these systems are specifically indicated to be considered grounded, color identification and other requirements for grounded conductors do not apply, nor can identified (grounded conductor) terminals of receptacles and equipment be reasonably assured of proper connection. There is no present requirement to bond a system conductor to the generator frame. Without a bond, there is no ground-fault current return path to operate overcurrent devices. If one conductor of the system shorts to portable or fixed equipment, the frame or equipment has the same potential; a short of another system conductor to a portable tool impresses the line voltage between the tool and frame or another tool. The proposal provides for a bond and specifies requirements for size which correlate with requirements for other separately derived ac systems and grounded dc systems. Present wording does not differentiate ac or dc generators, while Part VIII does.
Panel Meeting Action: Reject
Panel Statement: If the generator is not connected to earth, it is not considered grounded.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-127 Log #2551 NEC-P05 **Final Action: Reject**
(250.34(B))

Submitter: Edward Mitchell, City of Los Angeles, CA
Recommendation: Revise text to read as follows:
(2) The generator supplies only equipment located on the vehicle or cord-and plug-connected equipment through receptacles mounted on the vehicle, or both equipment located on the vehicle and cord- and plug-connected equipment through receptacles mounted on the vehicle or on the generator, or the generator is isolated from the earth and supplies power exclusively to portable wiring and equipment in compliance with Article 530 and...".
Substantiation: The motion picture industry employs trained, qualified persons to install all of their wiring and equipment. This wiring and equipment is used on a temporary basis for production purposes only. When the generator is the sole source of power for this equipment, it makes no difference in safety whether the equipment is plugged into receptacles mounted "directly" on the generator, or into receptacles mounted "remotely" from the generator; provided that all requirements of 250.34(B) are met, especially 250.34(B)(3) which requires equipment grounding all the way back to the generator frame which is bonded to the vehicle.
The motion picture industry frequently sets up and strikes their equipment at multiple locations during the course of a single day. Drilling holes in concrete to drive ground rods provides no additional electrical safety. The fact is they do NOT drive ground rods and they do NOT run a grounding electrode conductor for their single generator setups. There are no recorded incidents with the I. A.T.S.E Studio Electrical Lighting Technicians, Local 728 (Los Angeles County Jurisdiction), of problems with generators grounded as proposed. This proposal will bring the code language into line with the safe, practical application of generator grounding for the motion picture industry. This proposal was previously submitted to, and rejected by, code-making panel No. 15 (which regulates Article 530) because it deals with generator grounding.
Panel Meeting Action: Reject
Panel Statement: The submitter is proposing something that already applies. The submitter is proposing isolating the generator from the earth, which is the case with some portable or vehicle-mounted generators but is not practical or possible with others, depending on conditions at each unique installation. The proposal introduces language that would be difficult to enforce.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-128 Log #3503 NEC-P05 **Final Action: Reject**
(250.35 (New))

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Add a new section 250.35 as follows.
Permanently Installed Generators. The wiring methods supplied from permanently installed generators that are not separately derived systems shall include a conductor that provides an effective fault current path. This conductor shall either be a grounded conductor that is bonded to the generator frame or an equipment bonding jumper that is run with the supplying conductors. The conductor shall be sized in accordance with 250.102(C) based on the size of the derived phase conductors if they are on the supply side of the overcurrent device(s).If the overcurrent device is located on the generator the conductor shall be sized in accordance with 250.102(D).
Substantiation: Single phase 120/240V generators are commonly installed at dwellings as optional standby systems and are located outside of the building. If the generator is permanently installed, 250.34 doesn't apply.
Many transfer switch suppliers use 2 pole devices, I suspect because they are less expensive. Connected this way makes the generator "not" a separately derived system so 250.30 does not apply. Section 250.32 doesn't seem to apply either because the generator is not "supplied"- it is the "supply".
The service grounding electrode system grounds the system because the generator neutral is solidly connected to the service neutral.

Other that 250.4 there does not seem to be a specific requirement to provide an effective fault current path from the generator.

I'm not sure this is the best location for this requirement but it needs to be clarified. The issue of parallel paths might also need to be addressed such as they are in 250.32.

Panel Meeting Action: Reject

Panel Statement: The panel does not accept the concept of re-grounding the grounded conductor of generator systems that are not separately derived.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

MELLO, C.: The substantiation provided by the submitter clearly indicates a significant safety problem and also an area where the NEC is lacking guidance. There are clear requirements for connection of generators that are in fact separately derived systems but there is no direction on all the connections for non-separately derived systems for permanently installed units. This is particularly true when large generators are installed in parallel to separate paralleling switchgear, which contain both the generator disconnecting means and overcurrent protection. What are the requirements for connecting the generator frame to this switchgear enclosure since it is ahead of the overcurrent protection? This is the same case the panel clarified in the 2002 NEC for separately derived systems with the added equipment bonding jumper between the derived system and the first disconnecting means enclosure. While I agree with the panel's desire not to create another situation where the system grounded conductor is connected to ground again, creating possible parallel paths, the panel should have considered revised language to address the problem. The following language does address this issue and does address the panel's concern about reconnecting the grounded conductor to ground.

250.35 Permanently Installed Generators. A means that provides an effective ground fault current path shall be installed from a permanently installed generator(s) to the enclosure for the first disconnecting means in accordance with 250.35(A) and (B).

250.35(A) Bonding Means. Where the generator is a separately derived system the requirements in 250.30 shall apply. Where the generator is not a separately derived system, the generator shall be bonded to the disconnecting means enclosure by one of the following:

(1) Direct metal-to-metal attachment of the disconnecting means enclosure to the generator frame

(2) Installing the generator feeder conductors in rigid metal conduit, intermediate metal conduit, electrical metallic tubing or wireway

(3) Installing a wire type equipment bonding jumper between the generator terminal enclosure and the first disconnecting means enclosure.

250.35(B) Equipment Bonding Jumper Size. Where on the supply side of the generator overcurrent device, the conductor shall be sized in accordance with 250.102(C) based on the size of the derived phase conductors. Where on the load side of the overcurrent device, the conductor shall be sized in accordance with 250.102(D).

5-129 Log #1457 NEC-P05 **Final Action: Accept**
(250.36)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

250.36 High-Impedance Grounded Neutral Systems. High-impedance grounded neutral systems in which a grounding impedance, usually a resistor, limits the ground-fault current to a low value shall be permitted for 3-phase ac systems of 480 volts to 1000 volts where all the following conditions are met.

(1) The conditions of maintenance and supervision ensure that only qualified persons service the installation.

~~(2) Continuity of power is required.~~

~~(3)~~ <u>(2)</u> Ground detectors are installed on the system.

~~(4)~~ <u>(3)</u> Line-to-neutral loads are not served.

High-impedance grounded neutral systems shall comply with the provisions of 250.36(A) through (G).

Substantiation: Continuity is never required by the NEC. Rather, it is the inclination of the designer. Because of this, it is a design issue, and, therefore, should not be addressed in this code, per 90.1(C).

Panel Meeting Action: Accept

Panel Statement: The provision for "continuity or power" is not creating a Code requirement that continuity must be maintained, but the provision in 250.36(2) is one of the conditions that must be met when the designer is opting to use a high impedance grounded system. The condition that must be met as determined by the designer and accepted by the AHJ is that continuity of power is required.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-130 Log #3350 NEC-P05 **Final Action: Accept in Principle**
(250.36)

Submitter: Paul Dobrowsky, Holley, NY

Recommendation: Revise as follows:

250.36 High-Impedance Grounded Neutral Systems. High-impedance grounded neutral systems in which a grounding impedance, usually a resistor, limits the groundfault current to a low value shall be permitted for 3-phase ac systems of 480 volts to 1000 volts where all the following conditions are met:

(1) The conditions of maintenance and supervision ensure that only qualified persons service the installation.

~~(2) Continuity of power is required.~~

(2) ~~(3)~~ Ground detectors are installed on the system.

(3) ~~(4)~~ Line-to-neutral loads are not served.

Substantiation: The need for "continuity of power is required" should not be necessary to allow the use of high resistance grounding systems for personal safety. The vast majority of faults originate as line to ground faults because only one insulation failure can cause the fault. One presentation at the 2005 IEEE Electrical Safety Workshop indicated that 98% of faults originate as line to ground faults. Allowing this system to be used in other situations will help protect workers because the initial fault current will be significantly less resulting in considerably less potential incident energy exposure to a worker.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and substantiation on Proposal 5-129.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-131 Log #3643 NEC-P05 **Final Action: Reject**
(250.36(1))

Submitter: Sergio Panetta, IPC Resistors.com

Recommendation: Delete the following text:

250.36(1) requires the use of qualified personnel to service high resistance grounded installations.

Substantiation: We believe that all installations should be serviced by qualified personnel only. In fact it should be stated in the beginning of the NEC that only qualified personnel should service any electrical installations.

Panel Meeting Action: Reject

Panel Statement: No technical substantiation was provided to remove this requirement.

This type of system is not routine in premise wiring and therefore not familiar to all who do such work.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-132 Log #3644 NEC-P05 **Final Action: Accept in Principle**
(250.36(2))

Submitter: Sergio Panetta, IPC Resistors.com

Recommendation: Delete the following text:

250.36(2) allows the use of High Resistance grounding for service continuity.

Substantiation: The IEEE Green book states that high resistance grounding is chosen to reduce arc flash hazard. 250.186 allows high resistance grounded systems in higher voltages without the restrictions stated in 250.36.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposals 5-129 and 5-130.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-133 Log #1584 NEC-P05 **Final Action: Accept**
(250.36(A))

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 250.36(A):

Change "neutral" to "neutral conductor" in first two location. Change third appearance of "neutral" to "neutral point."

The revised text would appear as follows:

(A) Grounding Impedance Location. The grounding impedance shall be installed between the grounding electrode conductor and the system neutral <u>conductor</u> . Where a neutral <u>conductor</u> is not available, the grounding impedance shall be installed between the grounding electrode conductor and the neutral <u>point</u> derived from a grounding transformer.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

MELLO, C.: The panel action should have been to accept in principle. Changing the term "neutral" to "neutral conductor" is incorrect in accordance with the definition of the term "neutral conductor" accepted by the panel. Since this conductor is not expected to carry current, unbalanced or from non-linear loads, under normal conditions, then it cannot be called a neutral conductor. Adding the term "neutral point" is clearer and bypasses the necessity of naming this conductor, which may really be a bonding conductor or another variation of a grounding conductor. The revised text for the main section would then read as follows:

250.36(A) Grounding Impedance Location. The grounding impedance shall be installed between the grounding electrode conductor and the system neutral <u>point</u> . Where a neutral point is not available, the grounding impedance shall be installed between the grounding electrode conductor and the neutral <u>point</u> derived from a grounding transformer.

5-134 Log #1585 NEC-P05 **Final Action: Accept**
(250.36(D))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.36(D):

Delete "Neutral Conductor Routing". Replace with "Neutral Point to Grounding Impedance Conductor Routing".

The revised text would appear as follows:

(D) ~~Neutral Conductor Routing~~ <u>Neutral Point to Grounding Impedance Conductor Routing</u> . The conductor connecting the neutral point of the transformer or generator to the grounding impedance shall be permitted to be installed in a separate raceway. It shall not be required to run this conductor with the phase conductors to the first system disconnecting means or overcurrent device.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

The change in this section is proposed because according to the new definition of a "neutral conductor," the conductor between the neutral point of the supply and the grounding impedance is not a neutral conductor as it is not a circuit conductor.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

MELLO, C.: In this case, just deleting the term "neutral" is the best solution. The specific conductor being addressed is clarified by the first part of the first sentence, which states "The conductor connecting the neutral point of the transformer or generator to the grounding impedance", and does not need any additional label. The term neutral conductor as defined now is to carry current under certain normal conditions and in this application, the only time this conductor has current flow is under ground fault (abnormal) conditions. Deleting the term "neutral" altogether would have the section read as follows:

D) ~~Neutral~~ Conductor Routing. The conductor connecting the neutral point of the transformer or generator to the grounding impedance shall be permitted to be installed in a separate raceway. It shall not be required to run this conductor with the phase conductors to the first system disconnecting means or overcurrent device.

5-135 Log #132 NEC-P05 **Final Action: Reject**
(250.50)

Submitter: William Whitehead, City of Macon
Recommendation: Add a new statement:

Any new construction utilizing a concrete footing, Article 250.50(C) shall apply.

Substantiation: In many locations, there is a problem meeting a 25 ohm resistance or even good resistance. The Concrete-Encased Electrode will not likely be compromised by alterations or other means of compromise. I have applied CEE for several years.

Prior to the implementation of our requirement for Concrete-Encased Electrodes, we had many cases of residential customers who had electronics being damaged. In most cases, this was due to lightning but in some cases the problem was traced to lack of grounding electrodes. These were cases where there was only one rod type electrode. The application of required water pipe grounding helped, but in some cases the piping is of a nonmetallic piping.

In my area, there is an abundance of soft limestone at ground level. In other areas, there is sandy soil, both which do not lean to good grounding resistance. Likewise, there is a high corrosive content to the soil. I have seen pipe and galvanized rods, which were corroded to thin rods or pipe. Copper clad rods in many cases are hollowed out. Of course, this does not prohibit a copper-clad rod's performance but the galvanized are useless.

In 1999, my inspection jurisdiction began a push for Concrete-Encased Electrodes. During this period, we have not had one case of damage to electronics in one of these structures.

Presently, the enforcement language of NEC, 1999 *250-50 says that; If available on the premises at each building or structure served...

If there is another statement added to 250-50 which says; any new construction utilizing a concrete footing 250.50(C) shall apply.

Panel Meeting Action: Reject
Panel Statement: The submitter has not been specific in how the text is to be added, revised, or deleted.
The proposal does not meet the requirements of Section 4-3.3 Regulations Governing Committee Projects. The panel understands that the proposal uses the a 1999 Code reference.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-136 Log #2192 NEC-P05 **Final Action: Reject**
(250.50)

Submitter: Dann Strube, Strube Consulting
Recommendation: Add new sentence:

All electrodes used shall be installed in accordance with 250.53.

Substantiation: This change calls attention to 250.53 and should reduce the number of installation errors.
Panel Meeting Action: Reject
Panel Statement: Not all grounding electrodes in the system are installed. Some are inherent to the building construction and are established through the construction process. The concept of the proposal would provide only limited correlation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-137 Log #2642 NEC-P05 **Final Action: Accept in Principle**
(250.50)

Submitter: Robert A. Jones, IEC Texas Gulf Coast
Recommendation: Add a new sentence between first and second sentence of 250.50 to read:

Where multiple concrete-encased electrodes are present at a building or structure it shall be permissible to bond only one into the grounding electrode system.

Substantiation: Several foundations are designed with isolated rebar sections that meet the definition of a concrete-encased electrode. A pier and beam foundation may have several piers that are concrete-encased electrodes but are not tied together by any conductive path. 90.1 states "practical safeguarding" and requiring all of the concrete-encased electrodes to be bonded together is not practical.

If the piers or isolated sections of rebar did not meet the definition of a concrete-encased electrode, as in the case of encapsulated rebar or a vapor barrier between the concrete and earth, and none of the grounding electrodes described in 250.52(A)(1) through (A)(6) were present then one grounding electrode specified in 250.52(A)(4) through (A)(7) would be acceptable. Designers of residences and other structures will not hesitate to eliminate their concrete foundations as concrete-encased electrodes, by using encapsulated rebar or other means, if an NEC requirement adds unnecessary cost or increases the time to complete a foundation. A better grounding electrode would be present by allowing one of the piers or one isolated rebar section to serve as the grounding electrode rather than having all of them eliminated by design.

The foundation drawing titled "Jackson Hill Lofts" is an example of a pier and beam foundation. On drawing S1.0 there appears to be 8 concrete-encased electrodes present. The main slab would be one and then there are seven isolated locations, 4 individual piers and 3 locations with 3 piers connected by concrete and rebar. The seven locations have been circled for easy identification.

A more extreme example would be a pier and beam foundation similar to the "Jackson Hill Lofts" only without the concrete slab connecting the main foundation piers. This type of foundation has been used for several years in this area. Instead of a concrete slab and grade beam, wooden beams connect the piers. In this case there would be 49 concrete-encased electrodes present at this house. Would it be reasonable to expect all of these electrodes to be bonded together?

The foundation drawing title "Wilshire Homes" is an example of a post-tensioned slab with isolated sections of grade beam. These sections have been circled for each identification. This foundation also includes two columns that may be concrete-encase electrodes.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Add a new senternce to Section 250.52(A)(3) to read as follows:

Where multiple concrete-encased electrodes are present at a building or structure, it shall be permissible to bond only one into the grounding electrode system.

Panel Statement: The panel concludes that the requirements for the concrete encased electrode belong in 250.52(A)(3) and that 250.50 should only contain the requirements to establish a grounding electrode or grounding electrode system.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

BRENDER, D.: The proposal would have the effect of permitting multiple, independent electrodes to be present without bonding in-between. This would allow the earth to serve as a current-carrying conductor during lightning or similar transient conditions.

5-138 Log #3392 NEC-P05 **Final Action: Reject**
(250.50)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: I. Add the following sentences to the end:

"Structural steel components including unencapsulated reinforcing steel shall be considered bonded where welded, bolted, or tied with the usual steel tie wires made tight. Where the grounding electrode conductor run to a structural steel component complies with 250.64(F), additional grounding electrode conductor connections shall not be required."

II. Designate the existing exception as Exception No. 1 and add the following Exception No. 2:

Exception No. 2: Where multiple concrete encased electrodes as described in 250.52(A)(3) are present, and at least one of the concrete encased electrodes is connected to the grounding electrode system, it shall be permitted to omit from the grounding electrode system such electrodes located more than 6.0 m (20 ft), from the point of attachment of the grounding electrode conductor. Where multiple systems are connected, this distance shall be measured independently for the grounding electrode conductor connection for each system, but 250.58 shall still apply. Where a concrete-encased electrode is extended outside of concrete encasement, this distance shall apply horizontally from the point within the footing or base of the foundation where the electrode first qualifies for use under 250.52(A)(3).

Substantiation: This proposal addresses many of the field questions that have arise since the advent of concrete-encased electrodes becoming mandatory elements of many grounding electrode systems where they weren't previously. The first part of the proposal clarifies that if building steel is effectively bonded to a concrete encased electrode (something that would need field verification by inspection), then it is not necessary to run an actual wire to the remote concrete-encased electrode. Although the NEC for some time has allowed grounding electrode conductors to run from electrode to electrode (with the parent conductor sized for the worst-case exposure) there is no explicit recognition of this particular connection, and a separate wire might be required. Since the steel is likely even a superior connection overall, (due to the likely multiplicity of connections) it seems appropriate to expressly recognize this procedure.

The second part of the proposal squarely addresses the fact that all qualified grounding electrodes at any given premises have been required to be included in a grounding electrode system. For example, if a copper domestic water piping lateral exists side-by-side with a cast iron sprinkler main, and both are continuous and in contact with earth for at least 10 ft, then both should be picked up by the grounding electrode conductor. In the case of concrete-encased electrodes, however, this can get excessive, particularly on large buildings completed in segments. This proposal suggests a reasonable limitation on the numbers of connections that must be made.

Any qualified concrete-encased electrodes not made into a unified group by tying or actual jumpers would need to be picked up within the 20-ft radius that defines the minimum extent of a qualified concrete-encased electrode in the first place. A simple example involves the reinforcement in many dwelling unit footings, where two parallel No. 4 reinforcing bars run the length of the footing in parallel, and not tied together. Both bars would be picked up in this example. Another example involves 20 ft of 4 AWG copper laid in a footing with reinforcing steel along side; the copper and the reinforcing would be picked up in this case as well. However, in a large commercial or industrial building with two (or more) voltage systems from differing services at different locations, the rule would require local connections only, however, 250.58 still applies. Note also that if the reinforcing is extended long vertical distances (even if over 20 ft) through foundation walls, the 20-ft requirement continues in the usually understood sense because of the insertion of the word "horizontally" and other requirements at the end of the proposed exception.

Panel Meeting Action: Reject

Panel Statement: The first recommendation includes concepts that should be placed in different sections from what is being proposed. The second recommendation contains proposed requirements that would be difficult for installers to comply with and inspectors to enforce.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

DOBROWSKY, P.: The proposal should actually be accepted in principle based on the action on proposal 5-137.

5-139 Log #3612 NEC-P05 **Final Action: Reject**
(250.50)

Submitter: Joseph A. Hertel, State of Wisconsin

Recommendation: Replace the word present with available.

Substantiation: The current language requires that all reinforcing steel in a structure (since it is present) be bonded to form the grounding electrode system. This is becoming a design issue where in a large facility we are compelled to install an equipotential bonding plane similar to that of swimming pools or agricultural facilities. What is the Code trying to do?

Panel Meeting Action: Reject

Panel Statement: The submitter provides no technical substantiation to revert back to the language in the 2002 NEC that uses the words "if available" in this section. The panel reaffirms that its actions on Comments 5-73 through 5-81 to Proposal 5-115 in the 2005 NEC cycle are also consistent with the requirements of the NEC Style Manual, Section 3.2.1, that identify the word "available" as a word that should be avoided because it is vague and unenforceable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-140 Log #806 NEC-P05 **Final Action: Reject**
(250.50 and 250.52(A))

Submitter: John MacLennan, Prescott, WI

Recommendation: Although this Ufer ground is a good ground and has been installed for years in well engineered power plants and desert areas, the code falls short of dealing with the plastic coated re-bars used in todays projects. The code should address that either the continuity of the encased electrode with the Concrete has to be assured or an uncoated section should be used.

Substantiation: A ground is only as good as its path to ground. The coated re-bar rods of today do not meet this standard solely because they are laying in Concrete!

Panel Meeting Action: Reject

Panel Statement: No proposed language is provided by the submitter. The proposal does not meet the requirements of Section 4.3.3 Regulations Governing Committee Projects.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-141 Log #595 NEC-P05 **Final Action: Reject**
(250.50 through 250.53)

Submitter: Michael P. O'Quinn, MOGO Enterprises, Inc.
Recommendation: Revise text to read as follows:

250.50 Grounding Electrode System.

All grounding electrodes as described in 250.52(A)(1) through (A)(4 ~~6~~) that are present at each building or structure served shall be bonded together to form the grounding electrode system. Where none of these grounding electrodes exist, one or more of the grounding electrodes specified in 250.52(A)(2 ~~4~~) through (A)(5 ~~7~~) shall be installed and used.

Exception: Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete.

250.52 Grounding Electrodes.

(A) Electrodes Permitted for Grounding.

~~(1) Metal Underground Water Pipe. A metal underground water pipe in direct contact with the earth for 3.0 m (10 ft) or more (including any metal well casing effectively bonded to the pipe) and electrically continuous (or made electrically continuous by bonding around insulating joints or insulating pipe) to the points of connection of the grounding electrode conductor and the bonding conductors. Interior metal water piping located more than 1.52 m (5 ft) from the point of entrance to the building shall not be used as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system.~~

~~Exception: In industrial and commercial buildings or structures where conditions of maintenance and supervision ensure that only qualified persons service the installation, interior metal water piping located more than 1.52 m (5 ft) from the point of entrance to the building shall be permitted as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system, provided that the entire length, other than short sections passing perpendicular through walls, floors, or ceilings, of the interior metal water pipe that is being used for the conductor is exposed.~~

~~(2) Metal Frame of the Building or Structure. The metal frame of the building or structure, where any of the following methods are used to make an earth connection:~~

~~(1) 3.0 m (10 ft) or more of a single structural metal member in direct contact with the earth or encased in concrete that is in direct contact with the earth~~

~~(2) The structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(1), (A)(3), or (A)(4)~~

~~(3) The structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(5) or (A)(6) that comply with 250.56, or~~

~~(4) Other approved means of establishing a connection to earth.~~

(1 ~~3~~) Concrete-Encased Electrode. An electrode encased by at least 50 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 6.0 m (20 ft) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 13 mm (½ in.) in diameter, or consisting of at least 6.0 m (20 ft) of bare copper conductor not smaller than 4 AWG. Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means.

(2 ~~4~~) Ground Ring. A ground ring encircling the building or structure, in direct contact with the earth, consisting of at least 6.0 m (20 ft) of bare copper conductor not smaller than 2 AWG.

(3 ~~5~~) Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than 2.5 m (8 ft) in length and shall consist of the following materials.

(a) Electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size ¾) and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(b) Electrodes of rods of iron or steel shall be at least 15.87 mm (in.) in diameter. Stainless steel rods less than 16 mm (in.) in diameter, nonferrous rods, or their equivalent shall be listed and shall not be less than 13 mm (½ in.) in diameter.

(4 ~~6~~) Plate Electrodes. Each plate electrode shall expose not less than 0.186 m^2 (2 ft^2) of surface to exterior soil. Electrodes of iron or steel plates shall be at least 6.4 mm (¼ in.) in thickness. Electrodes of nonferrous metal shall be at least 1.5 mm (0.06 in.) in thickness.

(5 ~~7~~) Other Local Metal Underground Systems or Structures. Other local metal underground systems or structures such as piping systems, underground tanks, and underground metal well casings that are not effectively bonded to a metal water pipe.

(B) Electrodes Not Permitted for Grounding. The following shall not be used as grounding electrodes:

(1) Metal underground gas piping system

(2) Aluminum electrodes

FPN: See 250.104(B) for bonding requirements of gas piping.

250.53 Grounding Electrode System Installation.

FPN: See 547.9 and 547.10 for special grounding and bonding requirements for agricultural buildings.

(A) Rod, Pipe, and Plate Electrodes. Where practicable, rod, pipe, and plate electrodes shall be embedded below permanent moisture level. Rod, pipe, and plate electrodes shall be free from nonconductive coatings such as paint or enamel.

(B) Electrode Spacing. Where more than one of the electrodes of the type specified in 250.52(A)(5) or (A)(6) are used, each electrode of one grounding system (including that used for air terminals) shall not be less than 1.83 m (6 ft) from any other electrode of another grounding system. Two or more grounding electrodes that are effectively bonded together shall be considered a single grounding electrode system.

(C) Bonding Jumper. The bonding jumper(s) used to connect the grounding electrodes together to form the grounding electrode system shall be installed in accordance with 250.64(A), (B), and (E), shall be sized in accordance with 250.66, and shall be connected in the manner specified in 250.70.

~~(D) Metal Underground Water Pipe. Where used as a grounding electrode, metal underground water pipe shall meet the requirements of 250.53(D)(1) and (D)(2).~~

~~(1) Continuity. Continuity of the grounding path or the bonding connection to interior piping shall not rely on water meters or filtering devices and similar equipment.~~

~~(2) Supplemental Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in 250.52(A)(2) through (A)(7). Where the supplemental electrode is a rod, pipe, or plate type, it shall comply with 250.56. The supplemental electrode shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the nonflexible grounded service raceway, or any grounded service enclosure.~~

~~Exception: The supplemental electrode shall be permitted to be bonded to the interior metal water piping at any convenient point as covered in 250.52(A)(1), Exception.~~

(E) Supplemental Electrode Bonding Connection Size. Where the supplemental electrode is a rod, pipe, or plate electrode, that portion of the bonding jumper that is the sole connection to the supplemental grounding electrode shall not be required to be larger than 6 AWG copper wire or 4 AWG aluminum wire.

(F) Ground Ring. The ground ring shall be buried at a depth below the earth's surface of not less than 750 mm (30 in.).

(G) Rod and Pipe Electrodes. The electrode shall be installed such that at least 2.44 m (8 ft) of length is in contact with the soil. It shall be driven to a depth of not less than 2.44 m (8 ft) except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or, where rock bottom is encountered at an angle up to 45 degrees, the electrode shall be permitted to be buried in a trench that is at least 750 mm (30 in.) deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachment are protected against physical damage as specified in 250.10.

(H) Plate Electrode. Plate electrodes shall be installed not less than 750 mm (30 in.) below the surface of the earth.

Substantiation: Metal Underground Water Piping has been a practical problem for use as a grounding electrode because of the prevalence of non-metal piping systems, both inside the structure as well as being supplied by the municipality. The Code® solution has been to require another electrode in addition to the metal piping [250.53(D)(2)]. Since 250.104(A) requires bonding the metal piping system, the elimination of metal underground water piping as a grounding electrode would still provide an effective ground-fault current path, satisfying 250.4(A)(5), and since there are other possible electrodes covered in 250.52, eliminating metal underground water piping will not adversely effect the grounding electrode system.

If the metal underground water piping is in "direct contact with the earth for 3.0 m (10 ft) or more (including any metal well casing effectively bonded to the pipe) and electrically continuous (or made electrically continuous by bonding around insulating joints or insulating pipe) to the points of connection of the grounding electrode conductor and the bonding conductors" [250.53(D)], this would become an additional unrequired grounding electrode, adding to the effectiveness of the required grounding electrode system, as outlined in 250.50.

Portions of the changes in the 2005NEC in Metal Frame of Buildings or Structures [250.52(A)(2)] were in conflict with the new definition of grounding electrode in Article 100 – "A device that establishes an electrical connection to the earth.", specifically 250.52(A)(2) and 250.52(A)(3). This called the metal frame of buildings and structures "grounding electrodes" when in fact they were merely bonded to another grounding electrode(s).

Eliminating metal frames of buildings and structures as a grounding electrode will not adversely effect the grounding electrode system as there are other possible electrodes covered in 250.52. And since 250.104(C) requires bonding metal building structures, this would provide for an effective ground-fault current path as required in 250.4(A)(5).

Additionally, eliminating both metal underground water piping and metal frames of buildings and structures forces attention to the other electrodes listed in 250.52: concrete-encased electrodes, ground rings, driven ground rods, and ground plates. This will require the installer, AHJ, and equipment manufacturers to more effectively utilize these grounding electrodes and provide for more effective ground references.

Panel Meeting Action: Reject

Panel Statement: No technical substantiation has been provided to support the proposal. The panel maintains that metal underground water pipes and structural metal frames of buildings that qualify as grounding electrodes in accordance with 250.52(A) are required to be included in the grounding electrode system.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-142 Log #3647 NEC-P05 **Final Action: Reject**
(250.50 Exception (New))

Submitter: Lawrence Brown, National Association of Home Builders (NAHB)
Recommendation: Add New Exception as follows:

250.52 Grounding Electrode System. All grounding electrodes as described in 250.52(A)(1) through (A)(6) that are present at each building or structure served shall be bonded together to form the grounding electrode system. Where none of these grounding electrodes exist, one or more of the grounding electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.

Exception No. 1 : Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete.

Exception No. 2: A single concrete-encased electrode shall be permitted in the grounding electrode system for one- and two-family dwellings where the service is rated 300 amperes or less.

Substantiation: The concern is how to apply the provisions in Section 250.52(3) that reads, " **Concrete-Encased Electrode** . An electrode encased by at least 50 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 6.0 m (20 ft) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less that 13 mm (1/2 in.) in diameter, or consisting of at least 6.0 m (20 ft) of bare copper conductor not smaller that 4 AWG. Reinforcing bars shall be permitted to be bonded together by the usual steel tire wires or other effective means."

Main concerns center on Section 250.52(C) and what is the maximum length of rebar in the footing that would need to be bonded to the grounding electrode system to comply with this provision. The text of this Section states that the electrode, "…consisting of at least 6.0 m (20 ft) of one or more…steel reinforcing bars or rods…." is needed. But, is the 20 feet dimension the maximum length needed to comply, or does all of the steel in the footing need to be tied (bonded) together to form the electrode, no matter what the total length. This question is especially important as many footings for residential dwellings do not contain reinforcing steel, or only contains reinforcing steel in certain area such as the corners, where piping is placed under the footing, or in isolated pads for column support. It would seem impractical to bond a few five-foot rods together where they are 20 to 50 feet apart. NAHB's has also submitted a Proposal on Section 250.52(C) that is related to this concern.

The homebuilders understand the intent of the revised text of Section 250.50 for the 2005 NEC, and understand that a concrete-encased electrode may be a more reliable electrode that a metal water pipe or rod electrode. The homebuilders also believe that a service of 300 amps or less incorporating a single 20-foot concrete-encased electrode will pose no greater concern and if the service grounding electrode system was only a ground rod and perhaps a metal water pipe.

The homebuilders thank you in advance for your consideration of this matter.

Panel Meeting Action: Reject
Panel Statement: The substantiation does not support an exception limited to one- and two-family dwellings. See the panel's action on Proposal 5-137 which reduces the extent of bonding requirements for concrete-encased grounding electrode systems.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

DOBROWSKY, P.: The proposal should actually be accepted in principle based on the action on proposal 5-137.

5-143 Log #1673 NEC-P05 **Final Action: Reject**
(250.50(A))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: Add text to read as follows:

250.50(A): Under engineering supervision, it shall be permissible to eliminate the bonding of the concrete-encased steel reinforcing bars in foundations to the grouding electrode system where it has been determined corrosion of the steel reinforcing bars will occur due to galvanic corrosion.

FPN: Refer to NACE Standard Recommended Practice RP0290-2000. Item No. 21403, Impressed Current Cathodic Protection of Reinforcing Steel In Atmospherically Exposed Concrete Structures, for more information regarding steel corrosion and other deterioration phenonema associated with concrete.

Substantiation: While it is recognized that concrete-encased steel reinforcing bars provide a low impedance path to earth and should, under most circumstances, be bonded to the other grounding electrode system components, there is an exception that needs to be considered.

Industrial refineries and petrochemical plants typically utilize a low-impedance grounding electrode system consisting of many copper-clad ground rods and bare copper conductors (typically #4/0 AWG or larger in a grid or ring fashion) for the grounding electrode system. Bonding the concrete-encased steel reinforcing bars in foundations to large amounts of buried copper will create a corrosion cell and corrosion of the anode will occur. Corrosion is an electrochemical process involving the flow of electrons and ions and will cause deterioration of the steel reinforcing bars leading to structural weakness and/or failure of the concrete. A corrosion cell consists of an anode, a cathode, a common electrolyte containing the anode and cathode, and a metallic path between the annode and cathode. In this case, the copper-clad rod is the cathode, the steel rebar is the anode, the soil and concrete are the electrolyte and the bonding jumper is the metallic path between the cathode and anode. This is the same principle on which common batteries work.

Previous to the 2005 NEC, this wasn't an issue because the words "If available on the premises at each building or structure served..." seemingly allowed the design engineer some discretion to either bond the concrete-encased steel or not. The change to the 2005 NEC has effectively closed this option.

The Code needs to allow engineering judgment to be used to determine if a corrosion problem exists and a means to mitigate the issue. Grounding should not take precedence over structural integrity.

Panel Meeting Action: Reject
Panel Statement: There are methods of bonding the concrete-encased grounding electrode to the grounding electrode system that would minimize or eliminate any possibilities of corrosion due to galvanic reactions in concrete structures. These methods can be incorporated into building foundation designs where the conditions presented in this proposal are a concern of detriment to the structural design.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-146 Log #2293 NEC-P05 **Final Action: Reject**
(250.52(A)(1) Exception)

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Revise text to read as follows:

Add "institutional" to the building/structures that are permitted.

Substantiation: There is no reason to exclude institutions. For example, Princeton University employs an electrical maintenance team of licensed and trained electricians that easily meet the requirements.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that the qualification for commercial buildings includes institutional facilities where conditions of maintenance and supervision ensure that only qualified persons will service the work.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

MELLO, C.: The panel should have acted to Accept in Principle and revise the existing text to delete the terms "industrial and commercial". The problem raised by the submitter is common when there are NEC definitions for some types of buildings and there are Building Code definitions and names that are different from the NEC. The panel's statement is correct that the intent is to include "institutional" buildings in the group of "industrial and commercial". The question for the panel is what other type of occupancies are intended to be included that is now open to wide interpretation? The real question that needs to be asked is if the building type, industrial, commercial, health care facility, institutional, multi-family dwelling, multiple occupancy, etc. matters where the key qualifier is having continuous maintenance and supervision that ensures the original system is not impaired through actions of other trades over the building or structures life. If the qualified staff and supervision are present then the building or business type really would not appear to matter. Deleting the qualifier "industrial and commercial" altogether would be a better alternative than adding "institutional" as proposed and continue the list building evolution that will assuredly come.

Comment on Affirmative:

BRETT, JR., M.: I agree with the panel action to reject, however, the terms "industrial" "commercial" and "institutional" need a definition. Many large campus type facilities such as military bases, college campuses, steel mills, etc. have areas or buildings that need to be defined so that the inspector as well as the designer can determine the correct application of the NEC requirements. These definitions would be more appropriate in Article 100.

5-147 Log #1697 NEC-P05 **Final Action: Reject**
(250.52(A)(1) Exception)

Submitter: Charles M. Trout, Maron Electric Company
Recommendation: Delete 250.52(A)(1) Exception in its entirety.
Substantiation: The body of the text in 250.52(A)(1) satisfactorily contains the necessary requirements for the use of a metal underground water pipe as a grounding electrode regarding the use of interior metal water piping. The exception permits a lesser degree of safety based on an undocumented qualified person hypothetically servicing the installation. No requirements are present to ensure that the conditions of maintenance and supervision to ensure that only qualified persons service the installation actually exist.

Panel Meeting Action: Reject
Panel Statement: The submitter did not provide any evidence of a problem. The present practice has been successfully used for many years. The panel reaffirms its action and statement on the same proposal in the 2005 NEC cycle. See panel action and statement on Proposal 5-122 (Log # 3453) on page 550 of the Report on Proposal in the 2005 NEC cycle.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-148 Log #342 NEC-P05 **Final Action: Accept in Principle**
(250.52(A)(2))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(2) Metal Frame of the Building or Structure. The metal frame of the building or structure that is connected to the earth in either of the following methods: ~~where any of the following methods are used to make an earth connection:~~
(1) 3.0 m (10 ft) or more of a single structural metal member in direct contact with the earth or encased in concrete that is in direct contact with the earth.
~~(2)~~ (2) The structural metal frame is effectively connected to the reinforcing bars of a concrete-encased electrode as provided in 250.52(A)(3) ~~bonded to one or more of the grounding electrodes as defined in 250.52(A)(1), (A)(3), or (A)(4)~~
~~(3) The structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(5) or (A)(6) that comply with 250.56, or~~
~~(4) Other approved means of establishing a connection the earth.~~
Substantiation: This proposed revision is an effort to clean up a conflict that was created in the 2005 NEC when this language was added to the NEC. The revision had little or no effect on clarifying when metal building frames are suitable for use as grounding electrodes. The electrodes provided in 250.52(A) all include being connected to the earth (direct contact is the Code language used). The problem was created in the 2005 NEC because the water pipe electrode is required to be supplemented as required by 250.53(D)(2). If an underground water pipe electrode provides the earth connection for the metal building frame electrode as provided in 250.52(A)(2)(2) the metal frame should not be considered as supplement to the water pipe electrode. The supplemental electrode is anticipated to to be the only electrode if and when the water pipe electrode is replaced with nonmetallic components. Grounding electrodes, including metal building frame electrodes, should be directly connected to the earth and not be questionable connections to the earth.
Panel Meeting Action: Accept in Principle
Revise text of the recommendation to read as follows:
(2) Metal Frame of the Building or Structure. The metal frame of the building or structure that is connected to the earth in either of the following methods: ~~where any of the following methods are used to make an earth connection:~~
(1) 3.0 m (10 ft) or more of a single structural metal member in direct contact with the earth or encased in concrete that is in direct contact with the earth
(2) The structural metal frame is ~~effectively~~ connected to the reinforcing bars of a concrete-encased electrode as provided in 250.52(A)(3) ~~bonded to one or more of the grounding electrodes as defined in 250.52(A)(1), (A)(3), or (A)(4)~~
~~(3) The structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(5) or (A)(6) that comply with 250.56, or~~
(~~4~~ 3) Other approved means of establishing a connection the earth
Panel Statement: The panel removes “effectively,” as the term is vague and unenforceable.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:
BRENDER, D.: Insufficient technical substantiation was presented for the panel to change current language in 250.52(A)(2)(3). If replacement of the conductive water pipe with nonconductive material occurs, I agree with the submitter that the metal frame should not be considered the supplement to the water pipe.
However, the circular argument would be better eliminated by striking reference to the water pipe (250.52(A)(1)) from 250.52(A)(2)(2).
250.52(A)(2)(3) is correct as presently worded. Reference to any of the electrodes in 250.52(A)(5) and (6) if less than 25 ohms can and should remain.
Editorial note: The word “to” is needed between “connection” and “the earth” to correctly reflect present code language. If panel action is accepted, the revised 250.52(A)(3) should read: (3) Other approved means of establishing a connection to the earth.
BRETT, JR., M.: I agree with the other explanations of negative votes.
RAPPAPORT, E.: The submitter is using a bulldozer to remove an anthill. The intention is to remove the possibility of a metal frame that is connected to ground through a water pipe from being the supplement to the water pipe. In order for a metal frame to be an independent electrode, its connection to ground should not depend upon its connection to an electrode that requires supplementing. Removal of “250.52(A)(1)” in 250.52(A)(2)(2) would remove that conflict and still retain the ability to use a metal frame that complies with 250.52(A)(3) or (A)(4) or 250.52(A)(5) or (A)(6) where the latter two also comply with 250.56.
Removal of 250.52(A)(2)(3) which allowed the metal frame of the building or structure when bonded to one or more of the grounding electrodes as defined in 250.52(A)(5) - Rod and Pipe Electrodes; and 250.52(A)(6) - Plate Electrodes; will essentially require all metal structures to be rebar grounded or a ground ring be installed. It is not common to have structural steel members in direct contact with earth as required in 250.52(A)(2)(1). Concrete encased grounding electrodes could only be used if 6 m (20 ft) of 13 mm (1/2 in.) rebar is present at the bottom of the foundation.
For structures such as pipe racks, where each foundation may not have 20 ft of 1/2 in. rebar at the bottom of the foundation, it is a long time industrial practice to install rod electrodes at set intervals to ground the steel pipe racks. A ground ring is normally not an option since 250.52(A)(2)(4) requires “... encircling the building or structure”. No substantiation has been provided that grounding by rod or pipe electrodes has created any unsafe installations.
Comment on Affirmative:
BOKSINER, J.: The proposal and Panel Action are in general appropriate and address certain conflicts in the existing language. However, the proposed change removes the possibility of using Metal Frame of the Building or Structure as a grounding electrode where the metal frame is connected to other acceptable grounding electrode. Such application may be important under 250.30(A)(7). In this case, it is more appropriate to label the metal frame as a grounding electrode conductor. However, the permission to use the Metal Frame of the Building or Structure as a grounding electrode to connect to the grounding electrode system in a manner equivalent to the existing rule should be provided in 250.30. Thus, 250.30(A)(7)(2) should be modified to correlate with the proposal as follows:
(2) Structural metal grounding electrode as specified in 250.52(A)(2) or metal frame of the building or structure serving as a grounding electrode conductor that is bonded to the grounding electrode system as specified in 250.50.
TOOMER, R.: This panel action includes a third option so “either of the following methods” should be changed to “one of the following methods.”

5-149 Log #542 NEC-P05 **Final Action: Reject**
(250.52(A)(2))

Submitter: Edward G. Kroth, Academy Electric, Inc.
Recommendation: Revise text to read:
(2) Effectively Grounded Metal Frame of the Building or Structure. The metal frame of the building or structure shall be considered effectively grounded where any of the following methods are used to make an earth connection.
Substantiation: As an instructor in IBEW Local 159’s night school program, I have found that having the phrase “Effectively Grounded” as part of the previous code edition helped to reinforce the concept that not all building steel is necessarily a grounding electrode. I would hate to lose this concept. However, I do appreciate that in ‘05, 250.52(A)(2)(A)(1) through (4) helps to clarify when structural metal is “effectively grounded.”
Panel Meeting Action: Reject
Panel Statement: The panel concludes that the term “effectively,” while it adds emphasis, is vague and unenforceable.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-150 Log #2226 NEC-P05 **Final Action: Accept in Principle**
(250.52(A)(2))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
(2) Metal Frame of the Building or Structure. The metal frame of the building or structure, where ~~any of the following methods are used to make an earth connection:~~
~~(1)~~ 3.0 m (10 ft) or more of a single structural metal member is in direct contact with the earth or encased in concrete that is in direct contact with the earth
~~(2) The structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(1), (A)(3), or (A)(4)~~
~~(3) The structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(5) or (A)(6) that comply with 250.56, or~~
~~(4) Other approved means of establishing a connection to earth.~~
Substantiation: Only the portion of the metal frame that is actually and directly in contact with the earth should be called a grounding electrode per the Article 100 definition.
“Grounding Electrode. A device that establishes an electrical connection to the earth.”
The other parts of the metal frame or structure would be more correctly called effectively grounded metal structural frame.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-148.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-151 Log #543 NEC-P05 **Final Action: Accept in Principle**
(250.52(A)(2)(2))

Submitter: Edward G. Kroth, Academy Electric, Inc.
Recommendation: Revise text to read:
(2) The structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52 ~~(A)(1),~~ (A)(3) ~~,~~ or (A)(4).
Substantiation: As presently written, in the NFPA 70, 2005 edition, I perceive a conflict with the intention of 250.53(D)(2) for supplementing a water pipe grounding electrode. It is my understanding that the reason for a supplemental ground is to cover the possibility that in the future the underground metal water pipe could be changed to a nonconductive water pipe. It is possible to have the following scenario: we could have a metal structure that is only effectively grounded due to a bonding connection to the metal underground water pipe. This would appear to satisfy the requirement of 250.53(D)(2). Now some time later this metal water pipe is replaced by a nonconductive water pipe thus rendering the building steel useless as a grounding electrode and potentially leaving the service without a grounding electrode unless the water had been supplemented by some additional grounding electrode different from building steel.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-148.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-152 Log #1330 NEC-P05 **Final Action: Reject**
(250.52(A)(3))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
250.52(A)(3) Concrete-Encased Electrode. An electrode encased by at least 50 mm (2 in.) of concrete, located within ~~and near the bottom of~~ a concrete foundation or footing that is in direct contact with the earth, consisting of at least 6.0 m (20 ft) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 13 mm (1/2 in.) in diameter, or consisting of at least 6.0 m (20 ft) of bare copper conductor not smaller than 4 AWG. <u>If the amount of reinforcing bars that meet this requirement exceed 6 m (20 ft), not less than 6 m (20 ft) shall be bonded to form the electrode.</u> Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means.
Substantiation: The phrase "and near the bottom" might be construed as meaning that this section does not apply if the rebar is in the middle of the concrete.
As currently written, the Code requires all rebar, 1/2 inch or greater, to be bonded together to form the grounding electrode system. This proposal makes it clear that 6 m (20 ft) of rebar forms a sufficient electrode; more is not necessary.
Panel Meeting Action: Reject
Panel Statement: One of the factors contributing to the effectiveness of concrete-encased grounding electrodes is that they are located near the bottom of the footing and encased in not less than 50 mm (2 in.) of concrete. Removing this requirement for this section does not add clarity to this section and lessens the installation criteria for this type of electrode without substantiation. The findings of UFER were based on concrete-encased grounding electrodes that were installed in a manner that is consistent with the current language in this section. The proposed additional sentence is not necessary because the current language is clear that if the electrode consists of not less than 6.0 m (20 ft) of encased reinforcing bars, located as required by this section, then it qualifies as a grounding electrode. Tie wire can be used to bond sections of reinforcing bars together to meet this minimum length requirement in the rule.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:
BRETT, JR., M.: I agree with the other explanations of negative votes.
DOBROWSKY, P.: The proposal should be accepted. Many foundations are presently installed using piers and the reinforcing members are not necessarily near the bottom. These foundations still typically provide a much better "earth connection" than a single rod.
RAPPAPORT, E.: The proposal should be Accepted.
There is no technical justification to require that concrete encased electrode (rebars) be located near the bottom of a concrete foundation. When the National Electrical Code can accept a rod or pipe electrode of 2.5 m (8 ft) installed vertically, we should be able to accept 20 ft of rebar installed vertically. It is more important to have the required length of the rebars than a location at the bottom. The reason that the Ufer ground is so effective is due to the fact that the concrete has a much larger surface area in contact with the earth than a 5/8 in. diameter rod. In addition, the steel rods or copper conductor in the concrete is in intimate contact with the concrete. These two facts occur whether the rebars are at the bottom of the foundations or vertical in a column. If it is necessary for the rebars to be horizontal and well below the surface, then ground rods should also be required to be buried horizontally some distance below the surface. This would be an absurd requirement because there is no evidence that vertical ground rods have not been effective. We generally agree that concrete encased electrodes provide a better grounding electrode. We need to make it easier for this type of electrodes to be installed.
Concrete gives out moisture slowly wherever it is in contact with the earth, not just a the bottom of the foundation. Concrete absorbs moisture quickly and loses moisture very slowly. The mineral properties of concrete (lime and others) and their inherent pH means concrete has a supply of ions to conduct current. The soil around concrete becomes "doped" by the concrete, as a result, the pH of the soil rises and reduces what would normally be 1000 ohm meter soil conditions (hard to get a good ground). The moisture present, (concrete gives up moisture very slowly), in combination with the "doped" soil, make a good conductor for electrical energy or lightning currents.
A common method of installing foundations is by drilling. It is done by auger and special drill bits that create a bell at the bottom instead of excavating and refilling the space. In this method, there is very little concrete or rebars at the bottom. In this type of foundation, there may be more than 20 ft of 1/2 in. rebar, but not necessarily at the bottom of the foundation. All of the rebars are in a vertical section. It is a common type of installation for pipe racks and structures where qualified structural engineers calculate the load bearing capacity of soil and design a foundation for the required loading.

5-153 Log #3648 NEC-P05 **Final Action: Reject**
(250.52(A)(3))

Submitter: Lawrence Brown, National Association of Home Builders (NAHB)
Recommendation: Add a new text to 250.52(A)(3) as follows:
(3) Concrete-Encased Electrode . An electrode encased by at least 50 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of <u>one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less that 13 mm (1/2 in.) in diameter and a minimum total length of</u> ~~at least~~ 6.0 m (20 ft) ~~of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less that 13 mm (1/2 in.) in diameter~~ , or consisting <u>of a bare copper conductor not smaller that 4 AWG and a minimum total length of</u> ~~at least~~ 6.0 m (20 ft) ~~of bare copper conductor not smaller that 4 AWG~~ . Reinforcing bars shall be permitted to be bonded together by the usual steel tire wires or other effective means. <u>All reinforcing steel with a length of 6.0 m (20 ft) or greater shall be bonded together as required by Section 250.50.</u> <u>Isolated steel reinforcing bars less than 6.0 m (20 ft) in length shall not be required to be bonded together to form a concrete-encased electrode.</u>
Substantiation: The revised text would read as follows: (Only the new text is underlined, moved edited text is not)
(3) Concrete-Encased Electrode . An electrode encased by at least 50 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less that 13 mm (1/2 in.) in diameter and a minimum total length of 6.0 m (20 ft), or consisting of a bare copper conductor not smaller that 4 AWG and a minimum total length of 6.0 m (20 ft). Reinforcing bars shall be permitted to be bonded together by the usual steel tire wires or other effective means. <u>All reinforcing steel with a length of 6.0 m (20 ft) or greater shall be bonded together as required by Section 250.50.</u> <u>Isolated steel reinforcing bars less than 6.0 m (20 ft) in length shall not be required to be bonded together to form a concrete-encased electrode.</u>
The first new last sentence will help make clear that all reinforcing steel 20 ft or greater in length is a concrete-encased electrode and is required to be bonded as part of the grounding electrode system. The second new sentence will help make it clear that isolated individual pieces of reinforcing steel, such as those located at corner bends, cross braces, and other random pieces of reinforcing steel in a footing do not meet the criteria of a concrete-encased electrode and are not required to be bonded together as part of the grounding electrode system. This is an NAHB companion Proposal to that submitted on Section 250.50, that provides additional insight into the need for this proposal.
The homebuilders thank you for your consideration of this matter.
Panel Meeting Action: Reject
Panel Statement: The proposal would unnecessarily restrict the creation of a concrete-encased grounding electrode by not permitting the connecting together of two or more lengths of reinforcing steel to equal 20 ft or more in length.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-154 Log #3649 NEC-P05 **Final Action: Reject**
(250.52(A)(3), FPN)

Submitter: Lawrence Brown, National Association of Home Builders (NAHB)
Recommendation: Add a new Fine Print Note (FPN) to 250.52(A)(3) as follows:
(3) Concrete-Encased Electrode . An electrode encased by at least 50 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 6.0 m (20 ft) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less that 13 mm (1/2 in.) in diameter, or consisting of at least 6.0 m (20 ft) of bare copper conductor not smaller that 4 AWG. Reinforcing bars shall be permitted to be bonded together by the usual steel tire wires or other effective means.

FPN: It is not the intent of this section to require that isolated individual reinforcing bars or rods, or a group of reinforcing bars or rods that are bonded together by steel tie wires or other effective means and do not meet the 6.0 m (20 ft) minimum length for concrete-encased electrodes, such as those installed to insure the structural integrity of a post tension cable or other similar foundation design, to be bonded together to assure that there is a concrete encased electrode of at least 6.0 m (20 ft) present.

Substantiation: This added paragraph will make clear that individual corner bends, cross braces and apron reinforcement designs using reinforcing bars or rods in post tension and other foundation designs that do not primarily depend on reinforcing steel as the main reinforcement for a structural concrete foundation do not have to be bonded together so as to meet the design criteria for a concrete-encased electrode. Currently, there seems to be an opinion in many enforcing jurisdictions of the US that a concrete encased electrode is required whether the design of the foundation forms one in a natural state per the foundation design or if it is enforced to be formed by requiring individual and isolated pieces of reinforcing steel or rods to be bonded together using 6 or 4 AWG copper wire. Also, in some cases, the individual pier reinforcing steel is require to be bonded together so as to insure that there is at least one or more concrete-encased electrode present in the foundation design. This is a companion proposal to ones made to Sections 250.50 250.52(c) concerning this same subject.

The homebuilders thank you in advance for your consideration of this matter.

Panel Meeting Action: Reject

Panel Statement: The NEC Style Manual does not permit requirements to be included in fine print notes. The rule adequately covers the requirement.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-155 Log #3184 NEC-P05 **Final Action: Reject**

(250.52(A)(4))

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise text as follows:

(4) Ground Ring or Grounding Lateral . A ground ring encircling the building or structure, or a grounding lateral in direct contact with the earth, consisting of at least 6.0 m (20 ft) of bare copper conductor not smaller than 2 AWG.

Substantiation: What is the magic about a ground ring? A 20 ft. copper conductor not smaller than 2 AWG installed as a radial or lateral will perform at least as well as the ground ring encircling the building or structure. The length of the copper in direct contact with the earth is the main factor, not the layout of the copper.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any substantiation with the proposed revision to allow a length of copper wire 6.0 (20 ft) or more buried at the depth required by this section to qualify as a grounding electrode. The term “ground lateral” is confusing and is not currently used or defined in the NEC.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

MELLO, C.: The panel’s statement does not support the panel action. 250.52 and its various subparts are what defines what constitutes a grounding electrode. The panel statement that a “ground lateral” is not currently defined is negated by the fact that a “ground ring” is also not currently defined except by 250.5(A)(4) exactly where the submitter wants to add this other option. The panel’s statement that there was no substantiation is also incorrect. No more substantiation than the statement that a ground ring is acceptable is needed and is sufficient to what is proposed, otherwise the panel needs to technically substantiate why the ring continues to be accepted and that the proposed “grounding lateral” is not. The IEEE green book and a number of long time engineering practices for telecommunications and power distribution sites (high voltage transmission towers) have recognized the “counterpoise” or “ground lateral”, or whatever term is to be used, as a suitable grounding electrode. The proposed “grounding lateral” is no more than the already accepted “ground ring” straightened out instead of being in a circular shape. If 20 feet of 2 AWG copper in a circular shape around a building or structure is acceptable, what is the technical reason for 20 feet of 2 AWG copper buried along side the building or structure or radiating out from one or more sides or corners not acceptable? The same earth contact is achieved at the same burial depth etc. The panel action should have been to accept this proposal.

5-156 Log #631 NEC-P05 **Final Action: Reject**

(250.52(A)(5))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

(5) Rod ~~and Pipe~~ Electrodes. Rod ~~and pipe~~ electrodes shall be listed. Rod electrodes shall not be less than 2.5 m (8 ft) in length and shall consist of the following materials.

~~(a) Electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size 3/4) and where of iron or steel, shall have the outer surface galvanized or otherwise metal coated for corrosion protection.~~

~~(b~~) (a) ~~Electrodes of rods~~ Rod electrodes of iron , ~~or~~ steel, or copper coated steel shall be at least 15.87 mm (5/8 in.) in diameter. ~~Stainless steel rods less than 16 mm (5/8 in.) in diameter nonferrous rods, or their equivalent shall be listed and shall not be less than 13 mm (1/2 in.) in diameter.~~

(b) Stainless steel rods ~~less than 16 mm (5/8 in.) in diameter, nonferrous rods,~~ or their equivalent ~~shall be listed and~~ shall not be less than 13 mm (1/2 in.) in diameter.

Substantiation: There is a product standard that ground rods can be evaluated and listed to. Inspectors generally use listing as a basis for approvals. The information in this section is long overdue for revision and clarification. The proposal is an effort to remove conduit from this section as it is rarely ever used in current installations. Where 3/4 steel conduit is used, it has to be driven as required by 250.53(G). While listed ground rods are evaluated for being driven, among other things, and required to be of substantial construction to withstand the impact of being driven, rigid metal conduit and intermediate metal conduit is not, and is listed and evaluated for other purposes than being driven and serving as a grounding electrode.

The second change proposed in this section deals with clarifying that nonferrous rods are actually ferrous rods that are coated with a nonferrous material (copper coated). The whole rod is not a nonferrous rod. Adding a listing requirement in this section is an effort to provide enforcement officials with reasonable assurances that listed rods will meet the minimum size characteristics set forth in the Code for diameter and length. Unlisted rod type electrodes that do not meet the minimum length or diameter requirements that are currently being installed will no longer be permitted. Where the enforcement community can require a listed rod because of a Code rule, there are reasonable assurances it will meet the minimum criteria in the NEC. With the product standard requiring listing and other information about the rod to be marked on the rod within 12 in. of the top of the rod, it will provide enforcement with more ready means of verifying compliance with the minimum depth requirements contained in the installation rules for grounding electrodes of the rod types in 250.53(G).

Panel Meeting Action: Reject

Panel Statement: Insufficient substantiation was provided to add the word “listed” or for deleting “pipe” type electrodes. Pipe electrodes are successfully used.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

HAMMEL, D.: The panel agreed, during the ROP, that though very few pipe or conduit electrodes are used, there was insufficient substantiation to warrant the removal of the code recognition of such electrodes where they are used successfully. If the word pipe were to be deleted from this section, pipe electrodes would not be prohibited by the NEC. Pipe or conduit electrodes could be used though they would not meet the requirements of 250.50. Given the panel statement to Proposal 5-164 the panel recognizes this fact.

Also in the panel statement, for Proposal 5-164 (in regard to listed electrodes) is the concern for installation requirements. There are product standards that contain installation instructions for listed electrodes. I do not think the panel agreed on how conduit and pipe are successfully installed. Conduit and pipe are not evaluated for being driven. I do not see the logic in the code recognition of pipe and conduit electrodes that can be driven with a sledgehammer yet listed products with instructions are not recognized.

MELLO, C.: The panel action should have been to Accept in Part. The part to delete the “pipe” electrode was substantiated by the fact, indicated by the installer representatives on the panel, that galvanized pipe or rigid conduit is still used, although infrequently in the United States. With regard to ground rods the action should have been to Accept in Principle. Over the past three Code cycles there have been numerous proposals about hard set size, vs. hard or soft metric conversions, tolerances due to nominal manufacturing size, copper vs. galvanized coating, etc. The submitter made a good case for the enforcement agencies to have all ground rods listed to eliminate this continued flow of proposals and the field issues the many installers and AHJs have to wrestle with about if this one acceptable or is that acceptable, or can I use this splice connector on this rod, and so on. UL 467 already deals with the make up of the rod materials, dimensions, coating issues, suitability of the coating to withstand the impact of installation, compatibility of splice connectors etc. Listing can and do exist for ground rods of diameters 5/8 inch or greater. One of the major manufacturer’s in his presentation to the panel confirmed that Listing would resolve many of the controversies and issues coming from the industry. In addition, by requiring Listing, some of the existing convoluted Code language can be simplified into a list format as follows with the incorporation of panel accepted actions:

Revise 250.52(A)(5) to read as follows

250.52(A)(5) Rod Type and Pipe Electrodes. Rod and pipe type electrodes shall meet the following requirements:

(a) ~~Electrodes of~~ Pipe or conduit type electrodes shall not be smaller than metric designator 21 (trade size ¾) and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(b) Rod type electrodes shall be listed.

(c) Rod type electrodes shall not be less than ~~2.5~~ 2.44 m (8 ft) in length ~~and shall consist of the following materials.~~

(d) Rod type electrodes of steel, ~~S~~ s tainless steel rods ~~less than 15.87 mm (5/8 in.) in diameter, nonferrous rods,~~ or their equivalent ~~shall be listed and~~ shall not be less than 13 mm (½ in.) in diameter.

(~~b~~ e) Rod type electrodes ~~of rods~~ of ~~iron or~~ steel, other than stainless steel, shall be coated with copper or zinc ~~and be at least 15.87 mm (5/8 in.) 13mm (1/2 in) in diameter~~

This simplifies the NEC requirements for rods to be a minimum 1/2-inch diameter, be a minimum 8-foot in length and for steel rods to be coated with copper or be galvanized or be constructed of stainless steel. This lets the product standard, the Listing and the continued follow-up deal with variations posed by manufacturers and lets installers and AHJs get the job done by looking for the Listing mark and following the guide card and installation instructions that go with the listing.

5-157 Log #807 NEC-P05 **Final Action: Reject**
(250.52(A)(5))

Submitter: John MacLennan, Prescott, WI
Recommendation: The wording regarding use of galvanized pipe as a ground electrode needs mention of the galvanic action that needs to be addressed whenever copper and galvanized materials come in contact.
Substantiation: Galvanic action is well known in the electrical and plumbing trades and should always be addressed. Possibly as a seperate heading under methods of positive grounding?
Panel Meeting Action: Reject
Panel Statement: No proposed language is provided by the submitter. The proposal does not meet the requirements of Section 4-3.3 Regulations Governing Committee Projects.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-158 Log #825 NEC-P05 **Final Action: Reject**
(250.52(A)(5))

Submitter: Kim Parker, Austin, TX
Recommendation: Revise text to read as follows:

(5) Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than 2.5 m (8 ft) in length and shall consist of the following materials.

(a) Electrodes of standard pipe or rigid metal conduit shall not be smaller than metric designator 21 (trade size 3/4) and, where of iron or steel, shall ~~have the outer surface~~ be hot dip galvanized ~~or otherwise metal coated for corrosion protection.~~

(b) Electrodes of rods of iron or steel shall be at least 15.87 mm (5/8 in.) in diameter. ~~Stainless~~ Iron or steel core rods less than 16 mm (5/8 in.) in diameter ~~,~~ but not less than 13 mm (1/2 in.) in diameter , ~~nonferrous rods, or their equivalent~~ shall be listed ~~and shall not be less than 13 mm (1/2 in.) in diameter.~~

Substantiation: Very few pipe electrodes are used in the US because of the effort necessary to install such electrodes and much of that is used water pipe that is rusted and not full standard size when installed as an electrode. There are many more thicknesses of pipe than there was when pipe electrodes were first allowed as a grounding electrode. Wall thickness size of pipe is actually classified as tubing when it measures less than standard pipe size but such tubing is still utilized as pipe electrodes. When metal conduit is utilized as a pipe electrode, it should be as close to standard pipe size as possible and intermediate metal conduit does not meet that wall thickness. As to corrosion protection, a pipe electrode is going to be subjected to moisture both inside and outside the pipe and in all types of wet and corrosive soil conditions that makes only hot dip galvanization of a pipe used as an electrode feasible. Also, the allowance to allow, "or otherwise metal-coated for corrosion protection", is vague and unenforceable and could even mean protected by paint not classified as enamel as per 300.6(A)(1). This simply should not be allowed as electrode installations are not installations that are normally checked after installation and are somewhat assumed to be able to last the life of the service or system they are grounding. Acceptance of this proposal will help such electrodes maintain their integrity as grounding electrodes.

The proposal for (b) is meant to clarify the meaning of "or their equivalent" that is vague as there is no explanation of what equivalency means in this requirement. Also, there are few if any nonferrous rods made or available at any electrical supply dealer in this country. It is also a fact that the greatest majority, if not all, copper-coated and galvanized ground rods have steel or iron cores that make them rods of ferrous material but with a coating or platting process applied. Also, as rods less than 15.87 mm (5/8 in.) in diameter but that are not less than 13 mm (1/2 in.) in diameter are required to be listed for compliance with 250.52(A)(5), there is no reason for a laundry list of the various types of rod electrodes as long as they are listed and labeled rods.
Panel Meeting Action: Reject
Panel Statement: The proposed editorial revisions to this section do not improve clarity and are not substantiated. The current text in (a) covers the specific types of pipe mentioned in the proposal. The proposed revisions to (b) do not improve the current requirements of this section.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-159 Log #1984 NEC-P05 **Final Action: Reject**
(250.52(A)(5))

Submitter: Laurens Willard, Charlotte, NC
Recommendation: Revise text to read:

(5) Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than ~~2.5~~ 2.44 m (8 ft) in length , shall be listed, and shall consist of the following materials.

(a) Electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size ¾) and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(b) Electrodes of rods of copper or zinc coated ~~iron or~~ steel , or stainless steel, shall be at least ~~15.87 mm (5/8 in.) in diameter. Stainless steel rods less than 16mm (5/8 in.) in diameter, nonferrous rods, or their equivalent shall be listed and shall not be less than 13~~ 12.7 mm (1/2 in.) in diameter.

Substantiation: It is confusing that the existing code is interpreted so that some unlisted rods comply with the NEC while others do not. Consequently, rods of various lengths, diameters, coating material and thickness are in use. The correction above eliminates enforcement confusion by requiring all rods to be listed, while leaving the rod electrodes currently, correctly being manufactured and used without change. If a rod is listed it can be easily checked by inspecting for a listing mark, and can be reasonably expected to comply with the requirements of the NEC.

The above changes correct errors in the existing standard related to metric conversion.

The above changes eliminate the use of the confusing term "nonferrous". All driven rod electrodes consist of an iron or steel (ferrous) core and are coated, either with zinc or copper, for corrosion protection. Therefore, all driven rods are "ferrous" in nature.
Panel Meeting Action: Reject
Panel Statement: There is no field report identified that nonlisted electrodes that comply with the physical requirements in the NEC do not perform adequately.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-160 Log #1985 NEC-P05 **Final Action: Accept in Principle**
(250.52(A)(5))

Submitter: Roger J. Montambo, Glavan Industries, Inc.
Recommendation: Revise text to read:

Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than ~~2.5~~ 2.44 m (8 ft) in length and shall consist of the following materials.

(a) Grounding ~~E~~ electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size ¾) and, where of ~~iron or~~ steel, shall have the outer surface hot-dip galvanized or otherwise metal-coated for corrosion protection.

(b) Grounding ~~E~~ electrodes ~~of rods~~ of stainless steel, copper or zinc coated ~~iron or~~ steel shall be at least ~~15.87~~ 15.88 mm (5/8 in.) in diameter ~~.~~ unless ~~Stainless steel rods less than 16 mm (5/8 in.) in diameter, nonferrous rods, or their equivalent shall be~~ listed and ~~shall~~ not ~~be~~ less than 12.70 ~~13~~ mm (1/2 in.) in diameter.

Substantiation: · Electrical inspectors, due to confusing wording of coating types, often interpret this section incorrectly.

· Copper and/or zinc-coated rods are both produced from the same "ferrous" steel core and coated with the appropriate "non-ferrous" coating (copper or zinc) specified by the user.

· Decimal (mm) equivalents should more accurately represent inch values, and be consistent within document.

· Couplings for 5/8 inch galvanized rods are available, and exiting clamps are fully interchangeable.

· Longevity is NOT a part of the NEC, but integral to the engineering evaluation in proper electrode selection.

· Encouraging "listed" grounding electrodes would provide reasonable assurance the various parameters (length, diameter, etc) and performance of an "installed rod" is NEC compliant.

· Listed products are certified by a listing laboratory, and are subject to performance testing.

· The ground rod electrodes addressed herein are "UL" listed and include permanent marking on the rod.

· Marking on the rod provides a method for the inspectors to visually inspect the installed rod for compliance.
Panel Meeting Action: Accept in Principle

Revise text of the recommendation to read:

Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than ~~2.5~~ 2.44 m (8 ft) in length and shall consist of the following materials."

(a) Grounding ~~E~~ electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size ¾) and, where of ~~iron or~~ steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(b) Grounding ~~E~~ electrodes ~~of rods~~ of stainless steel, copper or zinc coated ~~iron or~~ steel shall be at least 15.87 mm (5/8 in.) in diameter ~~.~~ unless ~~Stainless steel rods less than 16 mm (5/8 in.) in diameter, nonferrous rods, or their equivalent shall be~~ listed and ~~shall~~ not ~~be~~ less than 12.70 ~~13~~ mm (1/2 in.) in diameter.

Panel Statement: The panel rejects the additional words "hot dipped". There are other suitable methods for electrode galvanizing. The panel retains 15.87 mm because 15.88 is incorrect.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BRENDER, D.: The panel is proposing to allow 1/2-in. diameter galvanized rods in place of 5/8-in. diameter, although no technical substantiation was presented to justify this reduced diameter. I have witnessed corrosion testing where galvanizing seems not to perform well compared to other coating materials, although all metals used over steel corrode in time. In an extensive grounding study, not yet published, galvanized rods performed poorly in respect to corrosion in the course of only a few years.

Contrary to the written substantiation for this proposal, a UL representative noted that listing of a ground rod by UL does not involve performance or corrosion testing, only physical dimensions. Thus, UL listing cannot be a technical reason for allowing a smaller diameter rod. If the zinc surface should corrode, a thicker steel core would last longer than a thinner, which I believe is the reason the panel previously insisted on 3/4-in. diameter, with a 5/8-in. minimum.

Longevity is indeed a characteristic that concerns the code, and is the reason for the words "corrosion resistant" throughout, or why aluminum electrodes are not permitted.

BRETT, JR., M.: I agree with the other explanations of negative votes.

5-161 Log #3590 NEC-P05 **Final Action: Accept in Principle**
(250.52(A)(5))

Submitter: Michael Gassman, ERICO, Inc.

Recommendation: Revise as follows:

Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than ~~2.5~~ 2.44 m (8 ft) in length and shall consist of the following materials.

Substantiation: The change will allow the NEC to be consistent with other standards. Technical committees of both NEMA GR1 and the NESC (NESC Rule 094B2a) have agreed in principle to recommend a change in length to 2.44 m.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-160.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-162 Log #2285 NEC-P05 **Final Action: Reject**
(250.52(A)(5)(a))

Submitter: Andre Michalik, AMI Electric Co. / Rep. ABCD Academy-Instructor

Recommendation: Add sentence at end of 250.52(A)(5)(a) to read:

...Steel galvanized conduit not smaller than metric designator 21 (trade size 3/4) used for underground service lateral and installed as 250.53(G) shall be considered as pipe electrode.

Substantiation: It is obvious, that proper length of steel rigid conduit used for underground service buried in trench at least 30 in. deep has good contact to earth as 5/8 in. rod or other 3/4 in. pipe installed under that same condition. In my business, I realized that some of the inspectors consider the service conduit as grounding electrode, while the others do not agree, telling that kind of electrode is not mentioned in the NEC.

Panel Meeting Action: Reject

Panel Statement: Steel conduit installed in this manner generally is connected to the earth if not coated or otherwise isolated, and already meets the definition of grounding electrode and thus provides the function as a grounding electrode, but is not listed in 250.52. Service laterals installed in steel conduit are not all regulated by the NEC requirements which can lead to inconsistencies and deficiencies from a Code enforcement perspective. Electrodes installed in accordance with 250.53(G) are generally required to be driven.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-163 Log #3591 NEC-P05 **Final Action: Accept in Principle**
(250.52(A)(5)(b) & (c))

Submitter: Michael Gassman, ERICO, Inc.

Recommendation: Revise as follows:

(b) Electrodes of rods of iron or steel or surface galvanized shall be at least 15.87 mm (5/8 in.) in diameter.

(c) Solid rod electrodes of stainless steel, ~~rods~~ or copper or suitable nonferrous metal, and coated solid rod electrodes of iron or steel having a stainless steel or copper or suitable nonferrous metal coating less than ~~16 mm~~ 15.87 mm (5/8 in.) in diameter, ~~nonferrous rods, or their equivalent~~ shall be listed and shall not be less than ~~13 mm~~ 12.7 mm (1/2 in.) in diameter

Substantiation: This paragraph is often the subject of loose interpretation. Two differing metric equivalents are used for 5/8. By splitting the paragraph into 2 paragraphs, the change clearly identifies size and electrode types for electrical inspectors. The change eliminates interpretation and simplifies the inspection process.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-160.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

BRENDER, D.: See my vote on proposal 5-160.

5-144 Log #2965 NEC-P05 **Final Action: Reject**
(250.52(A)(5) Exception (New))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Add an exception: A single electrode shall be permitted where the single electrode has a resistance to ground 25 Ohms or less.

Substantiation: This proposal makes clear that a resistant value applies to a single electrode only.

Panel Meeting Action: Reject

Panel Statement: Section 250.52(A)(5) addresses the details and descriptions of rod and pipe electrodes. The concerns of the submitter are directed toward the resistance in the connection between the electrode and the earth. The concerns of the submitter are presently addressed in the provisions of 250.56.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

DOBROWSKY, P.: The proposal should be accepted in principle and the concept included in 250.56. This would improve the clarity of 250.56.

5-164 Log #3309 NEC-P05 **Final Action: Reject**
(250.52(A)(6) (New))

Submitter: Redwood Kardon, Code Check Institute

Recommendation: Add new subsection 250.52(A)(6), renumber current subsection 250.52(A)(6) to 250.52(A)(7), renumber current 250.52(A)(7) to 250.52(A)(8) and reference 250.50 text to reflect change.

250.52(A) (6) Listed Electrodes.

(7) Plate Electrodes.

(8) Other Local Metal Underground Systems or Structures.

250.50 Grounded Electrode System. All grounding electrodes as described in 250.52(A)(1) through (A)(7) that are...

Substantiation: Currently, 250.52 does not recognize commonly installed listed electrode systems that utilize metal tubing (copper or stainless steel) rather than a rod or pipe. NRTLs make a distinction between pipe and tubing when it comes to the classification of ground clamps. Extending these logic to these "ground well" systems, they would not properly fall under the category of pipe or rod. These systems should not be grouped with rod or pipes because unlike rod or pipe these are not "driven" and are not necessarily required to be 8 ft in contact with the soil.

Listed electrode systems have a long track record of effectiveness and should be included in this article.

Panel Meeting Action: Reject

Panel Statement: The proposal is incomplete. Installation requirements need to be provided in the appropriate sections. These listed electrodes are not prohibited by the NEC.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

HAMMEL, D.: See my explanation of negative vote on Proposal 5-156.

MELLO, C.: The panel action should have been to Accept. While the panel statement that there is nothing to specifically prohibit the Listed tube type chemical ground rods, the fact that 250.52 is a distinct list and that 250.50 only recognizes the grounding electrodes identified in 250.52 effectively makes use of anything else that might be suitable, not acceptable to many AHJs without long discussions, and potential project delays. To just add the ability to use Listed grounding electrodes to the list of existing does not create any burden and meets the same thing the panel statement is saying is not prohibited.
If there are installation requirements, these would have to be dealt with as part of the listing and be covered by 110.3(B) since not every type of Listed electrode is known. If there are concerns specifically for the chemical rod type electrodes, then those can be dealt with in future Code cycles in 250.53. I do not believe the lack of installation requirements for one type of Listed electrode used as an example in the substantiation should be sufficient reason not to allow the use of Listed grounding electrodes in general in 250.52.

5-145 Log #2966 NEC-P05 **Final Action: Reject**
(250.52(A)(6) Exception (New))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Add an exception: A single electrode shall be permitted where the single electrode has a resistance to ground of 25 Ohms or less.

Substantiation: This proposal makes clear that a resistant value applies to a single electrode only
Panel Meeting Action: Reject
Panel Statement: Section 250.52(A)(6) addresses the details and descriptions of plate electrodes. The concerns of the submitter are directed toward the resistance in the connection between the electrode and the earth. The concerns of the submitter are presently addressed in the provisions of 250.56.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: The proposal should be accepted in principle and the concept included in 250.56. This would improve the clarity of 250.56.

5-165 Log #525 NEC-P05 **Final Action: Accept in Principle**
(250.52(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(B) ~~Electrodes~~ Not permitted for Use as Grounding Electrodes. The following shall not be used as grounding electrodes:
(1) Metal underground gas piping system
(2) Aluminum ~~electrodes~~
Substantiation: This proposal is intended as an editorial revision for clarity. The title of the subdivision (B) starts out with the word "electrodes." This section includes a list of elements not permitted as electrodes.
Panel Meeting Action: Accept in Principle
Revise the proposed text editorially to add an "s" in the word "system" in item (1) as follows:
(B) ~~Electrodes~~ Not Permitted for Use as Grounding Electrodes . The following systems and materials shall not be used as grounding electrodes:
(1) Metal underground gas piping system s
(2) Aluminum ~~electrodes~~
Panel Statement: "Systems and materials" was added to add clarity. Other editorial changes were made for clarity.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-166 Log #2968 NEC-P05 **Final Action: Reject**
(250.52(B), FPN (New))

Submitter: James H. Maxfield, Dover, NH
Recommendation: Add text to read as follows:
FPN: For further information see NFPA 13, Standard for the Installation of Sprinkler Systems and NFPA 24, Standard for the Installation of Private Fire Service and Their Appurtenances, for the limited use of these systems as grounding electrodes.
Substantiation: In the 2001 ROP code Proposal 5-165 (Log #3313) included a recommendation to revise section 250-52(A) by adding "Water Based Fire Protection Piping Systems" to be prohibited as a grounding electrode. The panel rejected the recommendation concluding the following statement applies, "The intentional bonding of all the utilities in a building creates an equipotential ground plane that minimizes the voltage differential between the different systems under normal and abnormal operating conditions. The result is an environment safer from the hazards of electrocution and fire. (Excerpt from January/February, 2000, NFPA Journal article "Grounding, Bonding, and Sprinklers", by John Caloggero).
There is no disagreement that the bonding of all systems results in a safer environment, however, there is a distinct difference between grounding and bonding as defined in Article 100 of the NEC.
Currently, the NEC does not appear to reference the limited use of these piping systems as part of the grounding electrode system. Therefore, the insertion of a FPN in Part B of this section referencing the limited use of these piping systems would not only be prudent, it will provide continuity between NFPA publications while achieving a more user friendly document.
Panel Meeting Action: Reject
Panel Statement: These metal water piping systems that meet the criteria in 250.52(A)(1) are grounding electrodes naturally, and as such are required to be bonded to the grounding electrode system. A provision that allows these piping systems to be isolated from the grounding electrode system is not substantiated. The NEC does not differentiate between the various water piping systems that qualify as grounding electrodes, neither does it exempt any.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-167 Log #1982 NEC-P05 **Final Action: Reject**
(250.53(3))

Submitter: David Prior, American Galvanizers Association
Recommendation: Revise text to read:
An electrode encased by at least 50 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 6.0 m (20 ft.) or more ~~bare or zinc~~ of hot dip galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 13 mm (1/2 in.) in diameter, or consisting of at least 6.0 m (20 ft.) of bare copper conductor not smaller than 4 AWG. Reinforcing bars shall ~~be permitted to~~ be bonded together by the usual steel tie wires or other effective means.
Substantiation: Corrosion of bare steel in atmospheric service is continuous and ongoing even in areas with relatively low humidity. Steel that is exposed without the benefit of some form of corrosion protection will ultimately degrade and fail. The protection afforded by galvanizing is inexpensive, readily available, and has a documented history extending the life of steel in atmospheric, buried and in concrete reinforcement exposures.
Reinforced concrete has been used as a composite material for decades, and experience has shown that corrosion of reinforcement continues to be the major cause of deterioration of concrete structures. The stability of reinforced concrete in aggressive environments is influenced as much by the integrity of the steel as concrete, and both are of serious concerns to engineers and designers. Departments of Transportation (DOT's) have strict limits on the amount of admixtures (accelerators/decelerators) allowable in bridge construction, and on the water/cement ratios allowable to achieve the density and level of permeability required for long term performance of reinforced concrete. Homebuilders are not constrained by these same parameters and concrete durability is left to local skill and homeowner awareness.
The total life of the galvanized coating in concrete is made up of the time taken for the zinc to depassivate, which is known to be longer than that for "black" steel, plus the time for the dissolution of the alloy layers in the coating. In quality concrete which has been properly compacted and cured, and where the bar has adequate depth of cover to suit the exposure conditions, the galvanizing of reinforcement does afford long-term protection against corrosion, including concrete exposed to severe, high-chloride conditions.
Galvanized reinforcement develops a concrete bond that is equivalent to or greater than the bond to bare steel. Galvanized reinforcement can give a cost-effective enhanced durable service life through a substantial increase in initiation time and in protection time against corrosion. The benefits of galvanized reinforcement can be schematically represented by the figure below, which is an extension of the model proposed by Yeomans and Swamy.
Research data over the past 40 years ranging from the highly scientific to everyday practical applications has been conducted in countries throughout the world. This fact indicates a worldwide interest in galvanizing as a viable means of corrosion protection for steel reinforcement. The weight of evidence from this research has provided sufficient data to substantiate the superior performance of galvanized reinforcement when compared to black steel in concrete.
Galvanizing extends the time to the initiation of corrosion of the rebar compared to black steel and significantly delays and perhaps even avoids cracking of the concrete in many types of structures for 30-50 years and beyond. Galvanizing may eliminate the need for the first cycle of repair and maintenance of traditionally reinforced concrete, which would more than recover the costs associated with its initial use.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: This article does not specify how to build foundations. It is only saying that if certain conditions exist within a foundation, then it must be used as a grounding electrode.
No field data were provided that indicate uncoated steel should not continue to be allowed.
The panel suspects that the submitter meant to submit his proposal to 250.52(A)(3).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-168 Log #498 NEC-P05 **Final Action: Reject**
(250.53(A))

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Add to the end of the section:
Where more than one rod or pipe electrode are used for the same system, the distance between electrodes shall not be less than the length of the longest rod or pipe and not exceed four times the length of the longest rod or pipe.
Substantiation: 1. 250.56 should be deleted completely. (Proposal already submitted for this).
2. The spacing requirements in 250.56 only apply to rod, plate, and pipe electrodes installed to meet that section. There is no requirement for electrode spacing under any other purpose for the same system.
3. 250.53(B) spacing requirements only apply to electrodes of different systems.
4. One of the primary purposes of electrode system grounding is to limit the voltage imposed by lightning as indicated in 250.4(A)(1). Per the NFPA 780 section A.4.13.2.4,
" No benefit is gained from the second ground rod if placed closer than the length of the longer rod. No additional benefit is gained if the second rod is placed over times the length of the longer rod." This finding should be shared into the NEC.

Panel Meeting Action: Reject
Panel Statement: The requirements of this section [250.53(A)] have to do with installation criteria only and do not address performance (resistance to ground) issues for rod, pipe, and plate electrodes. Section 250.56 clearly indicates that "where multiple rod, pipe, or plate electrodes are installed to meet the requirements of this section", the spacing requirements contained in 250.56 apply. The performance requirements (resistance to ground) for a single rod, pipe, or plate electrode are provided in 250.56. No technical substantiation has been provided related to the distances proposed between rod, pipe, or plate electrodes.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-169 Log #1662 NEC-P05 **Final Action: Reject**
(250.53(G))

Submitter: James Jackson, Carlisle, IN
Recommendation: Revise text to read as follows:
~~2.44 m (8 ft)~~ 3.048 m (10 ft)
Substantiation: 250.4(A)(1) "... limit voltage imposed by lightning"
675.15 "Lightning Protection"
NFPA 780 2004 Edition 4.13.2.3(A) and 4.13.2(B) "The groundrods shall extend vertically not less than (10 ft) 3 m into the earth"
This proposal is to make NFPA 70 the same as NFPA 780 for lightning protection.
Panel Meeting Action: Reject
Panel Statement: It would be inappropriate for this section to impose the requirements of NFPA 780. Grounding electrodes installed to comply with NFPA 780 are required to be bonded to the electrical system grounding electrode by 250.106.
The requirements of NFPA 780 apply to the installation of lightning protection systems and do not necessarily apply to the NEC.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-170 Log #1398 NEC-P05 **Final Action: Accept in Principle**
(250.54)

Submitter: George Stolz, II, Pierce, CO
Recommendation: Change the term "supplementary" to "superfluous", or anything that sounds and looks dissimilar from "supplementary" and is less comical.
Substantiation: The two terms, "supplemental" and "supplementary" are synonymous in the English language. It would be easier to distinguish between the two concepts if the term used to define the type of electrode function specified in 250.54 were changed.
Supplemental is generally defined as "compensating for a deficiency", which can make sense when applied to the requirement described in 250.53(D)(2).
The function described in 250.54 would be more aptly renamed, as there is no deficiency in the grounding electrode system that this electrode is serving, and often is superfluous in its nature.
Panel Meeting Action: Accept in Principle
Change existing 250.54 to read as follows:
"Auxiliary Grounding Electrodes. One or more grounding electrodes shall be permitted to be connected …".
Panel Statement: To delete the term "supplementary" which is too close to the term "supplemental" used in other sections of Article 250.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-171 Log #385 NEC-P05 **Final Action: Reject**
(250.56)

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Delete the entire section. Delete reference to this section in 250.53(D)(2).
Substantiation: There is no substantiation for having a resistance to ground 25 ohms or less. There is no evidence having a resistance to ground less than 25 ohms provides any more safety or reliability than ground resistances over 25 ohms. The section is based on design and not a minimum standard. No other electrodes are required to meet minimum resistances to ground, nor should rod, plate, or pipe electrodes. There are thousands of single-family homes in my community alone with single rod electrodes. There have been no reported cases of problems or hazards due to this. Performance grounding of the electrical service should be left to the electrical designer and engineer, and not the electrical installer.
Panel Meeting Action: Reject
Panel Statement: Insufficient substantiation has been provided to remove this section from the NEC. The panel concludes that deleting 250.56 reduces current minimum requirements. The panel affirms that the provisions in 250.56 are needed for installations using rod, pipe, or plate electrodes. See panel action and statement on Proposal 5-144 (Log#1858 and Proposals 5-128 (Log #1856) and 5-133 (Log #1857) in the 2004 ROP.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-172 Log #1833 NEC-P05 **Final Action: Reject**
(250.56)

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician
Recommendation: Revise as follows:
Where multiple rod, pipe, or plate electrodes are installed to meet the requirements of this section, they shall not be less than 1.8 m (6 ft) apart <u>with the burial depth of the conductor in accordance with Table 300.5 column (5).</u>
Substantiation: A dangerous trip hazard is present between electrodes, with no code article to enforce a safe installation to protect persons.
Panel Meeting Action: Reject
Panel Statement: The proposed revisions to this section are addressing the grounding electrode conductor installation and do not belong in this section. See also panel action and statement on Comment 5-116 (Log #372) in the 2004 ROC which rejected a proposed Code requirement for burial depths for grounding electrode conductors in accordance with 300.5 as proposed in Proposal 5-154 (Log # 2345) of the 2004 NEC ROP.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-173 Log #1983 NEC-P05 **Final Action: Reject**
(250.56)

Submitter: Frank Brewer, Bill Wade & Associates
Recommendation: Revise text to read:
250.56 Resistance of Rod, Pipe, Concrete Encased Electrodes, and Plate Electrodes. A single electrode consisting of a rod, pipe, concrete encased electrode, or plate that does not have a resistance to ground of 25 ohms or less shall be augmented by one additional electrode of any of the types specified by 250.52.(A)(2) through (A)(7). Where multiple rod, pipe, or plate electrodes are installed to meet the requirements of this section, they shall not be less than 1.8 m (6 ft) apart.
Substantiation: For safety reasons, it is important to have an additional electrode to supplement the "ufer" ground. This section was originally written to improve the ground system by requiring an extra electrode when the testing resulted in 25 ohms or less or when testing was not performed at all. If the logic exists for supplementing the other electrodes, it should exist for supplementing the concrete encased electrode also. Concrete encased electrodes should be treated in the same manner as other electrodes. The lack of a means to inspect whether the grounding conductor is properly attached to the rebar also warrants the need for another grounding electrode to assure integrity. A tester for testing resistance of rebar is commercially available.
Panel Meeting Action: Reject
Panel Statement: No substantiation has been provided to require concrete-encased grounding electrodes to be augmented by an additional electrode as required for a single rod, pipe, or plate electrode that does not meet the resistance requirements in 250.56. Concrete-encased grounding electrodes typically have low resistance values as documented in the findings of UFER.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-174 Log #2967 NEC-P05 **Final Action: Reject**
(250.56)

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Delete 250.56.
Substantiation: The resistence values provided in this section are proposed for 250.52(A)(5) & (6).
Panel Meeting Action: Reject
Panel Statement: See the panel actions and statements on Proposals 5-144 and 5-145.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-175 Log #3325 NEC-P05 **Final Action: Reject**
(250.56)

Submitter: David Pattison, Sky Electric
Recommendation: Revise text to read:
...25 ohms or less shall be augmented by ~~one~~ additional electrodes of any of the types specified by 250.52(A)(2) through (A)(7) <u>until 25 ohms or less is achieved</u> .
Substantiation: It is unclear if the intent of the code would be to continue driving ground rods until 25 ohms is achieved. If not what is the significance of 25 ohms or less?
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided substantiation to include the restrictions proposed. Single electrodes indicated in this section must meet the 25 ohm provisions of 250.56. One additional electrode is required where this resistance value exceeds 25 ohms. The panel affirms that it is not required to

install multiple rod, pipe, or plate electrodes until 25 ohms or less resistance is achieved. It is not the intent of this section to achieve a resistance of 25 ohms or less due to varying soil conditions. See also panel action and statement on Proposal 5-143 (Log # 293) in the 2004 NEC cycle.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-176 Log #386 NEC-P05 **Final Action: Reject**
(250.58)

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Add new text as follows:
Where separate services, feeders, or branch circuits supply a building and are required to be connected to a grounding electrode(s), the same grounding electrode(s) shall be used <u>and the provisions of (1) are met:</u>
<u>(1) An approved audible or visible alarm shall be installed at each service to indicate the grounded conductor brought to the service has opened.</u>
<u>Exception No. 1: In industrial installations, with written safety procedures, where conditions of maintenance and supervision ensure that only qualified persons service the equipment.</u>
<u>Exception No. 2: Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision.</u>
Substantiation: Upon the opening of the grounded (neutral) conductor at one service, potentially dangerous current will flow between the common electrodes to both services. Any person who comes in contact with exposed metal parts at the service equipment or grounding electrode system could be exposed to lethal current.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any technical substantiation to require monitoring grounding electrode and grounding electrode conductor integrity by audible and visible alarms. The Code is not structured to protect against abnormal conditions such as open neutrals that may develop.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-177 Log #3504 NEC-P05 **Final Action: Reject**
(250.58)

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Delete this entire section.
Substantiation: This section is not necessary and causes confusion. Section 250.50 already requires a electrodes to be bonded together. Having one section apply without duplicating the requiremet, using different and addiaitoal language does not help usability. If there is opposition to deleting any additional details contained in the section, then those details should be added to 250.50.
Panel Meeting Action: Reject
Panel Statement: The current requirements in 250.58 are needed. Removing this section could lead to conditions where separate electrodes for different services or other systems might not be bonded together. The direct wording addressing multiple services on one building or structure in 250.58 should be retained.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-178 Log #574 NEC-P05 **Final Action: Reject**
(250.62)

Submitter: Alan H. Nadon, City of Elkhart, IN
Recommendation: Add to the end of the existing text:
<u>The grounding electrode conductor(s) in switchboards, panelboards, cutout boxes, transfer switches, and other enclosures, shall be identified according to 250-119</u> .
Substantiation: The grounding electrode conductor is not currently required to be identified, unless it is also used for bonding. It is a common, minimum practice to identify this conductor, to reduce the possibility that it may be mistaken for a current carrying conductor. Many installers identify this conductor to facilitate verification of a proper installation. Because it is a common practice to identify this conductor, but not a requirement, some installers are not identifying it, and the distinct possibility exists that it may be confused with a current carrying conductor and an improper connection could result in serious damage or injury to persons.
Panel Meeting Action: Reject
Panel Statement: This section covers the required conductor material for the grounding electrode conductor. No substantiation has been provided by the submitter to indicate there is a safety concern related to the proposed more restrictive identification requirements. The identification requirements for equipment grounding conductors are provided in 250.119. The grounding electrode conductor is currently not required or prohibited from being identified by any of the means specified in 250.119.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-179 Log #1071 NEC-P05 **Final Action: Reject**
(250.62)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add: Insulated or covered conductors shall not have white or gray color or marking. Where the grounding electrode conductor is installed in a cable tray, raceway or enclosure with other conductors, it shall be identified by tagging or other effective means acceptable to the authority having jurisdiction.
Substantiation: There is no Code prohibition of installation in raceways or other enclosures with other conductors. Since no identification is required, it may be assumed to be a grounded or grounding conductor. While a connection of an equipment grounding conductor to this conductor may not pose a hazard, it does not comply with the connection point specified in the definition of equipment grounding conductor.
Panel Meeting Action: Reject
Panel Statement: This section covers the required conductor material for the grounding electrode conductor. No substantiation has been provided by the submitter to indicate there is a safety concern related to the proposed more restrictive identification requirements. The identification requirements for equipment grounding conductors are provided in 250.119. The grounding electrode conductor is currently not required or prohibited from being identified by any of the means specified in 250.119.
Sections 200.6 and 200.7 already universally restrict the use of the colors white and gray and therefore the requirement does not need to be repeated.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-180 Log #2591 NEC-P05 **Final Action: Reject**
(250.62)

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Add the following to the end of the existing text.
<u>Bare copper conductors shall not be permitted for use in aluminum raceways.</u>
Substantiation: Due to the galvanic action between these two dissimilar metals, when a bare copper conductor is installed in an aluminum raceway, the raceway corrodes and deteriorates very quickly. 110.14 addresses dissimilar metals in terminations and splices, this will only expand on that same theory.
Panel Meeting Action: Reject
Panel Statement: The existing language in 250.62 makes the proposed change unnecessary.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-181 Log #91 NEC-P05 **Final Action: Reject**
(250.64(B))

Submitter: Neil Birchmeier, New Lothrop, MI
Recommendation: Add a new sentence at the end of the paragraph as follows:
" <u>Where run outside on an exterior surface, an exposed grounding electrode conductor shall be secured to the surface at an interval of not to exceed 600 mm (2 ft)."</u>
Substantiation: The first sentence only requires the exposed grounding electrode wire to be secured to the surface. This requirement is frequently met and the cable is still subject to snagging that results in damage to the cable. By securing the cable at 600 mm (2 ft) intervals, the cable is held tight enough to the surface to minimize any chance of the cable being snagged. At greater support intervals, the cable can be easily pulled away from the surface. There will be fewer cases of damaged grounding electrode conductors with this rule, and there will be a rule to follow for the inspector when the presently unspecified support spacing is obviously too great in some cases.
Panel Meeting Action: Reject
Panel Statement: Section 250.64(B) adequately covers the installation requirements.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-182 Log #99 NEC-P05 **Final Action: Reject**
(250.64(B))

Submitter: Brian Kincaid, Swartz Creek, MI
Recommendation: Add a new last sentence to this paragraph to read as follows:
<u>Where run away from the surface of a building or structure for connection to a grounding electrode, unprotected grounding electrode conductors shall be run below grade level.</u>
Substantiation: There were proposals during the last cycle to prevent grounding electrode conductors from being run exposed across the surface of the ground where they can easily be damaged. Presently, there is no rule against running grounding electrode conductors across the surface of the earth.

The depth of burial seemed to be an issue, so why not omit the depth and just require the cable to be placed below the surface of the earth when run away from a building or structure. Perhaps, this will be acceptable so grounding electrode wires will be installed less likely to be damaged, or exposed along the ground surface where they pose a tripping hazard.
Panel Meeting Action: Reject
Panel Statement: Section 250.64(B) adequately covers the protection requirements.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-183 Log #101 NEC-P05 **Final Action: Reject**
(250.64(B))

Submitter: Justin Ptak, Wyandotte, MI
Recommendation: Add a new last sentence to this paragraph to read as follows:
"A grounding electrode conductor run away from a building or structure a distance of more than 600 mm (1 ft) shall be installed beneath a concrete or similar cover or buried to a depth of not less than 200 mm (4 in.)"
Substantiation: I can't understand why there is opposition to running a conductor as important as a grounding electrode conductor under the surface of the earth so it cannot be damaged. All too often the exposed cable is run along the surface of the earth to make connection to a grounding electrode. The 600 mm distance from the building or structure was included to take care of those situations where the electrode is installed close to the building or structure. Granted the length of the grounding electrode conductor should be as short as possible for best performance, but a damaged grounding electrode conductor certainly has impaired performance.
Panel Meeting Action: Reject
Panel Statement: Section 250.64(B) adequately covers the protection requirements.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-184 Log #450 NEC-P05 **Final Action: Reject**
(250.64(B))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: Insert a new third sentence to read:
Where protection is provided by a raceway, it shall be RMC, IMC, RNC, or EMT.
Substantiation: The last sentence prohibits the use of flexible metal conduit for enclosing a grounding electrode conductor smaller than 6 AWG. This makes sense, because current flow in a single conductor in a metal raceway is approximately 90 percent on the raceway, 5 percent on the conductor. Flexible metal conduit is a relatively poor conductor due to the oil used in its manufacture interrupting the turn-to-turn conductivity and resulting in a metal ribbon conductor three times the length of the raceway itself. This added sentence will make the rule the same for 4 AWG and larger as it is for 6 AWG and smaller.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided technical substantiation that would restrict the current accepted use of listed bare armored conductors for use as grounding electrode conductors, which is a current common practice. There is no evidence provided that indicates there is a problem with these types of cables installed as grounding electrode conductors.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-185 Log #972 NEC-P05 **Final Action: Reject**
(250.64(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
~~Where exposed:~~ A grounding electrode conductor or its enclosure shall be securely supported and f astened in place ~~to the surface on which it is carried~~ except where fished between access points where concealed in finished buildings or structures where supporting and fastening is impractical. A ~~4~~ 6 AWG or larger ~~copper or aluminum~~ conductor shall be protected if exposed to ~~severe~~ physical damage. A 6 AWG or larger grounding conductor that is ~~free from exposure~~ not exposed to physical damage shall be permitted to run along the surface of the building or structure without being enclosed in a raceway or cable armor ~~metal covering or protection~~ where it is securely supported and fastened in place to the construction or it shall be permitted to be installed in any approved raceway, subject to the provisions of the raceway article . Otherwise, it shall be rigid metal conduit, intermediate metal conduit, ~~rigid nonmetallic conduit, electrical metallic tubing~~ , or cable armor. Grounding electrode conductors smaller than 6 AWG shall be in rigid metal conduit, intermediate metal conduit, ~~rigid nonmetallic conduit, electrical metallic tubing~~ or cable armor except that electrical; metallic tubing and rigid nonmetallic conduit shall be permitted where not subject to physical damage. An unprotected grounding electrode conductor that is directly buried in the earth for a distance of more than 600 mm (2 ft) shall be installed at a depth of not less than 450 mm (18 in.) below grade.
Substantiation: "Fastened" does not assure support if distance between fastenings is great. Allowance should be made for fishing. Conductors larger than 6 AWG should also be protected if subject to damage. Structures which are not "buildings" should be included for the 6 AWG conductor. "Metal covering or protection" is not specific re: type, thickness, etc. If a 6 AWG can be run without covering or protection installation in any suitable raceway should be permitted; it is more than no protection or covering and may be desirable for esthetics or added protection. A directly buried 6 AWG conductor (maximum for made electrodes) run for extended lengths without concrete slab or protection should warrant a depth requirement since Table 300.5 may be interpreted as not applicable to grounding electrode conductors.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Comment 5-116 (Log No. 372) in the 2004 NEC ROC.
In addition, there is no substantiation for an 18 in. below grade requirement.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-186 Log #1901 NEC-P05 **Final Action: Accept**
(250.64(C))

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: In 250.64(C), delete (3) & (4) and move it to 250.64(F). The section to read as follows:
(C) Continuous. Grounding electrode conductor(s) shall be installed in one continuous length without a splice or joint except as permitted in (1) through ~~(4)~~ (3):
(1) Splicing shall be permitted only by irreversible compression-type connectors listed as grounding and bonding equipment or by the exothermic welding process.
(2) Sections of busbars shall be permitted to be connected together to form a grounding electrode conductor.
~~(3) Bonding jumper(s) from grounding electrode(s) and grounding electrode conductor(s) shall be permitted to be connected to an aluminum or copper busbar not less than 6 mm x 50 mm (1/4 in. x 2 in.) The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector or by the exothermic welding process.~~
~~(4) Where aluminum busbars are used, the installation shall comply with 250.64(A).~~
Substantiation: The (3) text covering bonding jumpers connected to the aluminum or copper busbar more appropriately belongs in 250.64(F) since it clearly addresses bonding jumpers installed from grounding electrodes to the busbar. The grounding electrode conductor should be installed without a splice from the point of connection at the grounded conductor at the service to the busbar and the bonding jumpers are then installed from this point to all of the electrodes in the system. With the busbar text presently in 250.64(C), it implies that all of the conductors connected to the busbar are grounding electrode conductors but (3) actually covers bonding jumpers to electrodes from a primary grounding electrode conductor. Deleting (3) from 250.64(C) should focus on the exceptions permitting splicing of grounding electrode conductors, not an exception permitting connection of bonding jumpers for other electrodes. This is a companion proposal to relocate the busbar text from 250.64(C) to 250.64(F).
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
DOBROWSKY, P.: The term "irreversible" should also be deleted. See my comment on proposal 5-11.

5-187 Log #3305 NEC-P05 **Final Action: Reject**
(250.64(C))

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Revise text to read as follows:
"250.64(C) Continuous. Grounding electrode conductor(s) shall be installed to connect the grounding electrode system in one continuous length without a splice or joint...".
Substantiation: There is a common misconception that a grounding electrode conductor must be run continuously to each of the various electrodes that comprise the grounding electrode system prescribed in Article 250.50. Adding the words "to connect to the grounding electrode system" will help further delineate the function of the grounding electrode conductor and make it clear this conductor does not have to be run continuously from electrode to electrode.
Panel Meeting Action: Reject
Panel Statement: The proposed wording does not add clarity to the Code and may cause confusion.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-188 Log #826 NEC-P05 **Final Action: Accept in Principle**
(250.64(C)(3))

Submitter: Kim Parker, Austin, TX
Recommendation: Revise text to read as follows:
(C) Continuous. Grounding electrode conductor(s) shall be installed in one continuous length without a splice or joint except as permitted in (1) through (4):
(1) Splicing shall be permitted only by irreversible compression-type connectors listed as grounding and bonding equipment or by the exothermic welding process.
(2) Sections of busbars shall be permitted to be connected together to form a grounding electrode conductor.
~~(3) Bonding jumper(s) from grounding electrode(s) and grounding electrode conductor(s) shall be permitted to be connected to an aluminum or copper busbar not less than 6 mm × 50 mm (1/4 in. × 2 in.). The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector or by the exothermic welding process.~~
~~(4)~~ (3) Where aluminum busbars are used, the installation shall comply with 250.64(A).
Substantiation: The inclusion of item (3) into 250.64(C) was a mistake as bonding jumpers are not grounding electrode conductors in the sense of splicing as covered by 250.64(C) and this inclusion tends to make them so. The provisions for use of a separate bonding busbar to make various electrode connections is not new to the industry just since the 2005 NEC but rather has been used in many areas for years. The electrical installers congratulate the panel on the inclusion of this provision in the 2005 NEC, as it is now a legal choice for connecting electrodes. However, this new provision should have been included in 250.64(F). This proposal is one of two proposals with a companion proposal also being submitted to revise 250.64(F).
Panel Meeting Action: Accept in Principle
Panel Statement: See panel actions and statements on Proposals 5-186 and 5-203.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-189 Log #2159 NEC-P05 **Final Action: Reject**
(250.64(C)(3))

Submitter: Richard E. Loyd, Sun Lakes, AZ
Recommendation: Revise text to read:
~~Bonding jumper(s) from grounding electrode(s) and g~~ Grounding electrode conductor(s) from each electrode and the common grounding electrode conductor shall be permitted to be connected to an aluminum or copper busbar not less than 6 mm × 50 mm (1/4 in. × 2 in.). The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector or by the exothermic welding process.
Substantiation: To clarify that each grounding electrode conductor shall be sized in accordance with 250.66 where spliced at a busbar. The term "bonding jumper" is understood as a short wire or strap to connect two items together or a tap to another item such as "jumper to ground". In this situation, it is clearly the GEC from the electrode to the busbar.
Panel Meeting Action: Reject
Panel Statement: Section 250.53(C) clearly states the interconnection of grounding electrodes is by a bonding jumper. The definition of bonding jumper and most applications in the Code do not restrict or imply restrictions on length. To identify the conductors between grounding electrodes or from one of the electrodes to the common bus bar as "grounding electrode conductors" would impose many added requirements that do not have technical substantiation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-190 Log #451 NEC-P05 **Final Action: Accept in Principle**
(250.64(D))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: Revise the last sentence to read as follows:
The tap conductors shall be connected to the common grounding electrode conductor by means of irreversible compression type connectors or by the exothermic welding process and in such a manner that the common grounding electrode conductor remains without a splice or joint.
Substantiation: The lack of this specific requirement has led some to assume that these connections can be made by the use of split-bolt connectors, in violation of 250.64(C).
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-192.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-191 Log #868 NEC-P05 **Final Action: Accept in Principle**
(250.64(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
(D) Grounding Electrode Conductor Taps. Where a service consists of more than a single enclosure as permitted in 230.71(A), it shall be permitted to connect taps to the common grounding electrode conductor. Each such tap conductor shall extend to the inside of each such enclosure. The common grounding electrode conductor shall be sized in accordance with 250.66 based on the sum of the circular mil area of the largest ungrounded service entrance conductors. Where more than one set of service entrance conductors as permitted by 230.40, Exception No. 2 connect directly to a service drop or lateral, the common grounding electrode conductor shall be sized in accordance with Table 250.66 Note 1. The tap conductors shall be permitted to be sized in accordance with the grounding electrode conductors specified in 250.66 for the largest conductor serving the respective enclosures. The tap conductors shall be connected to the common grounding electrode conductor in accordance with 250.8 and in such a manner that the common grounding electrode conductor remains without a splice or joint.
Substantiation: 250.64(D) provides an alternative for using grounding electrode conductor taps connected to a common grounding electrode conductor. The common grounding electrode conductor is required to remain without a splice or joint, but that doesn't apply to the grounding electrode conductor taps as addressed in this section. Adding this text that references Section 250.8 should provide the additional clarity needed for what methods are permitted to be used when connecting a grounding electrode conductor tap to a common grounding electrode conductor.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-192.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-192 Log #2396 NEC-P05 **Final Action: Accept in Principle**
(250.64(D))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
(D) Multiple Disconnecting Means. Where a service consists of more than a single enclosure as permitted in 230.71(A), it shall be permitted to connect to the grounding electrode system in accordance with (1) or (2).
~~(D)~~ (1) Grounding Electrode Conductor Taps. ~~Where a service consists of more than a single enclosure as permitted in 230.71(A), it shall be permitted to connect~~ Taps to the common grounding electrode conductor shall be permitted . Each such tap conductor shall extend to the inside of each such enclosure. The common grounding electrode conductor shall be sized in accordance with 250.66, based on the sum of the circular mil area of the largest ungrounded service entrance conductors. Where more than one set of service entrance conductors as permitted by 230.40, Exception No. 2 connect directly to a service drop or lateral, the common grounding electrode conductor shall be sized in accordance with Table 250.66 Note 1. The tap conductors shall be permitted to be sized in accordance with the grounding electrode conductors specified in 250.66 for the largest conductor serving the respective enclosures. The tap conductors shall be connected to the common grounding electrode conductor in such a manner that the common grounding electrode conductor remains without a splice or joint.
(2) It shall be permitted to connect each enclosure to one or more of the grounding electrodes individually with a grounding electrode conductor. Such grounding electrode conductor shall be permitted to be sized in accordance with 250.66 for the largest conductor serving the respective enclosures.
Substantiation: As written presently, the Code does not specifically address the installation of multiple grounding electrode conductors for separate disconnecting means enclosures. The existing code language only addresses taps to the common grounding electrode conductor, but does not address individual grounding electrode conductors terminated to the electrode itself.
Panel Meeting Action: Accept in Principle
Recommendation: Revise 250.64(D) to read:
(D) Service with Multiple Disconnecting Means Enclosures. Where a service consists of more than a single enclosure as permitted in 230.71(A), grounding electrode connections shall be made in accordance with (1), (2) or (3).
(1) Grounding Electrode Conductor Taps.
Where the service is installed as permitted by 230.40, Exception No. 2, a common grounding electrode conductor and grounding electrode conductor taps shall be installed. The common grounding electrode conductor shall be sized in accordance with 250.66, based on the sum of the circular mil area of the largest ungrounded service entrance conductor(s). Where the service-entrance conductors connect directly to a service drop or service lateral, the common grounding electrode conductor shall be sized in accordance with Table 250.66, Note 1.

A tap conductor shall extend to the inside of each service disconnecting means enclosure. The grounding electrode conductor taps shall be sized in accordance with 250.66 for the largest conductor serving the individual enclosure. The tap conductors shall be connected to the common grounding electrode conductor by exothermic welding or with connectors listed as grounding and bonding equipment in such a manner that the common grounding electrode conductor remains without a splice or joint.

(2) Individual Grounding Electrode Conductors. A grounding electrode conductor shall be connected between the grounded conductor in each service equipment disconnecting means enclosure and the grounding electrode system. Each grounding electrode conductor shall be sized in accordance with 250.66 based on the service-entrance conductor(s) supplying the individual service disconnecting means.

(3) Common Location. A grounding electrode conductor shall be connected to the grounded service conductor(s) in a wireway or other accessible enclosure on the supply side of the service disconnecting means. The connection shall be made with exothermic welding or a connector listed as grounding and bonding equipment. The grounding electrode conductor shall be sized in accordance with 250.66 based on the service-entrance conductor(s) at the common location where the connection is made.

Panel Statement: This proposal includes concepts that are included in Proposals 5-190, 5-191, 5-192 and 5-193. In addition, item No. 3 was added to include the provision in 250.24 for making the grounding electrode connection at an accessible location on the load side of the service drop or service lateral.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

TOOMER, R.: The proposed changes clarify the requirements for the installation of multiple grounding electrode conductors. However, the changes also introduce additional listing requirements by requiring that tap connections be made with "connectors listed as grounding and bonding equipment" in sub-paragraphs one and three. This change would prohibit some commonly used tap connectors with no technical substantiation for the limitation.

5-193 Log #346 NEC-P05 **Final Action: Accept in Principle**
(250.64(E))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Add text to read as follows:

<u>(E) Multiple Service Disconnect Enclosures. Where the service disconnecting means consists of more than a single enclosure as permitted in 230.71(A), it shall be permitted to run individual grounding electrode conductors from a common electrode as covered in 250.58, to each service disconnecting means. Each of the individual grounding electrode conductors shall be extended to the inside of each such service disconnecting means enclosure. The size of each individual grounding electrode conductor installed in accordance with this section shall be sized in accordance with 250.66 based on the size of the largest ungrounded service conductor serving the respective enclosure. The installation of such conductors shall meet the requirements of 250.64(A), (B), and (E).</u>

Substantiation: The proposed method of installing individual grounding electrode conductors is a common practice in many areas and follows the same concept of grounding electrode conductor taps as provided in 250.64(D) except the individual GECs connect directly to the electrode(s). The Code has not previously included clear provisions that recognize this method of installing grounding electrode conductors to multiple service disconnects grouped in the same location. This additional alternative will provide language in the NEC to apply to such practices that are already ongoing and recognized in industry. An example: Three service switchboards are installed in a large facility and there is a service disconnect (main) in each switchboard and they are all grouped in the same location. Currently, individual grounding electrode conductors are being run to each service switchboard. This is not an installation of three services, but three service disconnects (one on each switchboard) grouped in the same location. The proposed wording could also be applied where multiple service disconnect enclosures (smaller varieties) are installed grouped in one location to form a service disconnecting means. This proposed wording would provide Code rules that could be applied to such situations.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-192.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-194 Log #1240 NEC-P05 **Final Action: Reject**
(250.64(E))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete "ferrous" in the first and third sentences; delete second sentence.

Substantiation: Edit. 250.92(A) requires bonding and continuity for "any" metallic raceway, which includes nonferrous aluminum, brass, or copper.

Panel Meeting Action: Reject

Panel Statement: The revised wording does not add clarity to the Code. There is no substantiation to delete the entire second sentence.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-195 Log #2905 NEC-P05 **Final Action: Accept in Principle**
(250.64(E))

Submitter: Peter D. Noval, Jr., Philadelphia, PA

Recommendation: Revise text to read as follows:

(E) Enclosures for Grounding Electrode Conductors. Ferrous metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode and shall be securely fastened to the ground clamp or fitting.

Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor. Bonding shall apply at each end and to all intervening ferrous raceways, boxes, and enclosures between the ~~service equipment~~ <u>cabinets or equipment</u> and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than, the required enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.

Substantiation: Grounding electrode conductor installations pertain to more than just service equipment.

Replacing "service equipment" with "cabinets or equipment" addresses this point. In addition, this revision provides consistency throughout 250.64(E) and helps to eliminate the potential for misinterpretation with regard to bonding requirements. Such clarification will help inspectors and installers alike.

Panel Meeting Action: Accept in Principle

Revise text to read as follows:

(E) Enclosures for Grounding Electrode Conductors. Ferrous metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode and shall be securely fastened to the ground clamp or fitting.

Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor. Bonding shall apply at each end and to all intervening ferrous raceways, boxes, and enclosures between the service equipment, <u>cabinets, or equipment</u> and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than, the ~~required~~ enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.

Panel Statement: There is no technical substantiation to remove "service equipment."

The word "required" was delete by Proposal 5-196.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-196 Log #2907 NEC-P05 **Final Action: Accept in Principle**
(250.64(E))

Submitter: Peter D. Noval, Jr., Philadelphia, PA

Recommendation: Delete text to read as follows:

(E) Enclosures for Grounding Electrode Conductors. Ferrous metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode and shall be securely fastened to the ground clamp or fitting.

Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor. Bonding shall apply at each end and to all intervening ferrous raceways, boxes, and enclosures between the service equipment and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than, the ~~required~~ enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.

Substantiation: Field experience has shown that grounding electrode conductors are sometimes installed in sizes larger than the minimum required by the National Electrical Code or the design professional.

Frequently, this "oversizing" occurs simply because the larger size is readily available on the job site and the smaller "required" size is not.

Subsequently, bonding jumpers are then installed on the enclosing raceway to provide electrical continuity, but they are the same size as the "required" grounding electrode conductor.

In these instances, the bonding jumpers are smaller than the enclosed grounding electrode conductor.

From an inspector's prospective, the result is an installation that may not be readily determined to be code-compliant.

Therefore, to eliminate any confusion amongst installers and inspectors alike, and to facilitate inspections, delete the word "required".

This would clarify the requirement that bonding jumpers be the same size as, or larger than, the enclosed grounding electrode conductor.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 5-195. The action to remove the word "required" is taken in Proposal 5-195.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-197 Log #2925 NEC-P05 **Final Action: Reject**

(250.64(E))

Submitter: Peter D. Noval, Jr., Philadelphia, PA

Recommendation: Revise text to read as follows:

(E) Enclosure for Grounding Electrode Conductors. Strike metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode and shall be securely fastened to the ground clamp or fitting.

~~Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous~~ metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor. Bonding shall apply at each end and to all intervening ferrous metal raceways, boxes, and enclosures between the service equipment and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than the required enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.

Substantiation: Under certain conditions (lightning strike, voltage surge, ground-fault, etc.) unbonded sections of electrically conductive metal raceways, fittings, and enclosures may be subjected to arcing, resulting in a possible fire hazard.

This would be the case whether the metal was ferrous or nonferrous.

Therefore, to exempt nonferrous metal enclosures and raceways from the bonding requirements specifically called out for ferrous enclosures and raceways make no sense, with respect to the fire hazard.

In addition, due to the "skin effect", when properly bonded both ferrous and nonferrous raceways only add to the current-carrying capacity of the grounding electrode conductor installation (as the raceway is connected in parallel with the conductor) as well as lowering overall impedance of the path to ground.

The inclusion of "ferrous" to the exclusion of "nonferrous" perhaps was added to the previous 2002 NEC text in this section to address the choke effect that can be experienced with improperly bonded steel raceway.

However, as written, this text presently ignores the intent of the "bonding" part of Article 250 for all metal electrically conductive non-current carrying raceways, conductors, and enclosures.

The revised text brings the section back in line with the rest of Article 250.

Panel Meeting Action: Reject

Panel Statement: Determination of when bonding of floating nonferrous metal is required to prevent flashovers is an engineering consideration and should not be required in the NEC.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-198 Log #2926 NEC-P05 **Final Action: Accept in Principle in Part**

(250.64(E))

Submitter: Peter D. Noval, Jr., Philadelphia, PA

Recommendation: Revise the text to read as follows:

(E) Enclosures for Grounding Electrode Conductors. ~~Ferrous~~ metal Enclosures. For grounding electrode conductors shall be of electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode ~~and shall be securely fastened to the ground clamp or fitting~~ .

~~Nonferrous metal enclosures shall not be required to be electrically continuous~~ . ~~Ferrous~~ metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor. Bonding shall apply at each end and to all intervening ferrous <u>metal</u> raceways, boxes, and enclosures between the ~~service equipment~~ <u>cabinets or equipment</u> and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as or larger than the ~~required~~ enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.

Substantiation: The revised text clarifies the intent of the code with respect to:

1) Bonding <u>all</u> metal enclosures vs nonferrous only.

2) Bonding of enclosed vs. securely fastening to clamps or fittings.

3) Bonding between the grounding electrode and cabinets or equipment vs. service equipment only and;

4) Sizing of bonding jumpers relative to enclosed grounding electrode conductor size.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: See panel action and statement on Proposal 5-195. All text changes occur within Proposal 5-195. See panel action and statement in Proposal 5-197 for why the panel does not accept bonding <u>all</u> metal enclosures vs nonferrous only

See panel action and statement in Proposal 5-199 for why the panel does not accept bonding of enclosed vs. securely fastening to clamps or fittings.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-199 Log #2927 NEC-P05 **Final Action: Reject**

(250.64(E))

Submitter: Peter D. Noval, Jr., Philadelphia, PA

Recommendation: Delete text to read as follows:

(E) Enclosures for Grounding Electrode Conductors. Ferrous metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode ~~and shall be securely fastened to the ground, clamp or fitting.~~ Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor. Bonding shall apply at each end and to all intervening ferrous raceways, boxes, and enclosures between the service equipment and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than, the required enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.

Substantiation: The requirement for a grounding electrode enclosure to be "securely fastened to the ground clamp or fitting" serves no practical purpose in this section. Requiring grounding electrode conductor enclosures to be securely fastened to the ground clamps on the end of ground rods, for example, appears to be one literal interpretation of this section as presently written that is rarely, if ever, complied with.

Further, subsequent wording in this section allows for bonding where grounding electrode conductor enclosures are not physically continuous from end to end.

Therefore, deleting the text as indicated will eliminate ambiguity (securely fastened vs. bonding), clarify the intent of the code and improve installations and enforcement under this section.

Panel Meeting Action: Reject

Panel Statement: The proposal lessens the requirements of this section without technical substantiation. The electrically continuous requirement applies to metal enclosures for grounding electrode conductors and is the general requirement of this section. The bonding requirements are applicable where the metal enclosure is not electrically continuous from the cabinet or enclosure to the grounding electrode.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-200 Log #1631 NEC-P05 **Final Action: Reject**

(250.64(E), FPN)

Submitter: Peter Ramus, Town of Hanover

Recommendation: Add FPN as follows:

<u>FPN: When used as a bonding method for grounding electrode conductor enclosures, flexible metallic conduits may require the use of an external bonding jumper. See 250.4(A)(5), 250.90, 250.118(5), 250.118(6) and 250.118(7).</u>

Substantiation: Flexible metallic conduit is frequently used to enclose grounding electrode conductors at transformers and service equipment. The effects of impedance and the need for enclosures to safely carry fault current in this application are not always understood. Application of the performance requirements of 250.4(A)(5) and 250.90 are often overlooked by installers and not enforced by inspectors. This proposed FPN will serve to flag the issue and provide reference to pertinent sections.

Panel Meeting Action: Reject

Panel Statement: Flexible metal conduit is not permitted as one of the methods listed in the last sentence of 250.64(B) for providing this protection.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

DOBROWSKY, P.: I do not necessarily agree with the panel statement related to all sizes of grounding electrode conductors.

5-201 Log #824 NEC-P05 **Final Action: Accept in Principle**
(250.64(F))

Submitter: Kim Parker, Austin, TX
Recommendation: Revise text to read as follows:
(F) To Electrode(s). A grounding electrode conductor shall be permitted :
(1) T ~~t~~ o be run to any convenient grounding electrode available in the grounding electrode system with bonding jumpers allowed to connect individually to or between the other electrodes utilized , or
(2) T ~~t~~ o one or more grounding electrode(s) individually, or
(3) T ~~t~~ o ~~the~~ an aluminum or copper busbar not less than 6 mm × 50 mm (1/4 in. × 2 in.) where ~~permitted in 250.64(C). B~~ b onding jumper(s) from grounding electrode(s) ~~and grounding electrode conductor(s)~~ shall be permitted to be connected to ~~an~~ the aluminum or copper busbar ~~not less than 6 mm × 50 mm (1/4 in. × 2 in.).~~ The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector or by the exothermic welding process.
The grounding electrode conductor (s) and bonding jumper(s) shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it.
Substantiation: This is a companion proposal to a proposal made to 250.64(C). The inclusion of item (3) into 250.64(C) in the 2005 NEC was a mistake as bonding jumpers are not grounding electrode conductors in the sense of splicing as covered by 250.64(C) and this inclusion tends to make them so with this provision being more applicable for inclusion in 250.64(F). Thus, this proposal is aimed at addressing that issue. Added wording is also suggested for item (1) in this proposal as there does not seem to be any current words in the NEC that actually allows bonding jumper(s) to be extended from where the grounding electrode conductor has been terminated on the first electrode to complete the grounding electrode system even though it is generally understood that this is the intent of the panel. It is also suggested that additional wording be added that will clarify the size of multiple grounding electrode conductors as well as bonding jumper(s) where utilized. The revision to a list style of presentation is for clarity and usability.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-203.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-202 Log #875 NEC-P05 **Final Action: Reject**
(250.64(F))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise last sentence to read as follows:
" Each ~~The~~ grounding electrode conductor or bonding jumper connecting to one or more electrodes shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it."
Substantiation: This proposal addresses two issues. First, "the grounding electrode conductor..." implies one and only one in spite of the preceding language - a fact that was supposedly addressed in a previous change. Second, the rule needs to also address the sizing of bonding jumpers that interconnect electrodes.
Panel Meeting Action: Reject
Panel Statement: Section 250.53(C) provides the sizing requirements of bonding jumpers between grounding electrodes.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: The proposal should be accepted because it increases the usability of this section.

5-203 Log #1902 NEC-P05 **Final Action: Accept**
(250.64(F))

TCC Action: The Technical Correlating Committee directs that the Code-Making Panel clarify the Panel Action on this Proposal with respect to the wording of the subsections (1) through (4) and their relationship to (F). This action will be considered by the Code-Making Panel as a Public Comment.
Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: Move the deleted text from 250.64(C)(3) & (4) to 250.64(F) as a new (3) & (4). The first two items existing in (F) are to be numbered as new (1) and (2). The section will read as follows:
"(F) To Electrodes(s). A grounding electrode conductor shall be permitted in (1), (2), (3) or (4).
(1) ~~to~~ Be run to any convenient grounding electrode available in the grounding ~~electrode available in the grounding~~ electrode system, ~~or~~
(2) ~~to~~ One or more grounding electrode(s) individually, or
(3) Bonding jumper(s) from grounding electrode(s) and grounding electrode conductor(s) shall be permitted to be connected to an aluminum or copper busbar not less than 6 mm x 50 mm (1/4 in. x 2 in.). The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector or by the exothermic welding process.
(4) Where aluminum busbars are used, the installation shall comply with 250.64(A). The grounding electrode conductor shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it."
Substantiation: The (3) text covering bonding jumpers connected to the aluminum or copper busbar more appropriately belongs in 250.64(F) since it clearly addresses bonding jumpers installed from grounding electrodes to the busbar. The grounding electrode conductor should be installed without a splice from the point of connection at the grounded conductor at the service to the busbar and the bonding jumpers are then installed from this point to all of the electrodes in the system. This is companion proposal to relocate the busbar text from 250.64(C) to 250.64(F).
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-204 Log #909 NEC-P05 **Final Action: Reject**
(250.65(A), 250.64(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence:
"Where used outside, aluminum or copper-clad aluminum grounding electrode conductors not in a raceway, and connections to a grounding electrode(s) shall not be ~~terminated~~ within 450 mm (18 in.) of the earth.
Substantiation: Edit. An open run of bare conductor other than at the the termination to an electrode (connection) may be subject to corrosion.
Panel Meeting Action: Reject
Panel Statement: The panel assumes that the submitter intended to propose a revision to 250.64(A) and not 250.65(A,) which does not exist. The submitter added text without substantiation. The submitter misquoted the existing Code text. The proposed wording is confusing.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-205 Log #1437 NEC-P05 **Final Action: Reject**
(250.66)

Submitter: Danish Verma, Bowie, MD
Recommendation: Add new text as follows:
250.66(D) Connection to Enclosures. Termination of the grounding electrode conductors entering cabinets, cutout boxes and other equipment enclosures shall be done using only listed devices such as lugs, clamps, pressures connectors or other listed means. Ground clamps or fittings shall be listed for the materials of the grounding electrode conductor. Not more than one conductor shall be connected to a single clamp or fitting unless the clamp or fitting is listed for multiple conductors.
Substantiation: The grounding electrode connection to enclosures, cutout boxes requires standardization. The current wiring practice of using no fitting or an unlisted fitting or a fitting not listed for grounding poses many problems.
1. Difference of potential.
2. Choke effect.
3. Does not comply with the appropriate ANSI/UL Standards.
4. Not in compliance with NFPA 780 recommendations for bonding the electrode to the enclosures, sideflash.
5. Using a fitting listed for bonding and grounding will ensure positive bonding jumper connection under severe fault conditions, surges, over voltages or if one were to misapply or fail to install the proper bonding jumper at the service enclosure. The fitting would provide a safety net in these applications. Not to mention possibility of cross threading or over tightening or breaking of the bonding screw.
The NEC recognizes the connection of the grounding electrode conductor at the electrode under 250.70, but does not identify the connection at the cabinet. The use of listed fittings will ensure proper support, proper strain relief (torque value) and ensure proper bonding. Will clarify the requirements of 312.5(A) NEC "Openings to be Closed" in cutout boxes and cabinets by using a proper listed grounding and bonding fitting.
Strain relief testing is required under both UL 486A Standards for Connectors and UL 467 Standard for Grounding and Bonding. Although I have witnessed arguments over whether strain relief is necessary, without the use of a proper fitting the grounding electrode conductor can work loose from the grounded bar after being struck by hand held mower equipment without proper strain relief. UL Standards requires a push pull test on connectors and fittings. It's appropriate to apply the standard. UL 486A 12.1 requires a pullout test for connectors, Table 12.1 provides the test values for the pull out test. Example: 6 AWG requires 100 LB pullout force.
UL 467, Table 13.1 Short - time test currents: present practice of not using a listed fitting fails to meet the short-time current test of the standard. Knowing that the NEC now identifies these product safety standards in Annex A, I believe it's just as important to adhere to these recognized standards. UL 467, Table 13.1 requires a 3/0 copper conductor to withstand 8030 amperes for 9 seconds without burning away from the enclosure. Unlisted fittings do not meet these requirements/standards.

Panel Meeting Action: Reject
Panel Statement: The panel concludes that specific listed fittings are not required where grounding electrode conductors enter cabinets or other enclosures. Protection for the grounding electrode conductor may be required where the grounding electrode conductor enters the enclosure and is already covered by other general installation provisions of the NEC. See also panel action and statement on Proposal 5-167 (Log #1053) in the 2004 Report on Proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-206 Log #2162 NEC-P05 **Final Action: Reject**
(Table 250.66)

Submitter: Lawrence Cross, Local Union #98 IBEW
Recommendation: Revise text to read:
Table 250.66 Grounding Electrode Conductor for Alternating-Current Systems (ONLY)
New Table 250.67 Grounded Conductor, Bonding and Main Bonding Jumpers Alternating-Current Systems.
Substantiation: The problem with Table 250.66 is very misleading and confusing. The Table 250.66 is labeled as Grounding Electrode Conductor Alternating-Current Systems BUT ALSO SIZES the Grounded Conductor, Bonding and Main Bonding Jumpers. This is misleading and confusing because many times the electrician will size the Grounded Conductor, Bonding and Main Bonding Jumpers with the idea that the table is at the maximum conductor size 3/0 Copper and 250 Kcmil Aluminum with No consideration or calculation as per 250.24(C)(1), 250.28(D) and 250.30(A)(1) for the 12 1/2 percent rule for sizing conductors over 1100 Kcmil Copper and 1750 Kcmil Aluminum as per Table 8 Chapter 9. Note: See Example.

Copper Phase Conductor (Kcmil)	Copper Conductor Grounded Conductor, Bonding and Main Bonding Conductor (Kcmil)
1500	4/0 AWG
2000	250 Kcmil
2500	350 Kcmil
3000	400 Kcmil
3500	450 Kcmil
4000	500 Kcmil
5000	600 Kcmil
6000	750 Kcmil
7000	900 Kcmil
7500	1000 Kcmil
8000	1000 Kcmil
9000	1250 Kcmil
10000	1250 Kcmil

Panel Meeting Action: Reject
Panel Statement: The proposed table does not resolve the problem identified by the submitter. The phase conductor sizes are all based on copper per the first column heading where aluminum or copper-clad aluminum is used for services and feeders. There are no size ranges provided nor instruction on how to size the proposed "grounded conductor, bonding and main bonding jumper" when the ungrounded conductor size falls between the ones provided. The substantiation indicates that the reason for the table is that the users are not applying Code requirements, sections cited in the substantiation, already in place. If the requirement, that point to Table 250.66 with the qualifiers of sizing over 1100 Kcmil copper or 1750 Kcmil aluminum were being followed, then this table would be unnecessary.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-207 Log #2594 NEC-P05 **Final Action: Reject**
(Table 250.66)

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Revise Table 250.66 to read as shown below.
Substantiation: An individual sizing a grounding electrode conductor looks to the table and sees, for example, a 350 referenced in the first column. They then oversize the GEC based on that, not realizing it is for over 350 kcmil. This change will better correspond with the first three rows, making the table more user friendly.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that the existing table is clear. The table as written allows for all sizes of conductors.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-208 Log #3134 NEC-P05 **Final Action: Reject**
(250.66)

Submitter: Eric Stromberg, Stromberg Engineering, Inc.
Recommendation: Revise text as follows:
250.66 Size of Alternating-Current Grounding ~~Electrode~~ Conductor.
Substantiation: 250.66 is used for all grounding conductors that are not associated with circuits protected by over current protection. The word "Electrode" in the title makes it appear that 250.66 only applies to the Grounding Electrode Conductor. This is not the case.
Panel Meeting Action: Reject
Panel Statement: The title of the table is appropriate and is intended for grounding electrode conductors. There are current Code rules that are clear where Table 250.66 is used for sizing conductors or jumpers other than grounding electrode conductors.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-209 Log #3651 NEC-P05 **Final Action: Reject**
(Table 250.66)

Submitter: Larry Cross, Local Union #98 IBEW
Recommendation: Table 250.66 Grounding Electrode Conductor for Alternating - Current Systems (ONLY) New Table 250.67 Grounded Conductor, Bonding and Main Bonbding Jumpers Alternating - Current Systems.
Substantiation: The problem with Table 250.66 is very misleading and confusing. The Table 250.66 is labeled as Grounding Electrode Conductor Alternating - Current Systems BUT ALSO SIZES the Grounded Conductor, Bonding and Main Bonding Jumpers. This is misleading and confusing because many times the electrician will size the Grounded Conductor, Bonding and Main Bonding Jumpers with the idea that the table is at the maximum conductor size 3/0 Copper and 250 Kcmil Aluminum with no consideration or calculation as per 250.24(C)(1), 250.28(D) and 250.30(A)(1) for the 12 1/2 percent rule for sizing conductors over 1100 Kcmil Copper and 1750 Kcmil

[Proposal 5-207 (Log #2594)]

Table 250.66 Grounding Electrode Conductor for Alternating-Current Systems

Size of Largest Ungrounded Service-Entrance Conductor or Equivalent Area for Parallel Conductors (AWG/kcmil)		Size of Grounding Electrode Conductor (AWG/kcmil)	
Copper	**Aluminum or Copper-Clad Aluminum**	**Copper**	**Aluminum or Copper-Clad Aluminum**
2 or smaller	1/0 or smaller	8	6
1 or 1/0	2/0 or 3/0	6	4
2/0 or 3/0	4/0 or 250	4	2
4/0 through 350	300 through 500	2	1/0
400 through 600	600 through 900	1/0	3/0
750 through 1000	1000 through 1750	2/0	4/0
1250 and above	2000 and above	3/0	250

Aluminum as per Table 8 Chapter 9. NOTE SEE EXAMPLE Copper Conductor

Copper phase Conductor (Kcmil) Grounded Conductor, Bonding and Main Bonding Conductor (Kcmil)

1500 4/0 AWG
2000 250Kcmil
2500 350Kcmil
3000 400Kcmil
3500 450Kcmil
4000 500Kcmil
5000 600Kcmil
6000 750Kcmil
7000 900Kcmil
7500 1000Kcmil
8000 1000Kcmil
9000 1250Kcmil
10000 1250Kcmil

Panel Meeting Action: Reject

Panel Statement: The proposed table does not resolve the problem identified by the submitter. The phase conductor sizes are all based on copper per the first column heading where aluminum or copper-clad aluminum is used for services and feeders. There are no size ranges provided nor instruction on how to size the proposed "grounded conductor, bonding and main bonding jumper" when the ungrounded conductor size falls between the ones provided. The substantiation indicates that the reason for the table is that the users are not applying Code requirements, sections cited in the substantiation, already in place. If the requirements that point to Table 250.66 with the qualifiers of sizing over 1100 Kcmil copper or 1750 Kcmil aluminum were being followed, then this table would be unnecessary.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-210 Log #2253 NEC-P05 **Final Action: Reject**

(250.66 and Table 250.66)

Submitter: Bryan P. Holland, Holland Electric

Recommendation: Delete Table 250.66 and revise 250.66 to state: "The size of the grounding electrode conductor of a grounded or ungrounded ac system shall not be less than 4 AWG copper wire or 2 AWG aluminum wire, except as permitted in 250.66(A). Delete 250.66(B).

Substantiation: The NEC is a minimum standard. If a structure or building is compliant to the code and completely safe with only #4 AWG to a concrete-encased electrode, then there is no reason to require a different electrode type to be connected with anything larger. It's not logical nor should be a code requirement to require anything above the minimum. Simply changing the electrode type shouldn't change the minimum safety requirement. If the table is accurate, it could be assumed that systems connected to only ground rods or to a concrete-encased electrode are less safe then a similar structure with a metal underground water pipe system or metal frame. It is generally understood that the concrtete-encased electrode is the most effective and low-impedance electrode of choice yet it is only required to be connected with a #4 AWG while other possibly less effective electrodes require such large conductors. The requirement in 250.4(A)(1) and (2) can be satisfied with a grounding electrode conductor no larger than #4 AWG regardless what electrode it is connected to.

Panel Meeting Action: Reject

Panel Statement: Deleting Table 250.66 as proposed lessens the minimum requirements of the NEC without substantiation. Sections 250.66(A), (B), and (C) only apply where the grounding electrode conductor is a sole connection to any of the types of electrodes in those sections.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-211 Log #2296 NEC-P05 **Final Action: Reject**

(250.66(D))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Add (D) Existing Installations

In a single family dwelling where the existing grounding electrode conductor to the water system is rendered inaccessible, an existing copper grounding electrode conductor not smaller than 6 AWG shall be permitted for a service not larger than 200 amperes, providing that conductor continuity can be verified.

Substantiation: Frequently on a service upgrade to an existing dwelling, the grounding electrode conductor has been enclosed by remodeling. It becomes difficult to install a new conductor without damage to the structure.

Panel Meeting Action: Reject

Panel Statement: There is no technical substantiation that a reduction in the size of the grounding electrode conductor is appropriate. There is no technical reason given that a single family-dwelling specifically should have a reduction in the size of the grounding electrode conductor.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-212 Log #3188 NEC-P05 **Final Action: Reject**

(250.68(A))

Submitter: Donald Cook, Shelby County Development Services

Recommendation: Delete 250.68(A) and exceptions completely. Renumber existing 250.68(B) as 250.68.

Substantiation: Panel 5 rejected the same concept for the 2005 NEC (Proposal 5-175) and indicated that no substantiation was provided. They also indicated that accessibility is required for connections that are not inherently protected from damage. The panel also accepted an additional exception to the accessibility requirement in 2005 [250.68(A) Exception No.2] allowing specific connections to structural metal that was fire-proofed.

Nothing in either of the current exceptions seem to have anything to do with providing added inherent protection of the connection of the grounding electrode conductor termination. A grounding electrode conductor termination covered by wall coverings in a building would provide more inherent protection of the termination than an access hole in the wall covering.

As an AHJ enforcing and in many cases trying to help owners, designers, installers, and political interest understand that the purpose of the NEC is practical safeguarding of persons and property from hazards arising from the use of electricity, it is difficult to explain why a termination to a metal water pipe made underground and then covered, or a termination to rebar in a footing and then covered, or a termination to structural steel and then covered with fire-proofing is safe from hazards, but a water pipe termination or a rebar termination or a structural steel termination that is covered by an interior wall covering is now hazardous.

Panel Meeting Action: Reject

Panel Statement: If a mechanical connection becomes damaged or loosened during the construction of a building, it is necessary to have accessibility so it can be tightened or replaced.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

DOBROWSKY, P.: The proposals concept should be accepted. Based on the action on 5-213 a mechanical means will not be required to be accessible.

5-213 Log #3393 NEC-P05 **Final Action: Accept in Principle**

(250.68(A) Exception No. 2)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Revise in one of the following two ways:

"Exothermic or irreversible compression connections that constitute all elements of the final connection between the grounding electrode conductor and fireproofed structural metal shall not be required to be accessible."

OR

"Exothermic or irreversible compression connections used at terminations, together with the mechanical means used to attach such terminations to fireproofed structural metal whether or not the mechanical means is reversible, shall not be required to be accessible."

IF the second option is correct, THEN AND ONLY THEN modify 250.68(A) to read as follows:

"All mechanical elements used to terminate a grounding electrode conductor at a grounding electrode shall be accessible."

Substantiation: This submitter thought the NEC text clearly meant the first of the two above suggestions was the appropriate interpretation, because the literal text includes the phrase "exothermic or irreversible compression connection to fire-proofed structural metal." The rule under exception applies to the connection between conductor and electrode, and this defines the scope of the exception. Hence, the exception can only apply to the structural metal/ wire termination interface, which must be either welded (usual case) or perhaps hydraulically crimped if the structural metal would allow it, as in the case of reinforcing steel (unusual). However, the leading analysis now in print on the 2005 NEC changes shows a hydraulically crimped terminal lug attached to fireproofed building steel with a conventional nut and bolt, with a caption that clearly implies that the connection need not be accessible, i.e., conforms to the second wording above. It is apparent that clarification is in order.

Panel Meeting Action: Accept in Principle

Modify 250.68(A) to read as follows:

250.68 Grounding Electrode Conductor and Bonding Jumper Connection to Grounding Electrodes.

(A) Accessibility. ~~The connection of~~ All mechanical elements used to terminate a grounding electrode conductor or bonding jumper to a grounding electrode shall be accessible.

Exception No 1: An encased or buried connection to a concrete encased, driven, or buried grounding electrode shall not be required to be accessible.

Exception No. 2: ~~An~~ Exothermic or irreversible compression connections used at terminations, together with the mechanical means used to attach such terminations to fireproofed structural metal whether or not the mechanical means is reversible, shall not be required to be accessible.

Panel Statement: This action meets the submitter's intent.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-213a Log #CP505 NEC-P05 **Final Action: Accept**
(250.68(B))

Submitter: Code-Making Panel 5,
Recommendation: Revise 250.68(B) to read as follows:
250.68(B) ~~Effective~~ Grounding Path. The connection of a grounding electrode conductor or bonding jumper to a grounding electrode shall be made in a manner that will ensure a permanent ~~and~~ ~~effective~~ grounding path. Where necessary to ensure the grounding path for a metal piping system used as a grounding electrode, ~~effective~~ bonding shall be provided around insulated joints and around any equipment likely to be disconnected for repairs or replacement. Bonding ~~conductors~~ jumpers shall be of sufficient length to permit removal of such equipment while retaining the integrity of the ~~bond~~ grounding path.
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC.
Bonding jumper is a defined term. The term "grounding path" is the portion of the circuit that requires integrity. The panel removed the word "effective" because it is an unenforceable term. This is consistent with other task group work in handling the term "effective."
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-214 Log #452 NEC-P05 **Final Action: Reject**
(250.68(B))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: In line 4, replace "a permanent and," with "an" so as to read:
(B) Effective Grounding Path. The connection of a grounding electrode conductor or bonding jumper to a grounding electrode shall be made in a manner that will ensure ~~a permanent and~~ an effective grounding path. (Remainder to remain unchanged.)
Substantiation: The Webster definition of "permanent" is, in part: "lasting, durable, intended to last or function indefinitely, not subject to removal."
The only connections in Article 250 that meet this definition are the irreversible compression-type connector and the exothermic welding process called for (plus bus bar connections) in 250.64(C). All of the others can be removed using appropriate tools.
Other methods than these two are recognized in 250.8 and 250.70 in particular and in Parts V and VI of Article 250 in general.
Aside from the need for the NEC to be clear and specific in its requirements, there is the practical problem that the use of the word "permanent" where it is not intended may lead an unqualified inspector to make unreasonable requirements based on the literal wording.
Panel Meeting Action: Reject
Panel Statement: Section 3.2.4 of the NEC Style Manual recognizes the use of standard terms that have been established through accepted use or by definition. The word "permanent" is generally understood as it relates specifically to the characteristics and integrity of the electrical installation and can more readily be applied by inspectors in practical application.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-215 Log #459 NEC-P05 **Final Action: Reject**
(250.70)

Submitter: Lloyd Mathieson, Security Electric Inc.
Recommendation: Revise text to read as follows:
~~Not more than~~ One or more conductor s shall be connected to the grounding electrode each by a single clamp or fitting unless the clamp or fitting is listed for multiple conductors.
Substantiation: I first read this paragraph some years ago and it caused some confusion in that it implied that only one conductor can be connected to the electrode unless the clamp or fitting is listed for multiple conductors. I then called the inspector and he said two separate clamps would be code.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The current wording has been used in the NEC for many years. There is no technical substantiation that a problem exists. The revised wording will not add clarity to the code. It is the panel's intent that only one conductor be connected to the grounding electrode by a single clamp or fitting unless the fitting is listed for multiple conductors.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-216 Log #869 NEC-P05 **Final Action: Reject**
(250.80 through 250.106 and 251 (New))

Submitter: Ben Jacks, Seattle, WA
Recommendation: Revise:
Make V. Bonding 250.80 through 250.106 a new Article 251.
Substantiation: Eliminates confusion that "bonding" is not "grounding" (this change also affects title of 250 and all subsequent sections 250.4 through 250.86 that use bond, bonded, and bonding out of context when referring to grounding.)
Panel Meeting Action: Reject
Panel Statement: Insufficient substantiation has been provided to warrant developing a new Code article dedicated to just bonding. The panel maintains that grounding and bonding rules are both adequately covered by Article 250. Part V of the article provides specific bonding requirements. Both grounding and bonding are functions that are generally accomplished through a single conductor or component of the grounding and bonding system, no matter what that conductor is called. The two functions appropriately belong in the same article.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-217 Log #1903 NEC-P05 **Final Action: Accept**
(250.84(A))

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: In 250.84(A), delete the word "conduit" after the word "raceway" in the last line to read as follows:
250.84 Underground Service Cable or Raceway.
(A) Underground Service Cable. The sheath or armor of a continuous underground metal-sheathed or armored service cable system that is bonded to the grounded underground system shall not be required to be grounded at the building or structure. The sheath or armor shall be permitted to be insulated from the interior metal raceway ~~conduit~~ or piping.
Substantiation: This is probably an errata more than an intentional addition to the 2005 NEC but should be removed for the 2008 NEC.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-217a Log #CP506 NEC-P05 **Final Action: Accept**
(250.84(B))

Submitter: Code-Making Panel 5,
Recommendation: Revise Section 250.84(B) to read as follows:
(B) Underground Service Raceway Containing Cable. An underground metal service raceway that contains a metal-sheathed or armored cable ~~bonded~~ connected to the grounded ~~underground~~ system conductor shall not be required to be connected to the grounded system conductor at the building or structure. The sheath or armor shall be permitted to be insulated from the interior raceway or piping.
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. The word "connected" replaces the word "bonded" and is consistent with other task group work where the word "connected" or "connection" is used. See Proposal 5-217 which removed the word "conduit" from the text.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-218 Log #1331 NEC-P05 **Final Action: Reject**
(250.86)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete provision for concrete encasement
250.86 Other Conductor Enclosures and Raceways.
Except as permitted by 250.112(I), metal enclosures and raceways for other than service conductors shall be grounded.
Exception No. 3: A metal elbow shall not be required to be grounded where it is installed in a nonmetallic raceway and is isolated from possible contact by a minimum cover of 450 mm (18 in.) to any part of the elbow. ~~or is encased in not less than 50 mm (2 in.) of concrete~~ .
Substantiation: This change makes exception three to 250.86 mirror the exception to section 250.80. The protection afforded by 2 inches of concrete encasement should not be considered as equivalent to 18 inches of earth cover. Two inches of concrete encasement does not provide protection from electrical shock, as can be demonstrated by the equipotential bonding provisions found in articles 547 and 680.

Panel Meeting Action: Reject
Panel Statement: The exception to 250.80 deals only with rigid wiring methods and is necessary, whereas the 250.86 exception deals with the other wiring methods.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-219 Log #1335 NEC-P05 **Final Action: Accept**
(250.92)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete Parenthetical 3

250.92 Services.

(A) Bonding of Services. The non–current-carrying metal parts of equipment indicated in 250.92(A)(1), (A)(2), and (A)(3) shall be effectively bonded together.

(1) The service raceways, cable trays, cablebus framework, auxiliary gutters, or service cable armor or sheath except as permitted in 250.84.

(2) All service enclosures containing service conductors, including meter fittings, boxes, or the like, interposed in the service raceway or armor.

~~(3) Any metallic raceway or armor enclosing a grounding electrode conductor as specified in 250.64(B). Bonding shall apply at each end and to all intervening raceways, boxes, and enclosures between the service equipment and the grounding electrode.~~

Substantiation: Parenthetical 3 is an unnecessary redundancy. The requirement for bonding a metal enclosure for a grounding electrode is already spelled out clearly in 250.64(E). This requirement is not only for service equipment, which is the scope of 250.92, but also for separately derived systems. Sections 250.104(D) and 250.30(A)(3) and 250.30(A)(4) do not repeat the entire requirement of 250.64(C) like 250.92 does, because it is simply not necessary. 250.92 should address service equipment only, not service equipment and grounding electrode conductor enclosures. Also, article 100 defines Service Equipment as "The necessary equipment, usually consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the load end of service conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cutoff of the supply." An enclosure for a grounding electrode conductor does not fall into this definition.
Panel Meeting Action: Accept
Panel Statement: Editorially delete the reference to (A)(3) in the lead-in sentence.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-220 Log #1886 NEC-P05 **Final Action: Accept in Principle**
(250.94)

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 250.94 **Bonding for Other Systems** as follows:

Bonding for Other Systems. <u>An intersystem grounding termination for connecting intersystem bonding and grounding conductors required for other systems shall be provided external to enclosures at the service equipment and at the disconnecting means for any additional buildings or structures. The intersystem grounding termination shall be accessible for connection and inspection. The intersystem grounding termination shall have the capacity for connection of not less than three intersystem bonding conductors. The intersystem grounding termination shall be one of the following:</u>

<u>(1) A set of terminals securely mounted to the meter socket enclosure and electrically connected to the meter socket enclosure. This terminals and the enclosure shall be listed for grounding.</u>

<u>(2) A bonding bar near the service equipment enclosure, meter socket enclosure or raceway for service conductors. The bonding bar shall be connected with a 6 AWG copper conductor to an equipment grounding conductor(s) in the service equipment enclosure, meter socket enclosure or exposed nonflexible metallic raceway.</u>

<u>(3) A bonding bar near the grounding electrode conductor. The bonding bar shall be connected to the grounding electrode conductor with a 6 AWG copper conductor.</u>

<u>Exception:In existing buildings or structures where any of the intersystem bonding and grounding conductors required by 770.93, 800.100(B), 810.21(F), 820.100(B), 830.100(B) exist, installation of the Intersystem Grounding Termination is not required</u> . An accessible means external to enclosures for connecting intersystem bonding and grounding electrode conductors shall be provided at the service equipment and at the disconnecting means for any additional buildings or structures by at least one of the following means:

(1) Exposed nonflexible metallic raceways

(2) Exposed grounding electrode conductor

(3) Approved means for the external connection of a copper or other corrosion-resistant bonding or grounding conductor to the grounded raceway or equipment

FPN No. 1: A 6 AWG copper conductor with one end bonded to the grounded nonflexible metallic raceway or equipment and with 150 mm (6 in.) or more of the other end made accessible on the outside wall is an example of the approved means covered in 250.94 .

Substantiation: This is one of several correlated proposals (100 Definitions, 250.95, Chapter 8 Articles) to improve the requirements related to intersystem bonding and grounding of communication systems. The intent is to create a dedicated and well-defined location for terminating the grounding conductors required in Chapter 8 Articles and 770.93. These grounding conductors also provide between communication and power systems (intersystem bonding). The proposed termination would have sufficient capacity to handle multiple communication systems (telecom, satellite, CATV) on premises. See the figures I have provided.

Intersystem bonding accomplished by connection of a communication grounding conductor to the power system is an important safety measure to prevent occurrences of voltages between communication system and power system. However, the existing requirements are not adequate. Bonding is becoming difficult to implement due to changes in building construction practices such as increased prevalence of flush construction and use of PVC conduits. Frequently, in new construction, the grounding electrode, the raceway and the grounding electrode conductor are hidden behind walls and not accessible for bonding connection.

Even in older construction with accessible equipment, the requirement for installation of intersystem bonding connection is subject to varying interpretation because there is not a clearly defined dedicated bonding location. The connection to the power system is sometimes haphazard. Installers are sometimes confused over where the connection should be made especially if multiple Communication Systems are present on premises.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise 250.94 **Bonding for Other Systems** as follows:

Bonding for Other Systems. <u>An intersystem bonding termination for connecting intersystem bonding and grounding conductors required for other systems shall be provided external to enclosures at the service equipment and at the disconnecting means for any additional buildings or structures. The intersystem bonding termination shall be accessible for connection and inspection. The intersystem bonding termination shall have the capacity for connection of not less than three intersystem bonding conductors. The intersystem bonding termination shall be one of the following:</u>

<u>(1) A set of terminals securely mounted to the meter socket enclosure and electrically connected to the meter socket enclosure. This terminals and the enclosure shall be listed for grounding.</u>

<u>(2) A bonding bar near the service equipment enclosure, meter socket enclosure or raceway for service conductors. The bonding bar shall be connected with a minimum 6 AWG copper conductor to an equipment grounding conductor(s) in the service equipment enclosure, meter socket enclosure or exposed nonflexible metallic raceway.</u>

<u>(3) A bonding bar near the grounding electrode conductor. The bonding bar shall be connected to the grounding electrode conductor with a minimum 6 AWG copper conductor.</u>

<u>Exception:In existing buildings or structures where any of the intersystem bonding and grounding conductors required by 770.93, 800.100(B), 810.21(F), 820.100(B), 830.100(B) exist, installation of the Intersystem Bonding Termination is not required</u> . An accessible means external to enclosures for connecting intersystem bonding and grounding electrode conductors shall be <u>permitted</u> ~~provided~~ at the service equipment and at the disconnecting means for any additional buildings or structures by at least one of the following means:

(1) Exposed nonflexible metallic raceways

(2) Exposed grounding electrode conductor

(3) Approved means for the external connection of a copper or other corrosion-resistant bonding or grounding conductor to the grounded raceway or equipment

FPN No. 1: A 6 AWG copper conductor with one end bonded to the grounded nonflexible metallic raceway or equipment and with 150 mm (6 in.) or more of the other end made accessible on the outside wall is an example of the approved means covered in 250.94, Exception, (3).

Retain 2005 NEC FPN No. 2 as written.
Panel Statement: This action correlated with definition of intersystem bonding termination. The word minimum twas added o allow larger conductors where desired.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

BRETT, JR., M.: See my explanation of negative vote on Proposal 5-20. This adds cost and requirements to the electrical contractor (installer) that is not substantiated or justified. The present text is adequate and it is the responsibility of the CATV and telephone installers to make the connection. It is only the electrical installer's responsibility to make sure there is access to do this. This proposal should be rejected.
Comment on Affirmative:

WHITE, C.: EEI is voting in the affirmative on this proposal because we see it as a good first step towards solving a hazardous field condition that currently exists. Often the device that is used to provide this inter-system bonding termination is installed on the cover or door of service and/or meter enclosures thus preventing their routine opening. In these cases, the only option available to properly operate or maintain this equipment is to remove the inter-system bonding termination device from the service or meter enclosure. This proposal may not go far enough to solve this problem entirely. EEI recommends that

Panel 5 further consider four proposals; 16-168, 16-237, 16-300 and 16-396. These proposals are recommended to be forwarded to Panel 5 from Panel 16. These proposals will provide some additional wording that can be incorporated into 250.94 that will provide prescriptive requirements mandating the proper installation of bonding terminations at these locations.

5-221 Log #1336 NEC-P05 **Final Action: Accept**
(250.96(B))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Replace "required" with "installed"

B) Isolated Grounding Circuits. Where ~~required~~ installed for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, an equipment enclosure supplied by a branch circuit shall be permitted to be isolated from a raceway containing circuits supplying only that equipment by one or more listed nonmetallic raceway fittings located at the point of attachment of the raceway to the equipment enclosure. The metal raceway shall comply with provisions of this article and shall be supplemented by an internal insulated equipment grounding conductor installed in accordance with 250.146(D) to ground the equipment enclosure.

Substantiation: Generally speaking, isolated ground circuits are not required to be installed. When they are installed it is because of a designer's inclination, not a *Code* or manufacturer's requirement. This section should be changed to reflect this.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-222 Log #1996 NEC-P05 **Final Action: Reject**
(250.96(B))

Submitter: Robert Schuerger, EYP Mission Critical Facilities, Inc.
Recommendation: Revise as follows:

250.96(B) ~~Isolated~~ Insulated Grounding Receptacles . Where required for the reduction...

FPN: Use of an ~~isolated~~ insulated equipment grounding conductor does not relieve the requirement for grounding the raceway system and outlet box.

Substantiation: The use of the term "isolated" has caused confusion which has led to improper and unsafe installations in which a separate grounding electrode and grounding system is installed isolated from the rest of the grounding system of the building. Since the separate grounding system is not properly bonded to the grounding system of the building, a hazardous voltage can be developed between the two grounding systems by an electrical fault or lightning strike.

There have been many cases of this type of installation in the past, with data procession equipment, machine tools and other sensitive electronic equipment. The 2005 edition of IEEE Standard 1100, Recommended Practice for Powering and Grounding Electronic Equipment has "insulated ground receptacle" as the recommended terminology and has recommended the "isolated ground" and "isolated ground receptacle" be avoided.

Panel Meeting Action: Reject
Panel Statement: Section 250.96(B) covers isolated grounding circuits, not receptacles. The insulation referred to in this section has to do with insulation on the circuit conductors.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

DOBROWSKY, P.: The proposal should be accepted. The term "isolated" is confusing. Too often individuals are interpreting this section as permitting a connection to an electrode that is (isolated) instead of installing a conductor that provides an effective fault current path.

MELLO, C.: The panel should reconsider the action and not reject the entire proposal outright. The receptacles should continue to be referred to as "isolated grounding receptacles" since the yoke is in fact isolated from the green equipment grounding screw provided for connecting the third (grounding) receptacle sleeve.

The change to the fine print note should be further considered and possibly use the term "dedicated" in place of "isolated" when referring to the equipment grounding conductor. In the 2002 cycle the term "dedicated" was suggested and the panel statement at that time indicated that dedicated could be inferred to mean a separate equipment grounding conductor for each receptacle. The term dedicated means "to set apart for a definite use" (Websters New Collegiate Dictionary), which is exactly what is intended. The "dedicated equipment grounding conductor" is set apart from the required equipment grounding conductor for a definite use limiting electronic noise interference. The confusion in the industry indicated by the submitter is in dealing with the insulated green wire that comes from the isolated grounding receptacle. I agree the term "isolated" is poor and has caused great confusion and down right dangerous installations to be completed. I believe the panel action should have been to Accept in Principle and In Part. The change to the name of the receptacle should continue to be rejected, but the change of the term in the FPN to "dedicated" should have been considered.

5-223 Log #453 NEC-P05 **Final Action: Reject**
(250.97 Exception)

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: In line 4, delete "permanent" so as to read:

Exception: Where oversized, concentric, or eccentric knockouts are not encountered, or where a box or enclosure with concentric or eccentric knockouts listed to provide a ~~permanent~~ reliable electrical bond, the following methods shall be permitted: (Balance of exception to remain unchanged.)

Substantiation: The Webster definition of "permanent" is, in part: "lasting, durable, intended to last or function indefinitely, not subject to removal."

The only connections in Article 250 that meet this definition are the irreversible compression-type connector and the exothermic welding process called for (plus bus bar connections) in 250.64(C). All of the others can be removed using appropriate tools.

Other methods than these two are recognized in 250.8 and 250.70 in particular and in Parts V and VI of Article 250 in general.

Aside from the need for the NEC to be clear and specific in its requirements, there is the practical problem that the use of the word "permanent" where it is not intended may lead an unqualified inspector to make unreasonable requirements based on the literal wording.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-51.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-224 Log #876 NEC-P05 **Final Action: Accept**
(250.97 Exception)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise exception to read as follows:

"... with concentric or eccentric knockouts listed to provide a permanent, reliable electrical bond is installed , the following methods shall be permitted."

Substantiation: This proposal is intended to correct a grammatical error only. Alternatively, the exception should say "is listed to provide..." to complete the sentence.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-224a Log #CP510 NEC-P05 **Final Action: Accept**
(250.97 Exception)

Submitter: Code-Making Panel 5,
Recommendation: 250.97, Exception:
Revise the exception of Section 250.97 as follows: *Exception: Where oversized, concentric, or eccentric knockouts are not encountered, or where a box or enclosure with concentric or eccentric knockouts is listed to provide a permanent, reliable ~~electrical bond~~ bonding connection is installed , the following methods shall be permitted:* …
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. The phrase "… reliable bonding connection" is the preferred requirement. The words "is installed" were added due to action on Proposal 5-224
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-225 Log #1239 NEC-P05 **Final Action: Accept**
(250.100)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "Article 500" to "500.5".
Substantiation: Edit. To conform to Style Manual.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-226 Log #2227 NEC-P05 **Final Action: Accept in Principle**
(250.100)

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:

250.100 Bonding in Hazardous (Classified) Locations. Regardless of the voltage of the electrical system, the electrical continuity of non-current-carrying-metal parts of equipment, raceways, and other enclosures in any hazardous (classified) location as defined in Article 500 shall be ensured by any of the methods specified in 250.92(B)(2) through (B)(4) that are approved for the wiring method used. One or more of these bonding methods shall be used whether or not ~~supplementary~~ equipment grounding conductors are installed.

Substantiation: The deletion of the word "supplementary" will make it very clear that this bonding is always required in classified locations.
Panel Meeting Action: Accept in Principle
Revise the recommendation to read as follows:
250.100 Bonding in Hazardous (Classified) Locations. Regardless of the voltage of the electrical system, the electrical continuity of non–current-carrying metal parts of equipment, raceways, and other enclosures in any hazardous (classified) location as defined in ~~Article 500~~ 500.5 shall be ensured by any of the bonding methods specified in 250.92(B)(2) through (B)(4) ~~that are approved~~ ~~for the wiring method used~~. One or more of these bonding methods shall be used whether or not ~~supplementary~~ equipment grounding conductors of the wire type are installed.
Panel Statement: The reference to Article 500 was revised to 500.5 to comply with the NEC style manual for references and from Proposal 5-225. The panel agreed with the deletion of the word supplementary but added the word "of the wire type" because there will always be an equipment grounding conductor provided and the "supplementary" was referring to an additional wire type equipment grounding conductor in the raceway equipment grounding conductor. The panel deleted the text "that are approved for the wiring methoods used," since it added no clarity.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-227 Log #3507 NEC-P05 **Final Action: Reject**
(250.102(C))

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Revise text to read:
(C) Size — Equipment Bonding Jumper on the Supply Side of overcurrent devices ~~Service~~. The bonding jumper shall not be smaller than the sizes shown in Table 250.66 for grounding electrode conductors. Where the supp ly ~~service-entrance~~ phase conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum, the bonding jumper shall have an area not less than 12½ percent of the area of the largest phase conductor except that, where the phase conductors and the bonding jumper are of different materials (copper or aluminum), the minimum size of the bonding jumper shall be based on the assumed use of phase conductors of the same material as the bonding jumper and with an ampacity equivalent to that of the installed phase conductors. Where the supply ~~service-entrance~~ conductors are paralleled in two or more raceways or cables, the equipment bonding jumper, where routed with the raceways or cables, shall be run in parallel. The size of the bonding jumper for each raceway or cable shall be based on the size of the supply ~~service-entrance~~ conductors in each raceway or cable.
Substantiation: This section is referenced by other sections such as 250.30 and also apply to other than service conductors.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-244.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-244 Log #3508 NEC-P05 **Final Action: Reject**
(250.102(D))

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Revise text to read:
(D) Size — Equipment Bonding Jumper on Load Side of overcurrent devices ~~Service~~. The equipment bonding jumper on the load side of ~~the service~~ overcurrent devices shall be sized, as a minimum, in accordance with the sizes listed in Table 250.122, but shall not be required to be larger than the largest ungrounded circuit conductors supplying the equipment and shall not be smaller than 14 AWG.
A single common continuous equipment bonding jumper shall be permitted to bond two or more raceways or cables where the bonding jumper is sized in accordance with Table 250.122 for the largest overcurrent device supplying circuits therein.
Substantiation: This section is referenced by other sections that apply to other than service conductors.
Panel Meeting Action: Reject
Panel Statement: The present code is clear. Making the suggested changes will add confusion due to the multiple references made elsewhere in the Code.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-228 Log #1455 NEC-P05 **Final Action: Reject**
(250.104)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
250.104 Bonding of Piping Systems and Exposed Structural Steel.
(A) Metal Water Piping. Remain unchanged.
(B) Other Metal Piping. Where installed in or attached to a building or structure, metal piping system(s), including gas piping, that is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with 250.122, using the rating of the circuit that is likely to energize the piping system(s). The equipment grounding conductor for the circuit that is likely to energize the piping shall be permitted to serve as the bonding means. The points of attachment of the bonding jumper(s) shall be accessible.
~~FPN: Bonding all piping and metal air ducts within the premises will provide additional safety.~~
(C) Structural Metal. Exposed structural metal that is interconnected to form a metal building frame and is not intentionally grounded and is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250.66 and installed in accordance with 250.64(A,)(B), and (E). The points of attachment of the bonding jumper(s) shall be accessible.
(D) Other Metal. Where installed in or attached to a building or structure, metal objects that are likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with 250.122, using the rating of the circuit that is likely to energize the piping system(s). The equipment grounding conductor for the circuit that is likely to energize the piping shall be permitted to serve as the bonding means. The points of attachment of the bonding jumper(s) shall be accessible.
(E) Separately Derived Systems. Remain unchanged.
Substantiation: It is evident that code understands the fact that bonding isolated metal is an enhancement in safety. This can be verified by referring to the fine print notes of 250.104(B) and 250.116. Because there are, in fact, documented deaths that have occurred because of the lack of bonding of such things as nonstructural metal wall framing and ducting systems, this concept should be a requirement, and not just a suggestion in the form of a fine print note. This proposal uses the existing text of 250.104(B) in an effort to provide consistent code language between the two subsections.
A companion proposal to delete the FPN to 250.116 will be submitted for correlating purposes.
Panel Meeting Action: Reject
Panel Statement: The terms "other metal" and "metal objects" are vague and unenforceable as used in this context.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-229 Log #1484 NEC-P05 **Final Action: Accept in Principle**
(250.104)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
250.104 Bonding of Piping Systems and Exposed Structural Steel.
(A) Metal Water Piping. The metal water piping system shall be bonded as required in (A)(1), (A)(2), or (A)(3) of this section. The bonding jumper(s) shall be installed in accordance with 250.64(A), (B), and (E). The points of attachment of the bonding jumper(s) shall be accessible.
(1) Remain unchanged.
(2) Buildings of Multiple Occupancy. In buildings of multiple occupancy where the metal water piping system(s) installed in or attached to a building or structure for the individual occupancies is metallically isolated from all other occupancies by use of nonmetallic water piping, the metal water piping system(s) for each occupancy shall be permitted to be bonded to the equipment grounding terminal of the panelboard or switchboard enclosure (other than service equipment) supplying that occupancy. The bonding jumper shall be sized in accordance with Table 250.122, based on the overcurrent protection device for the feeder circuit supplying the occupancy.
Substantiation: Simply referring the code user to Table 250.122 is not adequate. The user must know which overcurrent protection device is being used when referring to the table. Because of the allowance of this code section, it makes sense that the feeder protection device should be used. The code should tell the user this information.
Panel Meeting Action: Accept in Principle
Revise the proposed wording in the last sentence to read as follows:
The bonding jumper shall be sized in accordance with Table 250.122, based on the rating of the overcurrent protective device for the circuit supplying the occupancy.
Panel Statement: The panel accepts the revisions as providing clarity and improvement in usability to this section.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-230 Log #1402 NEC-P05 **Final Action: Reject**
(250.104(A))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Revise 250.104(A) as follows:
(A) Metal Water Piping. Where metal water piping systems do not meet the criteria for a grounding electrode as described in 250.52(A)(1), interior metal piping shall be bonded as required in (A)(1), (A)(2), or (A)(3) of this section.

The bonding jumpers shall be installed in accordance with 250.64(A), (B), and (E). The points of attachment for the bonding jumpers shall be accessible.
Substantiation: This would clarify that this section only becomes effective when the water piping does not qualify as a Grounding Electrode. This is submitted to coordinate with a proposal for 250.104(A).
Panel Meeting Action: Reject
Panel Statement: The proposed revision does not add clarity or improve the requirements of this section and is not necessary. Metal piping is required to be bonded whether or not the piping qualifies as a grounding electrode in accordance with 250.52(A)(1). It is recognized that the grounding electrode conductor in these cases accomplishes both grounding and bonding.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-231 Log #3215 NEC-P05 **Final Action: Reject**
(250.104(A))

Submitter: Gus Bryan, Deputy ELectrical Inspector State of TN
Recommendation: Add text to read as follows:
"...bonding jumpers shall be accessible. (add) Effectively grounded metal water piping shall have jumpers sized per 250.66, metal water piping not effectively grounded shall have jumpers installed per 250.122."
Substantiation: Metal water piping systems that are not effectively grounded are no different from process piping, etc. and should not require bonding beyond that required by 250.104(B).
Panel Meeting Action: Reject
Panel Statement: The submitter proposes lessening the minimum sizes required for bonding jumpers for metal water piping systems without substantiation. The panel maintains that the minimum size of the bonding jumpers for metal water piping systems is required to be in accordance with Table 250.66.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-232 Log #2120 NEC-P05 **Final Action: Reject**
(250.104(A) Exception)

Submitter: Bud Swathwood, Bud Swathwood Consulting
Recommendation: Add an exception to read as follows:
Exception: For the purpose of this section metal water piping shall not include metal eave troughs or down spouts for roof drainage.
Substantiation: Some inspectors are actually requiring this to be done: there have been suspicious fires caused by dry leaves in the trough catching fire because of the arcing of the loose joint in the eave troughs and down spouts.
Panel Meeting Action: Reject
Panel Statement: Metal trough gutters, scuppers, down spouts, and so forth are not metal water piping systems as covered by this section. These other metal objects qualify for what is presently addressed in the FPN to Section 250.104(B).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-233 Log #2136 NEC-P05 **Final Action: Reject**
(250.104(A) Exception (New))

Submitter: Russell LeBlanc, Peterson School of Engineering
Recommendation: Add exception to read as follows:
Isolated sections of metal water piping that are not likely to become energized, shall not be required to be bonded.
Substantiation: If a short section of metal water pipe was used in a plastic water piping, system it would be required to be bonded even if there was no likelihood of it ever becoming energized. There are no exceptions.
Panel Meeting Action: Reject
Panel Statement: Isolated sections of metal water piping are covered by 250.104(B). Section 250.104(A) is specifically for "systems" meaning complete systems consisting all of metal water piping.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-234 Log #121 NEC-P05 **Final Action: Reject**
(250.104(A)(1))

Submitter: Arthur J. Carlson, Chubbuck, ID
Recommendation: Add new paragraph:
"If the building or structure has a nonmetallic water service, the metal water piping may be bonded in accordance with 250.104(B)."
Substantiation: A nonmetallic water service makes the interior and exterior water piping no different than gas, air, etc.
Panel Meeting Action: Reject
Panel Statement: The proposed revision does not add clarity or improve the requirements of this section and is not necessary. Metal piping is required to be bonded whether or not the piping qualifies as a grounding electrode in accordance with 250.52(A)(1). The submitter proposes amending the sizes required for bonding jumpers for metal water piping systems without substantiation. The panel maintains that the minimum size of the bonding jumpers for metal water piping systems is required to be in accordance with Table 250.66. See panel action and statement on Proposal 5-231.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-235 Log #1834 NEC-P05 **Final Action: Reject**
(250.104(A)(1))

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician
Recommendation: Revise as follows:
~~General~~ Combination metal water piping system(s) separated by nonmetallic water piping system(s) where may become energized installed in or attached to a building or structure shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or the one or more grounding electrodes used.
Substantiation: Nonmetallic water piping systems are being inserted between our metal water piping system and today's code is not recognizing these changes.
Panel Meeting Action: Reject
Panel Statement: The conditions indicated in the substantiation are already covered by 250.104(B) where there is not a complete metallic water piping system.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-236 Log #2432 NEC-P05 **Final Action: Reject**
(250.104(A)(1))

Submitter: Robert P. McGann, City of Cambridge
Recommendation: Revise text to read as follows:
Metal water piping system(s) that is likely to be energized , installed in or attached to a building or structure shall be bonded.
Substantiation: With much expanded use of plastic water piping system(s) isolating section of metal piping systems. This type of installation leaves contractors and inspectors what is required to be bonded.
Panel Meeting Action: Reject
Panel Statement: The requirements of 250.104(A) apply to complete metallic water piping systems. Where there is no complete metallic water piping system, then the requirements of 250.104(B) would apply for those portions of isolated metal water piping system likely to become energized.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-237 Log #3216 NEC-P05 **Final Action: Reject**
(250.104(A)(1))

Submitter: Gus Bryan, Deputy ELectrical Inspector State of TN
Recommendation: Revise text to read as follows:
"...shall be sized in accordance with Table 250.66 for effectively grounded piping and Table 250.122 for non-effectively grounded metal water piping .
Substantiation: Metal water piping that is not effectively grounded is no different from air lines, process piping, etc. and, in that it is not being used as a grounding electrode, should not require bonding beyond 250-122.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-234. The submitter proposes amending the sizes required for bonding jumpers for metal water piping systems without substantiation. The panel maintains that the minimum size of the bonding jumpers for metal water piping systems is required to be in accordance with Table 250.66.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-238 Log #1232 NEC-P05 **Final Action: Reject**
(250.104(A)(2))

Submitter: Michael Dempsey, Municipal Code Inspections
Recommendation: Revise text to read as follows:
Buildings of multiple occupancy and one and two family dwellings .
Substantiation: There is no difference between a bond in a multi-occupancy and a one- and two-family for metal water piping in the interior of a dwelling unit when the water piping is not part of a grounding electrode.
Panel Meeting Action: Reject
Panel Statement: As used in this section, the term "multiple occupancies" includes one- and two-family dwellings. The Code does not differentiate between the types of multiple occupancy buildings referred to in this section.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-239 Log #1413 NEC-P05 **Final Action: Reject**
(250.104(B))

Submitter: Technical Committee on Lightning Protection,
Recommendation: Revise the existing Fine Print Note in NFPA 70 250.104(B) as follows (proposed new text underlined):

FPN: Bonding all piping and metal air ducts within the premises will provide additional safety. <u>For structures with a lightning protection system, all grounding media in or on a structure is required to be interconnected to provide a common ground potential. This interconnection shall include lightning protection, electric service, telephone, and communication system grounds, as well as underground metallic piping systems. For further information see NFPA 780-2004, Standard for the Installation of Lightning Protection Systems.</u>

Substantiation: The proposed additional text provides additional guidance for specified potential equalization bonding of building grounded systems detailed in NFPA 780 to minimize sideflash. This information is taken from paragraphs 4.14.1 and 4.14.1.1 of NFPA 780. The addition of this text will aid in the coordination between NFPA Standards Committees in the bonding of grounding systems and metallic piping installed in a structure.
Panel Meeting Action: Reject
Panel Statement: Mandatory text in a fine print note is not appropriate.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-240 Log #1448 NEC-P05 **Final Action: Reject**
(250.104(B))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:

(B) Other Metal Piping. Where installed in or attached to a building or structure, metal piping system(s), including gas piping <u>and fire sprinkler piping</u>, that is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes uses. The bonding jumper(s) shall be sized in accordance with 250.122 using the rating of the circuit that is likely to energize the piping system(s). The equipment grounding conductor for the circuit that is likely to energize the piping shall be permitted to serve as the bonding means. The points of attachment of the bonding jumper(s) shall be accessible.

FPN: Bonding all piping and metal air ducts within the premises will provide additional safety

Substantiation: There is a long-standing debate as to whether fire sprinkler piping is a 250.104(A) or 250.104(B) type of piping. I have spoken with several code experts on this issue, including multiple members of Panel 5, and have received different answers on this issue. Accepting this proposal would end this debate, and would be a step forward in the uniform interpretation of this rule, which is something that we should all be striving for.
Panel Meeting Action: Reject
Panel Statement: A metallic fire sprinkler piping system is metal water piping system that is covered by Section 250.104(A). Section 250.104(A) does not differentiate or exclude between the various types of metal water piping systems that might be present in a building or structure. Section 250.104(B) covers metal piping systems other than those metal water piping systems covered by 250.104(A).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-241 Log #2803 NEC-P05 **Final Action: Reject**
(250.104(B), FPN (New))

Submitter: Jeff Sellon, Western Engineering & Research Corporation
Recommendation: ...to add the following new fine print note to the existing wording of 250.104(B) Other Metal Piping of the 2005 edition of the NEC:

<u>FPN: See Installation of Sprinkler Systems (NFPA 13 Article 10.6.8 and A.10.6.8) for more information about the fire protection piping systems, which extend underground.</u>

Substantiation: Significant confusion persists over the bonding and/or grounding of fire protection piping systems that extend underground. (There is confusion among electrical inspectors, fire department inspectors, electricians, and engineers). Recently, in Colorado, stray current corrosion in an underground ductile iron fire protection piping caused a failure in the pipe, which resulted in millions of dollars of building and building foundation damage.

The failure occurred within several years of the pipe's installation. There have been some other similar failures, which I have investigated and know about. Such stray current failures typically occur just outside the building's foundation where current can flow around electrically discontinuous joints (bell & spigot) through moist conductive soil. The rubber gasket joints (unrestrained push-on or mechanical joints) of underground and above ground fire protection piping are not considered electrically continuous, although some joints can conduct current, depending how any particular joint fits together. Said differently, from an electrical perspective, such a fire protection piping system (inside a building and underground) consists of many individual piping segments, which may or may not conduct current.

NFPA 70, the National Electrical Code, does not require that all the individual piping segments be bonded together, nor could such a system be used as a grounding electrode since often the underground fire protection piping is coated or wrapped in plastic for corrosion protection. 250.104(B) allows that the equipment-grounding conductor for the circuit that is likely to energize the piping shall be permitted to serve as the bonding means. Thus, the ground of the electrical circuit for a tamper switch, for example, is allowed to bond the entire piping system even though the piping system itself may not be electrically continuous.

On occasion, when stray current does flow through the underground ductile iron fire protection piping, the potential for corrosion is increased and can result in rapid corrosion in this type of piping system.

Electrical isolation (via electrically insulated joints) of sections of underground piping systems has been used in various corrosion protection schemes for years.

Installing an electrically insulated joint between the underground fire protection piping and the above ground fire protection piping will stop stray current flow from 1) the building's electrical system into the underground fire protection piping and from 2) any source outside the building (such as an electric utility system) flowing into the building's low resistance grounding electrode system through the underground fire protection piping. Such as insulated joint would not change the electrical status of the piping system since it is already just a group of individual piping segments from an electrical perspective. Further, the underground ductile iron fire protection piping is often coated with a bonded or unbonded material, or wrapped in plastic, or cathodic protected with an active or inactive system to help protect against corrosion. An electrically insulating gasket installed between the underground and above ground fire protection piping would be part of the corrosion protection system.

Article 10.6.8 of the 2002 NFPA 13 describes this problem to some degree and it is further described in the associated 2002 Handbook. Last year, I proposed that an annex paragraph A.10.6.8 be added to NFPA 13 to further explain the problem and my proposal was accepted in principle (See 13-722 (Log #778) AUT-PRI **Final Action**: Accept in Principle (A.10.6.8).

My current proposal to add the above Fine Print Note (FPN) to 250.104(B) simply coordinates NFPA 70 and NFPA 13.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that "bonding all piping and metal air ducts within the premises will provide additional safety."
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-242 Log #1195 NEC-P05 **Final Action: Reject**
(250.104(D))

Submitter: Michael J. Timpanaro, Lake County Building Services
Recommendation: Revise as follows:

250.104 Bonding of Piping Systems, Exposed Structural Steel, <u>and Metal Framing Members.</u>

(D) Metal Framing Members. Metal Framing members shall be bonded to the equipment grounding conductor for the circuit that may energize the framing, and be sized in accordance with 250.122. For the purpose of this section, a grounded metal outlet box attached to the framing shall be permitted.

Substantiation: This proposal for bonding metal framing members was submitted for the 1999 code because a woman was shocked in a shower due to energized metal framing members. The proposal was rejected. This year an appliance installer died from electrocution due to an energized metal framing member that came in contact with the metal duct that was connected to the appliance.
Panel Meeting Action: Reject
Panel Statement: The panel notes that the submitter references 250.104(D) and that this section deals with the bonding of separately derived systems. Structural metal is covered by 250.104(C) for general cases and by 250.104(D)(2) for separately derived systems. Bonding of metal studs is not prohibited based on the condition of installation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

BRENDER, D.: The submitter points to the incorrect code section, but raises a valid point that could be easily corrected. In one of the previous code cycles, one submitter cited a death or serious injury that resulted from steel framing members becoming energized. Elimination of the word "exposed" in 250.104(C) and installation of one metal box would go a long way toward solving the problem.

5-243 Log #2842 NEC-P05 **Final Action: Reject**
(250.104(D))

Submitter: Edward Mitchell, City of Los Angeles, CA
Recommendation: Revise text to read as follows:

(1) Metal Water Piping System(s). The grounded conductor of each separately derived system shall be bonded to the nearest available point of the metal water piping system(s) ~~in the area served by each separately derived system.~~ This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

Exception No.1: A separate bonding jumper to the metal water piping system shall not be required where the metal water piping system is used as the grounding electrode for the separately derived system.

Exception No. 2: A separate water piping bonding jumper shall not be required where the metal frame of a building or structure is used as the grounding electrode for a separately derived system ~~and is bonded to the metal water piping in the area served by the separately derived system.~~

(2) Structural Metal. Where exposed structural metal that is interconnected to form the building frame exists ~~in the the area served by the separately derived system,~~ it shall be bonded to the grounded conductor of each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

Exception No. 1: A separate bonding jumper to the building structural metal shall not be required where the metal frame of a building or structure is used as the grounding electrode for the separately derived systems.

Exception No 2: A separate bonding jumper to the building structural metal shall not be required where the water piping of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the building structural metal ~~in the area served by the separately derived system.~~

(3) Common Grounding Electrode Conductor . Where a common grounding electrode conductor is installed for multiple separately derived systems as permitted by 250.30(A)(4), and exposed structural metal that is interconnected to form the building frame or interior metal piping exists ~~in the area served by the separately derived system,~~ the metal piping and the structural metal member shall be bonded to the common grounding electrode conductor.

Exception: A separate bonding jumper from each derived system to metal water piping and to structural metal members shall not be required where the metal water piping and the structural metal members ~~in the area served by the separately derived system~~ are bonded to the common grounding electrode conductor.

Substantiation: All references to “the area served by the separately derived system” should be deleted. What does that really mean anyway? If a transformer serves three floors of a building, do we need to bond to metal water piping on every floor? If a transformer on the first floor feeds a panelboard on the second floor, and that panelboard feeds branch circuits on the second and third floor, do we need a bonding connection to the metal water piping system on all three floors? In every room served by a branch circuit from that panelboard?

Exception No.1 to Metal Water Piping System(s) recognizes that when a separately derived system is bonded to the portion of the metal water piping system defined as the grounding electrode, no bonding is required in “the area served by the separately derived system” because the metal water piping system is in fact bonded from the “electrode portion” of the metal water piping system continuously throughout the building. When the separately derived system is bonded at <u>any point</u> to the metal water piping system, it is in fact bonded to the entire metal water piping system, including all “areas served by the separately derived system”. Similarly, when the separately derived system is bonded at <u>any point</u> to the structural metal, it is in fact bonded to the entire structural metal, including all “areas served by the separately derived system”.

Panel Meeting Action: Reject

Panel Statement: If there is no water piping in the area served, bonding to the water piping outside the area served would not be effective, since there will not be a direct connection through the separately derived systems.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-245 Log #2785 NEC-P05 **Final Action: Accept in Principle**
(250.104(D)(1) Exception No. 1)

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.

Recommendation: Revise as follows:

(D) Separately Derived Systems. Metal water piping systems and structural metal that is interconnected to form a building frame shall be bonded to separately derived systems in accordance with (D)(1) through (D)(3).

(1) Metal Water Piping System(s). The grounded conductor of each separately derived system shall be bonded to the nearest available point of the metal water piping system(s) in the area served by each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

~~Exception No. 1: A separate bonding jumper to the metal water piping system shall not be required where the metal water piping system is used as the grounding electrode for the separately derived system.~~

Exception No. 2: A separate water piping bonding jumper shall not be required where the meal frame of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the meal water piping in the area served by the separately derived system.

Substantiation: The exception No. 1 added in the 2005 code cycle should be removed from the NEC. The intent of requiring the bonding to the water pipe in the area served by the transformer was to ensure that the water piping system remained bonded to the electrical system throughout large buildings. It is critical that the entire water piping system remain bonded and electrically continuous throughout the entire building so that accidental contact of an energized conductor or equipment to the water piping system will cause the activation of an overcurrent device. Failure to provide this protection can result in portions of water piping system to become an energized conductor. This is all the more important to safeguard against now that more and more pieces of equipment connected to the water piping system are electrically energized.

Water piping systems that are bonded to the electrical system at the water main when the water main is used as the grounding electrode are subject to potential problems as the water piping system spreads throughout the building. Expansion fittings are installed and the electrical continuity of the water piping system can be lost. Parts of the water piping system may be replaced with nonconductive material during the life of the building causing the electrical continuity of the water piping system to be lost. Parts of the water piping system are removed for maintenance during the life of the building. If an electrical connection were made to the water piping system on the opposite side of the removed piece, from the watermain, then the maintenance person could be exposed to electrical shock from the now energized portion of the water piping system.

480V/208V transformers are equipment that is installed commonly throughout large structures. They are separately derived systems and are installed in numerous locations and spread out through the building. Requiring a bonding jumper to the water pipe in the area supplied by these separately derived systems, regardless of the means of obtaining a grounding electrode, is an effective means of ensuring the water piping system remains bonded throughout the building.

This bonding jumper was never intended to serve as a grounding electrode conductor. The grounding electrode is a necessary and important part of the safe electrical installation as is this bonding jumper. Both conductors need to be installed to ensure a safe electrical installation and neither conductor should be considered to be doing the job of the other or negate each other.

Panel Meeting Action: Accept in Principle

Revise the recommended text for 250.104(D)(1,) Exception No. 1 to read as follows:

Exception No. 1: A separate bonding jumper to the metal water piping system shall not be required where the metal water piping system is used as the grounding electrode for the separately derived system <u>and the water piping system is in the area served.</u>

Panel Statement: The panel does not accept the deletion of this exception. The intent is to not require both a grounding electrode conductor under 250.30 and a bonding jumper under 250.104 from the separately derived system to the same point on the metallic water pipe.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-246 Log #1414 NEC-P05 **Final Action: Accept**
(250.106)

Submitter: Technical Committee on Lightning Protection,

Recommendation: Delete the word “spacing” in Fine Print Note No. 1 and replace it with “sideflash distance”.

Revised FPN will read as follows:

FPN No. 1: See 250.60 for use of air terminals. For further information, see NFPA 780-2004, Standard for the Installation of Lightning Protection Systems, which contains detailed information on grounding, bonding, and ~~spacing~~ <u>sideflash distance</u> from lightning protection systems.

Substantiation: NFPA 780 shows the method for calculating sideflash distance based on factors related to the design of the lightning protection system. Grounded metallic bodies within the sideflash distance are interconnected with the system, and those outside the calculated distance are not. The term “spacing” misleads the user, who may believe that a grounded system could be separated from the lightning protection system with no connection, when in reality all grounded systems must be interconnected at grade level minimum. The evaluation of sideflash distance then occurs at roof level, and at intermediate height levels. Sections 4.19 to 4.21 of NFPA 780 cover this method of determination.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-247 Log #1415 NEC-P05 **Final Action: Accept in Part**
(250.106)

Submitter: Technical Committee on Lightning Protection,

Recommendation: Revise Fine Print Note No. 2 as follows to change from the “typical” spacing of 6 feet to the calculated sideflash distance as required by NFPA 780:

FPN No. 2: Metal raceways, enclosures, frames, and other non-current-carrying metal parts of electric equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780-2004, Standard for the Installation of Lightning Protection Systems. ~~Separation from lightning~~

~~protection conductors is typically 1.8 m (6 ft) through air or 900 mm (3 ft) through dense materials such as concrete, brick, or wood.~~

Bonding is required if the grounded metal object is within the sideflash distance of the lightning protection system calculated at that location. Sideflash distance is calculated based on the vertical distance from the nearest bond, the number of proximate lightning protection down conductors, and the material the flashover must travel through. See NFPA 780 Sections 4.19 through 4.21 for the method of calculation.

Substantiation: Grounded metal bodies must be evaluated for additional interconnections at intermediate vertical heights. Ungrounded or floating metal bodies must be evaluated based on their ability to provide a short circuit path from the lightning protection system to another grounded building system. The indication of a "typical" distance is misleading, since evaluation of the factors involved can led to a sideflash potential distance as small as 1 foot or larger than 10 feet depending on the various system design factors. This proposal clarifies the current requirements of NFPA 780.

Panel Meeting Action: Accept in Part

Revise Fine Print Note No. 2 as follows to change from the "typical" spacing of 6 feet to the calculated sideflash distance as required by NFPA 780:

FPN No. 2: Metal raceways, enclosures, frames, and other non-current-carrying metal parts of electric equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780-2004, Standard for the Installation of Lightning Protection Systems. ~~Separation from lightning protection conductors is typically 1.8 m (6 ft) through air or 900 mm (3 ft) through dense materials such as concrete, brick, or wood.~~

Panel Statement: The panel agrees with the substantiation to delete the last sentence of the FPN No. 2. The panel does not accept the additional wording of the FPN, as it includes mandatory text and violates the NEC Style Manual.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

MELLO, C.: The panel action and the final language for FPN 2 do not match. The panel action was to delete the typical distance of 6 feet and replace this with "calculated sideflash distance" per NFPA 780. The only actual change that occurred in the revised text was to delete the last sentence to remove the "typical distance" reference but there was no replacement with a "calculated side flash distance". This leaves the user no information at all instead of what could be incorrect information if the typical distance was used without qualification by true calculations. The following is suggested language to resolve this apparent conflict:

250.106

FPN No. 2: Metal raceways, enclosures, frames, and other non–current-carrying metal parts of electric equipment installed on a building equipped with a lightning protection system may require bonding to or spacing from the lightning protection conductors based on the calculated sideflash distances in accordance with NFPA 780-2004, Standard for the Installation of Lightning Protection Systems. ~~Separation from lightning protection conductors is typically 1.8 m (6 ft) through air or 900 mm (3 ft) through dense materials such as concrete, brick, or wood.~~

5-247a Log #CP507 NEC-P05 **Final Action: Accept**
(250.112)

Submitter: Code-Making Panel 5,

Recommendation: Revise only the mentioned sections of Section 250.112 to read as follows:

250.112 Fastened in Place or Connected by Permanent Wiring Methods (Fixed) — Specific. Except as permitted in 250.112(I), ~~E~~ e xposed, non–current-carrying metal parts of the kinds of equipment described in 250.112(A) through (K), and non–current-carrying metal parts of equipment and enclosures described in 250.112(L) and (M), shall be ~~grounded~~ connected to the equipment grounding conductor regardless of voltage. … (K) Skid Mounted Equipment. Permanently mounted electrical equipment and skids shall be ~~grounded~~ connected to the ~~with an~~ equipment grounding ~~bonding~~ conductor ~~jumper~~ sized as required by 250.122. …

(M) Metal Well Casings Where a submersible pump is used in a metal well casing, the well casing shall be ~~bonded~~ connected to the pump circuit equipment grounding conductor. This proposal only modifies these sections within 250.112.

Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. The panel incorporated the text from Proposal 5-248 and the Task Group work as proposed in Proposal 5-77 and 5-218.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-248 Log #877 NEC-P05 **Final Action: Accept**
(250.112)

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Revise 250.112 to read as follows:

" Except as permitted in 250.112(I), ~~E~~ e xposed, non-current carrying metal parts..." (remainder to be unchanged).

Substantiation: The current rule literally requires grounding of parts described in 250.112(I) "regardless of voltage," even though the system grounding requirements of Parts II and VIII are applied based on voltage. 250.112(I) exempts some things from grounding, but this is not clear in the main rule. Wording is from 250.86.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-249 Log #1041 NEC-P05 **Final Action: Reject**
(250.112(F))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

Electric equipment in ~~commercial~~ garages, theaters, and motion picture studios ~~except pendant lampholder supplied by circuits not over 150 volts to ground.~~

Substantiation: Metal parts of pendant lampholders over 150 volts to ground are not exempt from grounding, therefore, it can be inferred a shock hazard may exist which also exists for 120 volt systems. 250.114(3)(e) and (4)(e) require portable cord and plug connected handlamps to be grounded. A pendant supported lampholder is also subject to being energized.

Panel Meeting Action: Reject

Panel Statement: There was no substantiation provided to delete the term "commercial," which then imposes this rule on all garages, which is undefined and could include residential garages. The exception is specifically for pendant style lampholders, and no technical substantiation was provided for removing the exemption.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-250 Log #1190 NEC-P05 **Final Action: Accept in Principle**
(250.112(G))

Submitter: Stephen G. Kieffer, Kieffer & Co., Inc. / Rep. International Sign Association

Recommendation: Revise section to read as follows:

250.112 Fastened in Place or Connected by Permanent Wiring Methods (Fixed) —Specific.

(G) Electric Signs. Electric signs, outline lighting, and associated equipment ~~as provided in Article 600~~ . See 600.7 for supplemental requirements.

Substantiation: As defined in 90.3 Code Arrangement, Article 600, Section 600.7 supplements or modifies the general rules of Article 250. 600.7 does not contain all of the grounding requirements for signs and outline lighting systems. Therefore, it is not appropriate to imply that Article 600 is the source of all grounding and bonding requirements for this equipment.

Panel Meeting Action: Accept in Principle

Revise section to read as follows:

250.112 Fastened in Place or Connected by Permanent Wiring Methods (Fixed) —Specific.

(G) Electric Signs. Electric signs, outline lighting, and associated equipment as provided in ~~Article 600~~ 600.7.

Panel Statement: Editorially corrected to meet the NEC style Manual.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-251 Log #1185 NEC-P05 **Final Action: Accept in Principle**
(250.112(I))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

~~POWER-LIMITED~~ REMOTE-CONTROL, SIGNALING, AND FIRE ALARM CIRCUITS . Equipment supplied by Class I ~~power-limited~~ circuits operating at over 50 volts, nominal, shall be grounded. Equipment powered by Class I power-limited circuits, Class 2 and Class 3 remote control and signaling, and by fire alarm circuits shall be grounded where the system is grounded ~~grounding is~~ as required or permitted by Part II or Part VIII of this article.

Substantiation: Equipment supplied by an unlimited power Class I circuit from an ungrounded 480 volt or 600 volt 3-phase 3-wire system does not have to be grounded, per this section. Other equipment supplied by such systems is generally required to be grounded. 250.174 requires instruments, meters, and relays (which may be connected to Class I circuits) to be grounded.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-252.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-252 Log #3339 NEC-P05 **Final Action: Accept**
(250.112(I))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise this paragraph to read as follows:
(I) Remote Control, Signaling, and Fire Alarm Circuits. Equipment supplied by Class 1 circuits shall be grounded unless operating at less than 50 volts. Equipment supplied by Class 1 power-limited circuits, Class 2, and Class 3 remote control and signaling circuits, and by fire alarm circuits, shall be grounded where system grounding is required by Part II or Part VIII of this article.
Substantiation: The literal text of the current section allows an ungrounded 480-volt (or 600-volt) Class 1 control circuit to omit equipment grounding because the control system need not be system-grounded, and therefore need not carry an equipment grounding conductor. Remember also that 250.21(3) recognizes omission of system grounding on some control circuits that operate at hazardous voltages. This proposal requires equipment grounding in such cases. The wording in this proposal responds to the CMP 5 reservation in the 2005 comment period with respect to somewhat different wording that would have required Class 1 control circuits to incorporate equipment grounding even if operating below 50 volts.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-252a Log #CP515 NEC-P05 **Final Action: Accept**
(250.114)

Submitter: Code-Making Panel 5,
Recommendation: Revise first paragraph of 250.114 as follows:and all 250.114 Exceptions as follows:
250.114 Equipment Connected by Cord and Plug. Under any of the conditions described in (1) through (4), exposed non–current-carrying metal parts of cord-and-plug-connected equipment likely to become energized shall be ~~grounded~~ connected to the equipment grounding conductor .
Revise all of the Exceptions within 250.114 as follows:
Exception: Listed tools, listed appliances, and listed equipment covered in (2) through (4) shall not be required to be ~~grounded~~ connected to an equipment grounding conductor where protected by a system of double insulation or its equivalent. Double insulated equipment shall be distinctively marked. …
Exception No. 1: Motors, where guarded, shall not be required to be ~~grounded~~ connected to an equipment grounding conductor .
Exception No. 2: Metal frames of electrically heated appliances, exempted by special permission, shall not be required to be ~~grounded~~ connected to an equipment grounding conductor , in which case the frames shall be permanently and effectively insulated from ground. …
Exception: Tools and portable handlamps likely to be used in wet or conductive locations shall not be required to be ~~grounded~~ connected to an equipment grounding conductor where supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. The word “the” was changed to the word “an” in all the exceptions because of consistancy.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-252b Log #CP508 NEC-P05 **Final Action: Accept**
(250.116)

Submitter: Code-Making Panel 5,
Recommendation: Revise 250.116 to read as follows:
250.116 Nonelectric Equipment. The metal parts of nonelectric equipment described in this section shall be connected to the equipment grounding conductor ~~grounded~~ . Retain existing (1), (2) and (3)
FPN: Where extensive metal in or on buildings may become energized and is subject to personal contact, adequate bonding and grounding will provide additional safety.
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. This proposal reflects a change from the from Proposal 5-77 submitted by TCC Task Group on Grounding and Bonding. The panel decided to restore the text of the FPN of this section to the 2005 NEC language in order to maintain clarity.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-253 Log #1456 NEC-P05 **Final Action: Reject**
(250.116)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
250.116 Nonelectric Equipment. The metal parts of nonelectric equipment described in this section shall be grounded.
(1) Frames and tracks of electrically operated cranes and hoists.
(2) Frames of nonelectrically driven elevator cars to which electric conductors are attached.
(3) Hand-operated metal shifting ropes or cables of electric elevators.
~~FPN: Where extensive metal in or on buildings may become energized and is subject to personal contact, adequate bonding and grounding will provide additional safety.~~
Substantiation: This proosal is being made as a companion to my proposal to change 250.104.
Panel Meeting Action: Reject
Panel Statement: The fine print note to this section is still necessary for informational purposes. Although “extensive metal” is not specific, the fine print note allows jurisdictions to evaluate bonding requirements where it is judged as necessary.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-253a Log #CP509 NEC-P05 **Final Action: Accept**
(250.118)

Submitter: Code-Making Panel 5,
Recommendation: Revise this section as follows:
250.118 Types of Equipment Grounding Conductors. The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following:
FPN No. 1: For effective ground-fault current path, see 250.2 Definition.
(1) A copper, aluminum, or copper-clad aluminum conductor. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a busbar of any shape.
(2) Rigid metal conduit.
(3) Intermediate metal conduit.
(4) Electrical metallic tubing.
(5) Listed flexible metal conduit meeting all the following conditions:
a. The conduit is terminated in listed fittings ~~listed for grounding~~ .
b. The circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.
c. The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 1.8 m (6 ft).
d. Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.
(6) Listed liquidtight flexible metal conduit meeting all the following conditions:
a. The conduit is terminated in listed fittings ~~listed for grounding~~ .
b. For metric designators 12 through 16 (trade sizes through ½), the circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.
c. For metric designators 21 through 35 (trade sizes ¾ through 1¼), the circuit conductors contained in the conduit are protected by overcurrent devices rated not more than 60 amperes and there is no flexible metal conduit, flexible metallic tubing, or liquidtight flexible metal conduit in trade sizes metric designators 12 through 16 (trade sizes through ½) in the grounding path.
d. The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 1.8 m (6 ft).
e. Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.
(7) Flexible metallic tubing where the tubing is terminated in listed fittings ~~listed for grounding~~ and meeting the following conditions:
a. The circuit conductors contained in the tubing are protected by overcurrent devices rated at 20 amperes or less.
b. The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 1.8 m (6 ft).
(8) Armor of Type AC cable as provided in 320.108.
(9) The copper sheath of mineral-insulated, metal-sheathed cable.
(10) Type MC cable where listed and identified for grounding in accordance with the following:
a. The combined metallic sheath and grounding conductor of interlocked metal tape–type MC cable
b. The metallic sheath or the combined metallic sheath and grounding conductors of the smooth or corrugated tube type MC cable

(11) Cable trays as permitted in 392.3(C) and 392.7.
(12) Cablebus framework as permitted in 370.3.
(13) Other listed electrically continuous metal raceways and listed auxiliary gutters.
(14) Surface metal raceways listed for grounding.

Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. The revisions identified above were added for clarity. Revisions were also made to restore text to the 2005 NEC where appropriate. This proposal correlates with Proposal 5-254.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-254 Log #609 NEC-P05 **Final Action: Accept in Principle**
(250.118)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise Section 250.118 as follows:

250.118 Types of Equipment Grounding Conductors. The equipment grounding conductor shall provide an effective ground-fault current path and a grounding connection for connected equipment. The wiring methods identified in 250.118 shall be used with fittings that are suitable for use in the effective ground-fault current path.

FPN No. 1: Equipment grounding conductor(s) serve as a means of grounding equipment and also performs bonding in addition to functioning as an effective ground-fault current path. See 250.4(A)(5) and 250.4(B)(4).

FPN No. 2: Listed fittings identified for use with the wiring methods identified in 250.118 must be suitable for grounding and suitable for use in the effective ground-fault current path. Fittings listed for grounding are also listed for bonding.

The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following wire-type conductors, busbars, or any of the wiring methods:

(1) A copper, aluminum, or copper-clad aluminum conductor. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a busbar of any shape.
(2) Rigid metal conduit.
(3) Intermediate metal conduit.
(4) Electrical metallic tubing.
(5) Listed flexible metal conduit meeting all the following conditions:
(a) The conduit is terminated in fittings listed for bonding and grounding.
(b) The circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.
(c) The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same effective ground -fault current ~~return~~ path does not exceed 1.8 m (6 ft).
(d) Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.
(6) Listed liquidtight flexible metal conduit meeting all the following conditions:
(a) The conduit is terminated in fittings listed for bonding and grounding.
(b) For metric designators 12 through 16 (trade sizes 3/8 through 1/2), the circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.
(c) For metric designators 21 through 35 (trade sizes 3/4 through 1-1/4), the circuit conductors contained in the conduit are protected by overcurrent devices rated not more than 60 amperes and there is no flexible metal conduit, flexible metallic tubing, or liquidtight flexible metal conduit in trade sizes metric designators 12 through 16 (trade sizes 3/8 through 1/2) in the effective ground-fault current ~~grounding~~ path.
(d) The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same effective ground -fault current ~~return~~ path does not exceed 1.8 m (6 ft).
(e) Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.
(7) Flexible metallic tubing where the tubing is terminated in fittings listed for bonding and grounding and meets ~~ings~~ all of the following conditions:
(a) The circuit conductors contained in the tubing are protected by overcurrent devices rated at 20 amperes or less.
(b) The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same effective ground -fault current ~~return~~ path does not exceed 1.8 m (6 ft).
(8) Armor of Type AC cable as provided in 320.108.
(9) The copper sheath of mineral-insualted, metal-sheathed cable.
(10) Type MC cable where listed and identified for grounding and bonding in accordance with the following:
(a) The combined metallic sheath and equipment grounding conductor (s) of interlocked metal tape–type MC cable.
(b) The metallic sheath or the combined metallic sheath and equipment grounding conductor (s) of the smooth or corrugated tube type MC cable.
(11) Cable trays as permitted in 392.3(C) and 392.7.
(12) Cablebus framework as permitted in 370.3.
(13) Other listed electrically continuous metal raceways and listed auxiliary gutters.
(14) Surface metal raceways listed for bonding and grounding.

Substantiation: This proposal is a continuation of a larger effort being extended to use the correct terms related to grounding and bonding in Code rules. The proposed revisions to this section address two items primarily. First, the new first paragraph provides the user with clear information about the functionality of the equipment grounding conductor. This conductor serves as a means of grounding equipment and equally important, it also serves as an effective ground-fault current path. This should be stated within this section and correlate with 250.4. The proposed fine print notes indicate that the equipment grounding conductor also performs bonding and functions as an effective ground-fault current path because that is what it does in addition to grounding.

The second item addressed in this proposal has to do with the fittings used with any of the wiring methods identified in this section. This section previously required fittings that are listed for grounding to be used with these wiring methods that are recognized as equipment grounding conductors. The problem here is that the fittings (connectors and couplings) are performing bonding functions. The connectors connect (bond) the raceways to enclosures and the couplings connect (bond) conduit raceways and tubing together. The more appropriate term to use in this section where the term "listed for grounding" is used is "listed for bonding" because bonding is really what is being accomplished by the fittings. This is also how they are evaluated by testing laboratories. See attachments 1 and 2 that I have provided. The proposed revision changes the term "listed for grounding" to listed for bonding because both functions are inherent to their use.

It is recognized that product standards and guide card directory information also currently indicate that such fittings are listed for grounding. The reality here is that these publications also need to be revised to correctly indicate how the fittings are listed. Bonding is basically the function of connecting things together, which is what conduit and tubing fittings do. Grounding is connecting something to the earth. If the conduit or tubing is grounded at the source or service by connection to a grounding electrode, as the fittings are installed, the function of bonding and grounding is ongoing.

Proposals will also be presented to the UL Electrical Council at the 2006 May meeting to revise the guide care information and standards as appropriate to reflect how fittings are actually listed and evaluated. The attachments I have provided are an illustration and photo of how the fittings are tested for their ability to establish an effective connection between the conduit or tubing and an enclosure (this is bonding). Note that there is no connection to ground in the test model illustration, yet the guide card indicates that the fittings are listed for grounding. The Code should indicate that they are listed for both functions. That is what they do.

The Code should include language that is clear and means what it implies within the requirement.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposals Proposal 5-253a (Log CP509) and Proposal 5-77

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-255 Log #3394 NEC-P05 **Final Action: Reject**
(250.118(10)b. (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Insert a new "b.", relettering the existing "b." as "c." as follows:

b. The combined metallic armor and enclosed bonding conductor of interlocked metal tape-type MC cable where specifically listed for equipment grounding without an enclosed equipment grounding conductor.

Substantiation: This proposal supplies the missing NEC authorization for full recognition of a new generation of interlocking armor Type MC cable with an enclosed bonding conductor that meets all 250.122 sizing requirements. Although there has been considerable discussion as to whether a change in the NEC is necessary, I have consistently believed that it was required, and this proposal will provide the required public review for this cycle.

Panel Meeting Action: Reject

Panel Statement: The panel concludes the present text in 250.118(10) and the additional requirements stated in 250.118(10)(a) cover the product identified by the submitter. The metal armor with the internal bare grounding conductor of the combined metal sheath and grounding conductor on interlocked metal tape type MC cable listed and identified for use as an equipment grounding conductor means the armor is suitable as an equipment grounding conductor. Any additional insulation wire type equipment grounding conductor contained within the cable assembly is an additional equipment grounding conductor.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-256 Log #3021 NEC-P05 **Final Action: Reject**
(250.118(2) Exception (New))

Submitter: James Conrad, Tyco Thermal Control
Recommendation: Add exception to 250.118(2) Rigid metal conduit.
Exception: When rigid metal conduit is used to enclose circuit conductors that are a part of an Electrical Circuit Protective System (also known as fire-rated cables), the equipment grounding conductor shall be installed in the raceway. The type of wire used as the equipment grounding conductor is identified in the Electrical Circuit Protective System write-up and should only be used for that specific system.
Substantiation: Electrical Circuit Protective Systems are used to protect critical circuits from fires in Articles 695, 700 and 760. Some systems use a fire-rated cable installed in a steel raceway to achieve a fire-rated system. Although the steel raceway maintains excellent integrity during the fire, the grounding aspect of the conduit is lost or minimized at the couplings and fittings because of oxidation and thermal expansion, therefore, the conduit should not be used as the sole equipment grounding conductor. A separate ground wire, sized per Table 250.122, should be installed in each conduit. The type(s) of wire, such as RHH, RHW, etc., used as the ground is identified in each system write-up and should be the only ground wire permitted in the conduit of that systems. See FHIT Guide Information in the UL Fire Resistive Directory for more information on Electrical Circuit Protective Systems and grounding.
Panel Meeting Action: Reject
Panel Statement: Studies show that all steel conduit is a reliable equipment grounding conductor in high temperature situations. UL white book does not require a wire type equipment grounding conductor. The technical substantiation does not support the proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRENDER, D.: Fire-rated cables are related to life safety and installation of an equipment grounding conductor would enhance safety. Conduit alone is not a reliable grounding path.

5-257 Log #3020 NEC-P05 **Final Action: Reject**
(250.118(3))

Submitter: James Conrad, Tyco Thermal Control
Recommendation: Add exception to 250.118(3) Intermediate metal conduit.
Exception: When intermediate metal conduit is used to enclose circuit conductors that are a part of an Electrical Circuit Protective System (also known as fire-rated cables), the equipment grounding conductor shall be installed in the raceway. The type of wire used as the equipment grounding conductor is identified in the Electrical Circuit Protective System write-up and should only be used for that specific system.
Substantiation: Electrical Circuit Protective Systems are used to protect critical circuits from fires in Articles 695, 700 and 760. Some systems use a fire-rated cable installed in a steel raceway to achieve a fire-rated system. Although the steel raceway maintains excellent integrity during the fire, the grounding aspect of the conduit is lost or minimized at the couplings and fittings because of oxidation and thermal expansion, therefore, the conduit should not be used as the sole equipment grounding conductor. A separate ground wire, sized per Table 250.122, should be installed in each conduit. The type(s) of wire, such as RHH, RHW, etc., used as the ground is identified in each system write-up and should be the only ground wire permitted in the conduit of that systems. See FHIT Guide Information in the UL Fire Resistive Directory for more information on Electrical Circuit Protective Systems and grounding.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-256.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRENDER, D.: See my negative vote on proposal 5-256.

5-258 Log #3019 NEC-P05 **Final Action: Reject**
(250.118(4) Exception (New))

Submitter: James Conrad, Tyco Thermal Control
Recommendation: Add exception to 250.118(4) Electrical metallic tubing.
Exception: When EMT is used to enclose circuit conductors that are part of an Electrical Circuit Protective System (also known as fire-rated cables), the equipment grounding conductor shall be installed in the raceway. The type of wire used as the equipment grounding conductor is identified in the Electrical Circuit Protective System write-up and should only be used for that specific system.
Substantiation: Electrical Circuit Protective Systems are used to protect critical circuits from fires in Articles 695, 700 and 760. Some systems use a fire-rated cable installed in a steel raceway to achieve a fire-rated system. Although the steel raceway maintains excellent integrity during the fire, the grounding aspect of the conduit is lost or minimized at the couplings and fittings because of oxidation and thermal expansion, therefore, the conduit should not be used as the sole equipment grounding conductor. A separate ground wire, sized per Table 250.122, should be installed in each conduit. The type(s) of wire, such as RHH, RHW etc., used as the ground is identified in each system write-up and should be the only ground wire permitted in the conduit of that system. See FHIT Guide Information in the UL Fire Resistive Directory for more information on Electrical Circuit Protective Systems and grounding.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-256.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRENDER, D.: See my negative vote on proposal 5-256. EMT is a particularly unreliable grounding path as connections involving set screws are sometimes not tightened correctly, or can grow loose due to vibration. Corrosion at joints can also be an issue affecting reliability.

5-259 Log #2697 NEC-P05 **Final Action: Reject**
(250.118(5), FPN (New))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text of section as follows:
250.118(5)
Add a FPN to read as follows:
FPN. For the purposes of this section a need for flexibility does not include adjustment or vibration.
Substantiation: The revision of this section has created confusion. Flexibility can be interpreted as including vibration. Flexible conduit is used for movement “while in use” and also for vibration or infrequent adjustment. Flexible conduit is also used in many applications to reduce vibration from being applied to the raceway system. Adding this FPN will clarify the intent of the section.
Proposals were submitted for sections 250.118(5), 250.118(6), 348.60, and 350.60.
Panel Meeting Action: Reject
Panel Statement: The proposal does not add clarity or improve the requirements of this section. The panel acted in the 2005 cycle to clarify what was intended by flexibility in this section. See panel actions and statements on Proposals 5-216, 5-217 and 5-218 in the 2004 NEC Report on Proposals. By specifically addressing the requirement for flexibility for installation, the section does not exclude installations where flexible metal conduit is installed to address the conditions pointed out by the submitter in the proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-260 Log #2698 NEC-P05 **Final Action: Reject**
(250.118(6))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text of section as follows:
250.118(6)
Add a FPN to read as follows:
FPN. For the purposes of this section a need for flexibility does not include adjustment or vibration.
Substantiation: The revision of this section has created confusion. Flexibility can be interpreted as including vibration. Flexible conduit is used for movement “while in use” and also for vibration or infrequent adjustment. Flexible conduit is also used in many applications to reduce vibration from being applied to the raceway system. Adding this FPN will clarify the intent of the section.
Proposals were submitted for sections 250.118(5), 250.118(6), 348.60, and 350.60.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-259.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-261 Log #2147 NEC-P05 **Final Action: Reject**
(250.119)

Submitter: Roger Hewitt, Puget Sound Electrical Apprenticeship / Rep. IBEW LU #46
Recommendation: Delete existing text from 250.119 and replace with:
Equipment grounding conductors shall be identified in accordance with 310.12(B).
Substantiation: Multiple sections of the NEC must now be consulted to ensure proper conductor identification. Combining all conductor identification requirements in one section in Article 310 is logical.

Panel Meeting Action: Reject
Panel Statement: According the scope of Article 250 specific requirements of grounding conductors are covered in this article. 250.119 is the appropriate location for this requirement. The proposal removes the equipment grounding conductor identification requirements without substantiation and creates a circular loop in the Code that includes no rules. Section 310.12 currently does not include any identification requirements for equipment grounding conductors, but refers to Section 250.119 for those requirements.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-262 Log #2555 NEC-P05 **Final Action: Reject**
(250.119)

Submitter: Jeff Holmes, Saint Charles, MO
Recommendation: Revise text to read as follows:
250.119 Identification of Equipment Grounding Conductors.
Unless required elsewhere in this Code, equipment grounding conductors shall be permitted to be bare, covered, or insulated. Conductors with insulation or individual covering that is green, green with one or more yellow stripes, or otherwise identified as permitted by this section shall not be used for ungrounded or grounded circuit conductors.
(A) Conductors 6 AWG and Smaller.
Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green or green with one or more yellow stripes except as permitted in this section.
(B) Equipment grounding conductors larger than 6 AWG shall comply with 250.119(B)(1) and (B)(2).
(1) An insulated or covered conductor larger than 6 AWG shall be permitted, at the time of installation, to be permanently identified as an equipment grounding conductor at each end and at every point where the conductor is accessible.
Exception: Conductors larger than 6 AWG shall not be required to be marked in conduit bodies that contain no splices or unused hubs.
(2) Identification shall encircle the conductor and shall be accomplished by one of the following:
a. Stripping the insulation or covering from the entire exposed length
b. Coloring the exposed insulation or covering green
c. Marking the exposed insulation or covering with green tape or green adhesive labels
(C) Multiconductor Cable. Where the conditions of maintenance and supervision ensure that only qualified persons service the installation, one or more insulated conductors in a a multiconductor cable, at the time of installation, shall be permitted to be permanently identified as equipment grounding conductors at each end and at every point where the conductors are accessible by one of the following means:
(1) Stripping the insulation from the entire exposed length
(2) Coloring the exposed insulation green
(3) Marking the exposed insulation with green tape or green adhesive labels
(D) Flexible Cord. An uninsulated equipment grounding conductor shall be permitted, but, if individually covered, the covering shall have a continuous outer finish that is either green or green with one or more yellow stripes.
Substantiation: In areas that I have worked in, I still see 6 and 8 AWG equipment grounding conductors being installed with black insulation and then identified with green tape. When this section is taught to the students, it is also confusing, since 200.6 is much more specific on the identification of the grounded conductor.
The rewording of this Article does not attempt to change the intent of the Article, but, make the Article “user friendly”, so that the Article is more consistent with other code articles and that the standard can be met in all installations.
Panel Meeting Action: Reject
Panel Statement: The added text in proposed 250.119(A) is redundant to the text in the main body of the section which requires all equipment grounding conductors of any size that are covered or insulated to have the indicated identification.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-263 Log #2592 NEC-P05 **Final Action: Reject**
(250.119)

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Add the following to the end of the existing text.
Bare copper conductors shall not be permitted for use in aluminum raceways.
Substantiation: Due to the galvanic action between these two dissimilar metals, when a bare copper conductor is installed in an aluminum raceway, the raceway corrodes and deteriorates very quickly. 110.14 addresses dissimilar metals in terminations and splices, this will only expand on that same theory.
Panel Meeting Action: Reject
Panel Statement: Insufficient technical substantiation was submitted. Section 250.119 deals with the identification of equipment grounding conductors and the issue raised by the submitter is an installation issue not one of identification.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-264 Log #878 NEC-P05 **Final Action: Reject**
(250.119 Exception (New))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Add the following exception before (A):
Exception: Where equipment is connected by multiconductor cable and equipment grounding conductors are not required, the solid color green may be used for other than grounding conductors.
Substantiation: This is intended to correct an oversight in the 2005 NEC that effectively outlawed a standard industry-wide practice in which the color green is used for ungrounded fan control in Class 2 thermostat circuits. Most such circuits (and similar circuits using communications cables) are not required to be grounded.
Panel Meeting Action: Reject
Panel Statement: The rewording of the proposed exception is too broad. A cable that is installed to a piece of equipment not required to be grounded, may remain in place for many years. If equipment is replaced that requires grounding a hazard may result from improper wiring.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: The proposal should be accepted. The submitter is correct that an insulated conductor that is colored green should be able to be used for other purposes if providing a fault current path is not necessary. This is similar in concept to the permitted use of a white conductor in 200.7(B).

5-265 Log #2553 NEC-P05 **Final Action: Reject**
(250.119 Exception (New))

Submitter: Tom Baker, Puget Sound Electrical Training
Recommendation: Revise text to read as follows:
Unless required elsewhere in this Code, equipment grounding conductors shall be permitted to be bare, covered, or insulated. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green or green with one or more yellow stripes except as permitted in this section. Conductors with insulation or individual covering that is green, green with one or more yellow stripes, or otherwise identified as permitted by this section shall not be used for ungrounded or grounded circuit conductors.
Exception: A green or green with yellow stripe conductor may be used for other than equipment grounding purposes for traffic signals, when the conditions of maintenance and supervision ensure that only qualified persons service the installation, and a listed traffic signal cable is used.
Substantiation: The 2005 NEC restricted a green or green with a yellow stripe conductor for use only as the equipment grounding conductor. Traffic signal heads commonly use a 5 conductor cable, where black is a spare, white is the grounded conductor, red supplies the red signal, yellow supplies the yellow signal and green supplies the green signal. There are thousands of traffic signals installed with the green conductor supplying the green signal.
There is a UL Listing for Traffic Signal Cable, Classified in Accordance with IMSA (International Municipal Signal Association) Specifications (XNTL), which states “this cable employs a color-code scheme that permits a conductor with green insulation to be used for other than grounding purposes”. This proposal would continue to allow the use of a listed traffic signal cable where installed and maintained by qualified persons.
Panel Meeting Action: Reject
Panel Statement: Load side wiring from a traffic light controller is not covered by the NEC. Load side wiring to signal, push button, sensors and inter system conductors are covered by other standards such as standards developed by IMSA.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:
BRETT, JR., M.: I agree with the other explanations of negative votes.
DOBROWSKY, P.: The proposal should be accepted. The panel statement is not necessarily correct. Traffic signals are also used on private property and are covered by the NEC.
STEINMAN, G.: The proposal reflects safer wiring practice regarding traffic signals. Only qualified persons should be persons handling the wiring in a signal head. The IMSA classifications are generally accepted in the industry.

5-266 Log #454 NEC-P05 **Final Action: Accept**
(250.119(A)(2) b. and c.)

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: Revise b. to read:
Coloring the ~~exposed~~ insulation or covering green at the termination .
Revise c. to read:
Marking the ~~exposed~~ insulation or covering with green tape or green adhesive labels at the termination .

Substantiation: Confusion exists because on the one hand there is the requirement that the identification encircle the conductor, while on the other hand the entire exposed insulation or covering must be colored green. This change should have been made when the "encircle" proposal was accepted for the 2002 NEC. This change will coordinate with the identification requirements for the grounded conductor in 200.6(B).

A few turns of green tape near the termination of the conductor is adequate, and represents common practice in the field.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-267 Log #2416 NEC-P05 **Final Action: Reject**
(250.119(D) (New))

Submitter: Dan Frohberg, Northeast Community College
Recommendation: Add new text to read:

(D) Where grounding conductors of different systems are installed in the same raceway, cable, box, auxiliary gutter, or other type of enclosure, each grounding conductor shall be identified by system. Identification that distinguishes each system grounding conductor shall be permitted by one of the following means:

(1) One system grounding conductor shall have an outer covering conforming to 250.119

(2) The other grounding conductor of other systems shall have a different outer covering conforming to 250.119

This means of identification shall be permanently posted at each branch circuit panelboard.

Substantiation: We have as a matter of code changes separated grounded conductors of different systems and posted those markings at each panelboard. The requirement for distinguishing grounding conductors should be done to help facilitate the opening of overcurrent devices for those particular systems within a building.

Panel Meeting Action: Reject
Panel Statement: Grounded conductors of different systems need to be clearly identified so the current under normal conditions returns to the proper source, whereas the equipment grounding systems do not require such separation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-268 Log #3170 NEC-P05 **Final Action: Reject**
(250.120)

Submitter: Karl Williamson, Boulder, CO
Recommendation: NEC should specify allowed wiring methods specific for separately run equipment grounding conductors.
Substantiation: 250.130(C) and 250.134(B) Ex. 1 and 2 allow the equipment grounding conductor (EGC) to be run separately from the circuit conductors under certain conditions. But I don't see guidance for the permitted wiring methods for this separately run conductor. 250.120 doesn't really help, except to say that aluminum must be isolated from things like earth, and that if smaller than 6 AWG, the EGC must be protected from physical damage. 250.118 applies only when the EGC is run WITH the circuit conductors, and 250.120(A) only when within some other wiring method. One can infer that an EGC can be a wire from 250.122(A), and it also gives the wires minimum required size. (I am presuming a larger size is not required even though there will be more impedance due to less magnetic field cancellation.) And, from 250.8, a listed means of connecting it must be used. But, I don't see anywhere answers to things like: if a separately run EGC must be continuous, or if it can be spliced (if so how?), how it is to be supported and attached, etc.

Panel Meeting Action: Reject
Panel Statement: The proposal does not meet the requirements set forth in Section 4-3.3 of the NFPA Regulations Governing Committee Projects. There is no proposed revision for the existing text of this section.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-269 Log #2940 NEC-P05 **Final Action: Reject**
(250.120(B))

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Add a new last sentence to existing 250.120(B) as follows:

(B) Aluminum and Copper-Clad Aluminum Conductors. Equipment grounding conductors of bare or insulated aluminum or copper-clad aluminum shall be permitted. Bare conductors shall not come in direct contact with masonry or the earth or where subject to corrosive conditions. Aluminum or copper-clad aluminum conductors shall not be terminated within 450 mm (18 in.) of the earth.

Aluminum conductors shall not be directly buried.

Substantiation: Experience has shown that aluminum conductors fail at a high rate when installed in direct-burial applications. When the conductor insulation has a defect or is damaged by backfill, the aluminum conductor turns to a white powder and opens.

If this happens to energized conductors, there will be some indication of the problem as equipment will not work properly. When this happens to an equipment grounding conductor, the conductor can fail with no indication of an open circuit until the conductor is called upon to carry fault current and it doesn't. This open circuit can result in equipment being at a dangerous voltage above ground.

This issue was recently mentioned to a group of journeyman electricians. One of them volunteered that they make repairs to failed aluminum conductors every week so this is a widespread problem.

Panel Meeting Action: Reject
Panel Statement: Aluminum conductors with insulation suitable for direct burial are listed for that purpose. As with all conductors, care in handling and installation by qualified persons is also required to have a Code compliant installation. Any conductor directly buried with damaged insulation can experience failure under different soil conditions.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

BRENDER, D.: This proposal will enhance safety. Aluminum conductors corrode quickly when exposed to moisture. The failure of an aluminum equipment ground would not normally be noticed until a safety hazard exists. It has been reported that a widespread problem with direct buried aluminum cable exists in the field.

5-270 Log #1183 NEC-P05 **Final Action: Reject**
(250.120(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:

Where not run with the circuit conductors in a raceway, cable, or cable tray e equipment grounding conductors ~~smaller than 6 AWG~~ shall be protected from physical damage ~~by a raceway or cable armor~~ except where run in hollow spaces of ~~walls or partitions~~ a building or structure, or as overhead spans of open conductors .

Substantiation: This section appears intended to apply to separately run equipment grounding conductors, as in 225.1, 250.130(C), 250.134(B) Exceptions No. 1 and 2, and Articles 225, 394 and 398. However, literal wording includes equipment grounding conductors in nonmetallic sheathed cable. Conductors larger than 6 AWG should also be protected from physical damage, which could be by height, location, burial, or other conditions other than raceway or armor. Present literal wording requires a smaller than 6 AWG conductor in a cable tray to be in a raceway or armor. "Walls or partitions" may be inferred as not including ceiling or floor spaces; structures which are not "buildings" should be included.

Panel Meeting Action: Reject
Panel Statement: The suggested changes do not add clarity.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-271 Log #149 NEC-P05 **Final Action: Reject**
(Table 250.122)

Submitter: Victor Timpanaro, Municipal Electrical Inspectors
Recommendation: Revise as follows:

Where necessary to comply with 250.4(A)(5) or (B)(4) (in accordance with Section 250.122(A)).

Substantiation: The language at 250.4(A)(5) or (B)(4) is too broad in language and could, therefore, be interpreted broadly where the reference to these two sections at 250.122 specifically limit its application to a raceway or cable armor used as a EGC.

Panel Meeting Action: Reject
Panel Statement: Table 250.122 only applies to equipment grounding conductors of the wire type. The proposal does not add clarity or improve usability.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-272 Log #1242 NEC-P05 **Final Action: Accept**
(250.122(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence: Where a cable tray , a raceway, or a cable armor...(remainder unchanged).
Substantiation: Edit. 250.118 and 392.7(B) permit cable tray which is not a raceway, as an equipment grounding conductor.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

BRETT, JR., M.: I agree with the other explanations of negative votes.

MELLO, C.: The panel should not accept this change without qualification. Cable tray is suitable as an equipment grounding conductor when Listed (Classified) and when installed with the instructions, hardware and accessories provided or specified by the manufacturer. As worded with this change, cable tray has been made equivalent to raceways where no such listing (Classification) is necessary and may lead to confusion and unsafe installations. At most the panel should Accept in Principle and add the appropriate qualifiers as stated above. Otherwise the panel should reject the proposal since it is incomplete and may allow unsafe installations.

5-273 Log #1666 NEC-P05 **Final Action: Reject**
(250.122(A))

Submitter: James Tente, City of Naperville
Recommendation: Revise text to read as follows:
250.122 Size of Equipment Grounding Conductors.
(A) General. A sole copper, aluminum, or copper clad aluminum equipment grounding conductor of the wire type shall not be smaller than shown in Table 250.122, but shall not be required to be larger than this circuit conductors supplying the equipment. (remainder unchanged)
Substantiation: Where more than one equipment grounding conductor is run with a circuit, for example: a metal raceway as given in 250.118 is supplemental by an additional equipment grounding conductor of the wire type, the wire equipment ground shall not be required to be sized to Table 250.122 since the raceway already provides the minimum equipment grounding conductor.
Panel Meeting Action: Reject
Panel Statement: The panel has established that all equipment grounding conductors including both those required and those that are optionally added shall comply with all the applicable. requirements of the NEC. No technical substantiation was provide that the "additional" equipment grounding conductor could be reduced in size and provide suitable safety as a low impedance path.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-274 Log #3490 NEC-P05 **Final Action: Reject**
(250.122(A))

Submitter: Alan Manche, Square D Co.
Recommendation: Revise NEC 250.122 with the additions (underlined) and deletions (strike through) as shown. The entire text of 250.122(A) is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
250.122 Size of Equipment Grounding Conductors.
(A) General. Copper, aluminum, or copper-clad aluminum equipment grounding conductors of the wire type shall not be smaller than shown in Table 250.122 but shall not be required to be larger than the circuit conductors supplying the equipment. Where the conductor supplying the equipment is smaller than 14 AWG, the equipment grounding conductor shall not be required to be larger than the circuit conductor. Where a raceway or a cable armor or sheath is used as the equipment grounding conductor, as provided in 250.118 and 250.134(A), it shall comply with 250.4(A)(5) or (B)(4).
Substantiation: There are various power limited applications in the NEC (NEC Article 725, 760,,,,) which permits wiring methods with wire sizes smaller than 14 AWG, however there is not a provision in these articles or in NEC article 250 that would permit a power limited cable or circuit to have a grounding conductor smaller that 14 AWG. NEC 250.122(E) is the only permission for smaller grounding conductors when used in flexible cord and with fixture wire. Permission is needed within NEC article 250 in order to address power limit circuits such as Class 3 circuits where the supply conductors are smaller than 14 AWG.
Panel Meeting Action: Reject
Panel Statement: The first sentence in 250.122 provides the relief the submitter is requesting. Section 250.122 states that the equipment grounding conductor shall not be required to be larger than the circuit conductors to the equipment.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
DOBROWSKY, P.: The proposal should be accepted. the smallest conductor in Table 250.122 is a 14 AWG.

5-275 Log #343 NEC-P05 **Final Action: Accept in Principle**
(250.122(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Add text to read as follows:
(B) Increased in Size. Where ungrounded conductors are increased in size, equipment grounding conductors, where installed, shall be increased in size proportionately according to circular mil area of the ungrounded conductors.
Exception: Where conductors are increased in size as a result of ampacity adjustment factors required by 310.15(B)(2)(a), the minimum size equipment grounding conductor shall be not less than the minimum size required by Table 250.122.
Substantiation: Where ampacity correction factors are applied, the conductor is required to be protected at its ampacity after the adjustments, or it can be increased in size. Conductors are often increased in size when ampacity correction factors are necessary rather than reducing the size of the overcurrent protective device. The feeder or branch circuit equipment grounding conductor in these cases is not impacted from a performance standpoint and the Code should not require more than the minimum sizes provided in Table 250.122 in these specific cases.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-276.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-276 Log #345 NEC-P05 **Final Action: Accept**
(250.122(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(B) Increased in Size. Where ungrounded conductors are increased in size for reasons other than application of ampacity adjustments factors, equipment grounding conductors, where installed, shall be increased in size proportionately according to circular mil area of the ungrounded conductors.
Substantiation: Where ampacity correction factors are applied, the conductor is required to be protected at its ampacity after the adjustments, or it can be increased in size. Conductors are often increased in size when ampacity correction factors are necessary rather than reducing the size of the overcurrent protective device. The feeder or branch circuit equipment grounding in these cases is not impacted from a performance standpoint and the Code should not require more than the minimum sizes provided in Table 250.122 in these specific cases.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
BRENDER, D.: This is a major change in the intent and application of the Code without any technical substantiation submitted. The panel should reconsider the sense-of-the-panel vote.
Using Table 310.16 et al, ampacity must be adjusted for ambient temperature. As temperatures rise, resistance of any conductor increases. This increased circuit resistance decreases fault current, and may cause the overcurrent device to open later than planned, or not open at all. There were no calculations or supporting data submitted to show the proposal would represent safe practice.
The submitter is suggesting that Table 250.122 is moot in this circumstance with no justifying reasons shown.
BRETT, JR., M.: I agree with the other explanations of negative votes.

5-277 Log #1263 NEC-P05 **Final Action: Reject**
(250.122(B))

Submitter: Nicholas Alger, Modjeski and Masters Inc.
Recommendation: Modify 250.122(B) as follows:
(B) Ungrounded Conductors Increased in Size. Where ungrounded conductors are increased in size, ~~equipment grounding conductors, where installed, shall be increased in size proportionately according to circular mil area of the ungrounded conductors~~ and equipment grounding conductors are installed, one of the methods described in (1) and (2) of this section shall be utilized.
(1) The equipment grounding conductors shall be increased in size proportionately according to circular mil area of the ungrounded conductors.
(2) Where ground-fault protection is installed, the equipment grounding conductors in a multiconductor cable shall be permitted to be sized in accordance with Table 250.122 on the basis of the trip rating of the ground-fault protection where the following conditions are met:
(1) Conditions of maintenance and supervision ensure that only qualified persons will service the installation.
(2) the ground-fault protection equipment is set to trip at not more than the ampacity of the ungrounded conductor of the cable.
(3) The ground-fault protection is listed for the purpose of protecting the equipment grounding conductor, or is integral to a listed adjustable speed drive.
Substantiation: Increasing the size of an equipment grounding conductor (EGC) as required by 250.122(B) may preclude the use of standard multiconductor cables because such cables are often supplied with EGCs which would be too small to satisfy 250.122(B). This situation is similar to that considered in 250.122(F)(2) where multiconductor cables installed in parallel would require EGCs which are larger than those generally supplied in standard cables. Sizing the EGC in a multiconductor cable based on the ground fault protection trip rating, as allowed for parallel cables by 250.122(F), would permit the use of standard manufactured cables rather than expensive custom cables. The wording at the end of condition (3) regarding ground-fault protection which "is integral to a listed adjustable speed drive" is included here for coordination and consistency with my proposal to add similar language to 250.122(F)(2).

Also note that, as currently written, 250.122(B) and (F) contain a "loop hole". Instead of increasing the size of ungrounded conductors in a cable and being forced to use a custom manufactured cable due to 250.122(B), a clever designer and/or installer may elect to take advantage of 250.122(F) and use standard manufactured cables in parallel. The proposed change effectively does away with this inconsistency between 250.122(B) and (F).
Panel Meeting Action: Reject
Panel Statement: There is no technical substsntiation for how an adjustable speed drive provides protection for the equipment grounding conductor.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-278 Log #1264 NEC-P05 **Final Action: Accept in Principle**
(250.122(B))

Submitter: Nicholas Alger, Modjeski and Masters Inc.
Recommendation: Modify 250.122(B) as follows:
(B) Increased in Size. Where ungrounded conductors are increased in size <u>beyond what is required by this code</u> , equipment grounding conductors, where installed, shall be increased in size proportionately according to circular mil area of the ungrounded conductors.
<u>FPN: The requirements of 250.122(B) do not apply when ungrounded conductors are increased in size to accommodate ampacity correction such as for ambient temperature or number of current-carrying conductors. The requirements of 250.122(B) do apply when ungrounded conductors are increased in size to compensate for voltage drop, to comply with the recommendations of equipment manufacturers, or for similar reasons not considered by this code.</u>
Substantiation: Historically, the requirement to increase the size of an equipment grounding conductor (EGC) proportionately to ungrounded conductors seems to be intended to ensure that ground-fault impedance is kept low enough to facilitate operation of the circuit ground fault protection device(s); the rationale being that if ungrounded conductors are increased to compensate for voltage drop (i.e., to reduce circuit impedance) then the EGC should also be increased to reduce its overall impedance. However, during the 2002 Code revision cycle, the requirement to increase EGCs was expanded to cover cases where the ungrounded conductors are increased for reasons other than voltage drop (see Proposal 5-264 (Log #1750) from the May 2001 Report on Proposals). The stated intent of the submitter was to reduce "abuse and misinterpretation" of the original wording.
Setting aside any debate over whether or not this reasoning represents sufficient substantiation for the change, a strict interpretation of 250.122(B), as currently written, would also require an EGC to be increased in size if the circuit conductors are increased in size due to ampacity correction as required elsewhere in the code, resulting in an unnecessarily large EGC. This was probably not the intent of the submitter of the 2002 change and cannot be substantiated based on the goal of maintaining low ground-fault impedance.
The proposed modification to 250.122(B) and the new fine print note would clarify that it is unnecessary to increase the EGC size where the only reason for increasing the ungrounded conductor size is for ampacity correction, while still requiring an increase in EGC size where the underlying reason for increasing the ungrounded conductors is voltage drop (impedance) or is unknown.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-276.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-279 Log #3141 NEC-P05 **Final Action: Reject**
(250.122(B))

Submitter: Dale Rooney, Municipality of Anchorage
Recommendation: Delete text after "where installed," and add:
shall comply with 1 or 2 below.
(1) For circuits rated 15 or 20 amps the equipment grounding conductor shall be the same size as the ungrounded conductors.
(2) For circuits rated more than 20 amps the equipment grounding conductor shall comply with 250.102(C). Where conductors are paralleled the equipment grounding conductor size shall be based on the equivalent area of the ungrounded conductors.
Substantiation: The current procedure for resizing equipment grounds is unnecessarily complex. Table 250.66 which is referenced by 250.102(C) is intended to maintain a adequate proportion of ungrounded to grounded (or bonding) conductor area and is well understood by the industry. Adopting this change would enhance the usability of the code.
Panel Meeting Action: Reject
Panel Statement: The proposed text does not add clarity.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-280 Log #3253 NEC-P05 **Final Action: Reject**
(250.122(B))

Submitter: Donald Dekker, N. Muskegon, MI
Recommendation: Revise text to read as follows:
...equipment grounding conductors, where installed, shall be increased in size proportionately according to (~~circular mil~~) (<u>the cross sectional</u>) area of the ungrounded conductors.
Substantiation: The NEC is moving towards metric units of measure. Circular mil refers only to English measurements, not metric. If we change to the phrase 'the cross sectional" area it will apply to any unit of measure.
Panel Meeting Action: Reject
Panel Statement: The Code uses kcmil or AWG for sizes of conductors, not cross-sectional area.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
HAMMEL, D.: In this code section the rule uses the term "proportionately". A proportion is a statement, which states that two ratios are equal to each other. In determining a ratio, the final answer does not contain unit identification. The proposal is technically correct.

5-281 Log #585 NEC-P05 **Final Action: Reject**
(250.122(B) Exception (New))

Submitter: Charles N. Landey, Wisconsin Dept. of Transportation
Recommendation: Add exception to 250.122(B) and add FPN to the exception
Exception: Street lighting, traffic signals, and similar outside branch circuits not connected to building wiring, where each pole or standard is equipped with a supplementary grounding electrode that provides effective grounding.
FPN: The effectiveness of supplementary grounding electrodes varies with soil conditions.
Substantiation: The proposal provides for effective equipment grounding at lower cost than the existing requirement. The proposal does not require supplementary grounding electrodes but does waive the requirement for up-sized equipment grounding conductors where the supplementary grounding electrodes are installed. Also, the proposal legalizes what some jurisdictions do and will continue to do anyway.
Panel Meeting Action: Reject
Panel Statement: Supplementary grounding electrodes are not permitted as equipment grounding conductors as indicated in 250.54 and 250.4. The proposed FPN provides no functionality, clarity, or improvement in usability of this section. The earth does not provide an effective ground-fault current path.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-282 Log #1262 NEC-P05 **Final Action: Reject**
(250.122(B) Exception (New))

Submitter: Nicholas Alger, Modjeski and Masters Inc.
Recommendation: Add an exception to 250.122(B) as follows:
Exception: Equipment grounding conductors shall not be required to be increased in size where analysis performed under engineering supervision demonstrates that the impedance of the equipment grounding conductors remains low enough to facilitate overcurrent protective device operation within a time period which prevents damage to either the ungrounded conductors or equipment grounding conductors under line-to-ground fault conditions.
Substantiation: 250.122(B), as currently written, requires an equipment ground conductor (EGC) to be increased in size proportionately to the ungrounded conductors irregardless of the reason for increasing the size of the ungrounded conductors. This provides for a conservative approach to sizing the EGC in cases where a detailed engineering analysis of the grounding system under line-to-ground fault conditions is not performed. However, it also has the undesirable effect of causing an EGC to be increased in size even if an analysis of grounding system performance shows that this increase is unnecessary.
There are many reasons why a circuit designer may elect to increase the size of ungrounded conductors. This change would permit the designer to undertake an appropriate analysis to determine if the EGC should also be increased in size instead of simply increasing it blindly. Stipulating that such an analysis may be performed only under "engineering supervision" will prevent unqualified persons from using this new exception as an excuse for undersizing an EGC. There is already precedent in the code for allowing such analyses in lieu of blind application of a rating or requirement (see 310.15(C)).
Panel Meeting Action: Reject
Panel Statement: The panel concludes that the prescriptive text is correct. See panel action on Proposal 5-276 regarding ampacity adjustments.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

BRETT, JR., M.: I agree with the panel action to reject, however, I believe it is important to note that Table 250.122 is a prescriptive minimum. Engineering software is available to provide designers and installers a means to determine the safe minimum equipment grounding conductor size. Dr. A. P. Sakis Meliopoulos at the Georgia Institute of Technology, Atlanta, GA has performed equipment grounding studies that resulted in the development of a software program (GEMI @2.2b August 2004) which can be downloaded free at www.steelconduit.org.

5-282a Log #CP513 NEC-P05 **Final Action: Accept**
(250.122(C))

Submitter: Code-Making Panel 5,
Recommendation: Proposed text: Revise Section 250.122(C) to read as follows:

(C) Multiple Circuits. Where a single equipment grounding conductor is run with multiple circuits in the same raceway <u>,</u> ~~or~~ cable <u>or cable tray</u> , it shall be sized for the largest overcurrent device protecting conductors in the raceway <u>,</u> ~~or~~ cable <u>or cable tray</u> . <u>Equipment grounding conductors installed in cable trays shall meet the minimum requirements of 392.3(B)(1)(c).</u>

Substantiation: This change, working in conjunction with present language of 300.3(B), will help clarify that a common equipment grounding conductor is permitted to be used within a cable tray. This long established trade practice needs clarification in the Code.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-283 Log #93 NEC-P05 **Final Action: Reject**
(250.122(D))

Submitter: Tom Smith, Fowler, MI
Recommendation: Add new language to the section as follows:

(D) Motor Circuits. <u>The minimum size equipment grounding conductor shall be determined by (1) or (2):</u>

<u>(1) The equipment grounding conductor size shall not be smaller than determined by Table 250.122 based on the rating of the branch circuit short-circuit and ground-fault protective device. The equipment grounding conductor shall not be required to be sized larger than the largest ungrounded motor circuit conductor.</u>

<u>(2)</u> Present language that is in paragraph (D).

Substantiation: Based upon my experience in the field, it is just not clear to electricians and inspectors how to determine the minimum size of equipment grounding conductor for a motor circuit. Frequently, at least a bonding jumper must be installed across a flexible section of raceway that connects to the motor. It is usually omitted or just not sized correctly. The rule needs to be made clear. The present section (D) is titled motor circuits, that leads the reader to believe it applies to motor circuits in general when it only applies to cases where the branch circuit short-circuit and ground-fault protective device is an instantaneous trip circuit breaker or short-circuit protector. This revision preserves the present method in (D) while stating the rule for motor circuits, in general, as I understand the rule.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided that there is a problem with existing wording or how this will improve the Code.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

HAMMEL, D.: Proposals 5-283 and 5-284 merit more consideration. First, Table 250.122 uses the term “Overcurrent Device”. Overcurrent is defined in Article 100 as resulting “from overload, short circuit, or ground fault. In Article 430 “Motor Branch-Circuit Overload Protection” and “Motor Branch-Circuit Short-Circuit and Ground-Fault Protection” is typically achieved through the use of separate devices. A fact not delineated by Table 250.122.
Secondly, a motor overload protection device is not intended or designed for operation at fault current levels and, therefore, should not be used to size an equipment grounding conductor.

5-284 Log #3395 NEC-P05 **Final Action: Reject**
(250.122(D))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete this paragraph.
Substantiation: The present wording allows the highest rated overcurrent devices to have the smallest equipment grounding conductors, since ITCBs can have grounding conductors sized by entering Table 250.122 at 125% (typically) of motor current, but the grounding conductors with conventional overcurrent protection enter the table sized at 175% or 250% of motor current. Remember that the basic function of Table 250.122 is to provide suitable equipment grounding conductors under ground-fault conditions, and the protective device ratings used to enter Table 250.122 on motor circuits are in part ground-fault protective devices. CMP 5 rejected this in the comment stage in the 2005 cycle, stating that there was no substantiation provided to prohibit reductions in grounding conductors sizes for motor circuits using fuses or inverse-time circuit breakers. That statement is both true and beside the point, since the paragraph proposed for deletion only applies to instantaneous-trip circuit breakers; the sizing of grounding conductors on other circuits is unaffected.

Please refer to Proposal 5-297 and comment 5-215 in the 1999 cycle for more information. Please review in particular the exhaustive explanation of negative vote offered by Mr. Rappaport in support of this effort, as follows:

“RAPPAPORT: When this paragraph was originally proposed for the 1993 NEC, the Panel assumed that a 100 ampere ITCB (instantaneous trip circuit breaker) that will trip at 1200 percent of rating was, in fact, a 1200 ampere overcurrent device. Thus, for a 25 horsepower three phase motor at 208 volts, Table 250-95 would (according to CMP 5) require a #3/0 copper equipment grounding conductor instead of a #6 which would be required with short circuit protection rated at 175 percent of the motor full load current Exception No. 2 of Section 250-95 would have limited the equipment grounding conductor to a #2 copper.

“Application of paragraph 5 now permits a #8 copper equipment ground which is smaller than that required using normal fuse or circuit breaker short circuit protection. The intent of Table 250-95 is to provide a sufficiently low impedance for ground fault current so as to permit an overcurrent device to operate and clear the fault The use of a #8 instead of a #6 will limit the fault current and, if the fault is an arcing fault to ground, may not provide sufficient fault current to operate the 1TCB. The use of a #8 in this case is less than the minimum size presently required for the same motor with different short circuit protection and there has never been any substantiation that the deviation is safe. If this exception applies for ITCB, why should it not apply for fuses and inverse time circuit breakers?

“A review of manufacturer’s catalog information for ITCBs indicates that they are, in fact, rated in nominal amperes with an additional rating of “adjustable trip range”. Thus an ITCB <u>rated</u> for 100 amperes can be obtained with an adjustable trip range of 150 to 580 amperes (150 to 580 percent or 300 to 1100 amperes (300 to 1100 percent). The CMP should recognize that motor overloads are not intended or designed for operation at fault current levels and are only intended for protection against persistent overcurrent for a sufficient length of time to protect equipment from dangerous overheating.

“This fifth paragraph should be deleted as proposed in order to insure that adequate fault current will flow during a fault. The panel statement is without foundation and technical basis. Adequate technical substantiation has been provided by the submitter in Proposal 5-297.”

If this paragraph is deleted, motor circuits using instantaneous-trip circuit breakers would still have permission to use 250.122(A) which limits the required upward sizing of grounding conductors to the size of the circuit conductors. The result would be that they would have grounding conductors comparably sized to those with other motor circuits. In fact, even before the 1993 NEC, it was never required to size grounding conductors based on the full ITCB current rating, and it will not be so in the future if this proposal is accepted.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that deleting this will cause confusion in the industry. This section is necessary for sizing equipment grounding conductors for instantaneous trip circuit breakers and motor short circuit protectors.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

HAMMEL, D.: See my explanation of negative vote on Proposal 5-283.

RAPPAPORT, E.: The submitter’s substantiation has merits. It very correctly points out errors and inconsistency in sizing equipment grounding conductor for motor circuits as stipulated in 250.122(D).

The submitter is correct that the highest rated overcurrent device, Instantaneous Trip Circuit Breakers (ITCB), results in the smallest size equipment grounding conductors in some cases. The EGC sized based on motor overload (125 percent of motor full load current) is less than the UL sizing of EGC contained in multi conductor cables.

Further, it is technically not defensible to refer to Overload for sizing of EGC. EGC is only in the circuit during ground fault or short circuit conditions. An Overload in the motor circuit is not expected to operate during short circuit and is not rated to interrupt fault currents. In Article 100 - Definitions, Overload is a condition described as “Operation of equipment in excess of rated normal full load rating, or of a conductor in excess of rated ampacity when it persists for a <u>sufficient length of time</u> .” The definition further sites, “ <u>A fault such as a short circuit or ground fault, is not an overload</u> ”.

The standard EGC contained in UL listed cables appears to be consistent with an EGC sizing based on Time delay fuses sized at 175 percent of motor full load currents. (A spreadsheet has been provided that displays this comparison for motor sizes from 5 horsepower to 150 horsepower and for UL listed cables from 14 AWG through 4/0 AWG.)

The spreadsheet shows the EGC sized based upon 125 percent (overload), 175 percent (short circuit fuses), 250 percent short circuit inverse time breaker, and 1300 percent ITCB (instantaneous trip breaker) of full load current compared with UL sizing of EGC in cables. Using 175 percent TD fuses provides sizes consistent with EGC contained in UL listed cables.

A better approach would to be amend 250.122(D) to indicate that "For motor circuits, the equipment grounding conductor shall be based on Time delay fuse sized at 175 percent of motor full load current as shown in Table 250.122." This will harmonize with EGC provided in UL listed cables, consistency with Table 250.122, and provide clear sizing guidelines to users and consistent sizing of EGC for motor applications.

Note: Supporting material is available for review at NFPA Headquarters.

5-285 Log #3550 NEC-P05 **Final Action: Reject**
(250.122(F)(1))

Submitter: Larry Watkins, Alcan Cable
Recommendation: Revise as follows:
(1)...with Table 250.122 <u>but shall not be required to be larger than the circuit conductors supplying the equipment.</u>
Substantiation: Clarification. 250.122(A) applies to conductors not required to be larger than circuit conductors supplying equipment.
Panel Meeting Action: Reject
Panel Statement: The proposal lessens the current requirements of the Code without technical or practical substantiation. Conductors in parallel could be small and protected by large overcurrent devices.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-286 Log #1261 NEC-P05 **Final Action: Reject**
(250.122(F)(2))

Submitter: Nicholas Alger, Modjeski and Masters Inc.
Recommendation: Modify condition (3) of 250.122(F)(2) as follows:
(3) The ground-fault protection is listed for the purpose of protecting the equipment grounding conductor <u>, or is integral to a listed adjustable speed drive</u> .
Substantiation: Because most modern adjustable speed drives employ solid-state power conversion, the load side of such drives behave as separately derived systems and ground fault protection equipment installed on the line side of such drives will not operate during ground faults on their load side. Consequently, the third condition of 250.122(F)(2), as currently written, would not be satisfied which may preclude the installation of standard multiconductor cables in parallel on the load side of adjustable speed drives. However, most such drives also include integral load side ground fault protection which will protect the load side circuit and equipment grounding conductors. This proposed change would allow such integral ground fault protection to satisfy condition (3) of 250.122(F)(2), provided that the adjustable speed drive is listed, and therefore allow standard multiconductor cables to be installed in parallel on the load side of adjustable speed drives.
Panel Meeting Action: Reject
Panel Statement: There is no listing or product standards submitted for technical substantiation. There has been no product information introduced to support this application.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-287 Log #3491 NEC-P05 **Final Action: Accept**
(250.122(F)(2))

Submitter: Alan Manche, Square D Co.
Recommendation: Delete NEC 250.122(F) (2)
~~**(2) Ground-Fault Protection of Equipment Installed.** Where ground-fault protection of equipment is installed, each parallel equipment grounding conductor in a multiconductor cable shall be permitted to be sized in accordance with Table 250.122 on the basis of the trip rating of the ground-fault protection where the following conditions are met:~~
~~(1) Conditions of maintenance and supervision ensure that only qualified persons will service the installation.~~
~~(2) The ground-fault protection equipment is set to trip at not more than the ampacity of a single ungrounded conductor of one of the cables in parallel.~~
~~(3) The ground-fault protection is listed for the purpose of protecting the equipment grounding conductor.~~
Substantiation: This section of the NEC was introduced into the NEC as a concept by placing a listing requirement on the ground-fault protection equipment with the expectations that a product would be listed for this application. After a number of code cycles in the NEC, this section is simply creating confusion among the electrical community. I receive a number of phone calls asking how to apply this section. There is no listing requirement and there is no product standard with listing requirements for this application and there has been no product introduced to support this application. Therefore, it is only prudent to delete this requirement from the NEC to eliminate the unnecessary potential for misapplication which is present in the NEC by this permission remaining in the NEC.
Panel Meeting Action: Accept
Editorially remove last sentence of Section 250.122(F).
Editorially remove (1) from existing paragraph (1).
Delete bold face title of Section 250.122(F)(1)
Panel Statement: Editorial corrections were made.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-288 Log #3569 NEC-P05 **Final Action: Reject**
(250.122(H) (New))

Submitter: Fred W. Brown, HI Electron
Recommendation: Add a new 250.122 (H) as follows:
(H) Isolated equipment ground conductor. An isolated equipment grounding conductor shall be sized by 250.122(H)(1), 250.122(H)(2) and 250.122(H)(3).
(1) An isolated equipment grounding conductor run with the derived phase conductors from the source of a separately derived system to the first disconnecting means, shall be sized in accordance with 250.102(C) and based on the size of the derived phase conductors.
(2) An isolated equipment grounding conductor run with feeder conductors shall not be smaller than shown in Table 250.122 based on the rating of the overcurrent device ahead of the feeder but shall not be required to be larger than the feeder conductors.
(3) An isolated equipment grounding conductor run with branch circuit conductors shall not be smaller than shown in Table 250.122 based on the rating of the overcurrent device ahead of the feeder but shall not be required to be larger than the branch circuit conductors.
Substantiation: There needs to be a method to size isolated equipment grounding conductors in the code. The proper installation of these types of equipment grounding conductors (bonding conductors) has been wrongly applied without guidance as to the proper way to size them. I have seen a No. 12 AWG copper isolated equipment grounding conductor installed with 4/0 AWG copper derived phase conductors from the source of a separately derived system to the first disconnecting means. The derived phase conductors were installed by 240.21(C)(2), Transformer Secondary Conductor tap rule. The separately derived system was a 75 KVA, 120/208 volt, three-phase, four wire system. The system bonding jumper and grounding electrode conductor point of attachment was located at the transformer secondary conductor terminals. The electrician was under the impression that the No. 12 AWG was appropriate since it was being used for multiple branch circuits with 20 ampere overcurrent protection devices. This type of installation poses a large safety issue.
Panel Meeting Action: Reject
Panel Statement: The proposal introduces mandatory requirements that exceed the minimum requirements of the NEC regarding design considerations for isolated grounding conductors without technical substantiation of a problem in the field. Section 250.146(D) and 408.40 Exception allow for a branch circuit conductor to be run through one or more panelboards so as to terminate at the applicable service or derived system. If only one circuit is involved in this provision, that is generally part of a design consideration, installers should not have to install an equipment grounding conductor with the feeder or secondary conductors of a separately derived system that is in excess of minimum requirements. This is a design concern expressed by the submitter in this proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-289 Log #982 NEC-P05 **Final Action: Reject**
(250.130(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add text to read as follows:
Branch circuit extensions shall be permitted to be supplied through a ground-fault circuit-interrupter where the supplied outlets are marked in accordance with 406.3(D)(3)(c).
Substantiation: The provisions of 406.3(D) should be suitable for extensions that do not supply receptacles.
Panel Meeting Action: Reject
Panel Statement: The revised wording will not add clarity to the code. Section 406.3(D)(3)(c) address the condition where no equipment grounding conductor exits. Section 250.130(C) address the connection where there is an equipment grounding conductor installed. The requirements for ground-fault circuit-interrupters are covered in both Articles 210 and 406.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-290 Log #3580 NEC-P05 **Final Action: Reject**
(250.130(C)(6))

Submitter: Randy Marsh, City of Hillsboro
Recommendation: Add new text to read:
(6) For ungrounded circuit extensions, and no accessible point of attachment to grounding electrode is available, the use of a ground fault circuit breaker or ground-fault circuit-interrupting type of receptacle shall be permitted. The equipment grounding conductor shall not be connected to any outlet, fixture, switch or device. The equipment grounding conductor, if present, must be insulated by appropriate means.

Substantiation: Working in older homes poses unique challenges. One of which is the grounding issue. The following is an example of an installation that would benefit from this proposal. In a finished second floor, the hallway has insufficient lighting. To add a remodel recessed fixture to the existing wiring would require an equipment grounding conductor to be connected to the electrode system. This would cause more wall repair to allow access for the installation of this conductor. In some cases the metallic water piping is being replaced with plastic. This adds further difficuly to locating a suitable grounding electrode. The use of a breaker of the entire circuit provides the necessary protection as a ground-fault circuit-interrupting type of receptacle does in 406.3(D)(3) for circuit extensions. The use of this type of breaker also affords protection to the rest of the nongrounded circuit. Just installing a connection from the new wiring to the grounding electrode system, only gives protection for the portion of the circuit connected to new wiring.

Panel Meeting Action: Reject

Panel Statement: The revised wording will not add clarity to the code. Section 406.3(D)(3)(c) address the condition where no equipment grounding conductor exits. Section 250.130(C) address the connection where there is an equipment grounding conductor installed. The requirements for ground-fault circuit-interrupters are covered in both Articles 210 and 406.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-291 Log #2397 NEC-P05 **Final Action: Reject**

(250.134)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise text to read:

250.134 Equipment Fastened in Place or Connected by Permanent Wiring Methods (Fixed) - Grounding. Unless grounded by connection to the grounded circuit conductor as permitted by ~~250.32,~~ 250.140, and 250.142, non-current-carrying metal parts of equipment, raceways, and other enclosures, if grounded, shall be grounded by one of the following methods.

(A) Remain unchanged.

(B) Remain unchanged.

Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 5-119.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-292 Log #2082 NEC-P05 **Final Action: Reject**

(250.134(B) Exception No. 2)

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Delete Exception No. 2

~~Exception No. 2: For DC circuits, the equipment grounding conductor shall be permitted to be run separately from the circuit conductors.~~

Substantiation: When this exception was added to the *Code* , the drafters correctly realized that pure direct currents do not have any oscillatory tendencies as do ac currents that would cause transformer-like heating in metal when the equipment-grounding conductor is separated from the circuit conductors. They likewise realized that there is no frequency-dependent impedance factor associated with dc currents that might cause higher than desired reactance in the dc circuits, which could prevent the operation of overcurrent devices.

However, with the resurgence of dc power systems (renewable energy systems, fuel cells, uninterruptible power systems, and various industrial processes), this exception needs to be reconsidered. *IEEE/ANSI Standard 1375, Guide for the Protection of Stationary Battery Systems* provides an excellent tutorial on the issues associated with using overcurrent devices in dc circuits. One of the many issues that this standard points out is the difficulty in getting proper overcurrent device operation as the circuit time constant goes above 10 milliseconds (the time-constant limit of testing in UL Standards 198 and 489). The Guide points out that fuses and circuit breakers may not operate properly when inductance in the circuit results in a time constant exceeding 10 milliseconds. Calculations shown in the IEEE Standard indicate that the normal circuit inductance in many dc systems results in time constants between 5 and 10 milliseconds. It wouldn't take much additional spacing between the equipment-grounding conductor and the circuit conductors to increase the fault-circuit time constant to greater than 10 milliseconds. If Exception number 2 in 250.134(B) is followed, the routing of the equipment-grounding conductor away from the circuit conductors may allow the time constant under ground-fault conditions to exceed 10 milliseconds. These longer time constants, under ground-fault conditions, could prevent the dc overcurrent devices from functioning properly.

A second issue is that many dc currents are not pure. Any single-phase dc-to-ac power inverter will have a 120 Hz sine wave imposed on the dc current that may have a RMS value greater than the average dc current value. In a similar manner, battery chargers that rectify the ac line to get dc to charge batteries will have 120 Hz ripple currents. Under fault conditions, these dc ripple currents act just like ac currents in that they may cause metal heating if the two (or three) circuit conductors are not routed together. Excess separation leading to increased inductance will also lead to increased impedance in the fault circuit and may not allow overcurrent devices to function properly. The impedance is a function of the frequency, and at 120 Hz the increased impedance will be higher than at 60 Hz. This is another reason why Exception 2 to 250.134(B) should be deleted.

Panel Meeting Action: Reject

Panel Statement: Dc systems with significant ripple are not generally considered dc systems. The product standards limit the ripple peak to peak not exceeding 10% of the average value. As for conductor separation, IEEE 1375 states "... long time constant in excess of level used in UL testing are unlikely for stationary battey systems." The presence of large motors, coils, crane rails, etc. may produce time constants used in UL testing." Determination of proper spacing between dc conductors is an engineering decision.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-293 Log #2398 NEC-P05 **Final Action: Reject**

(250.142)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise text to read:

250.142 Use of Grounded Circuit Conductor for Grounding Equipment.

(A) Supply-Side Equipment. A grounded circuit conductor shall be permitted to ground non-current-carrying metal parts of equipment, raceways, and other enclosures at any of the following locations:

(1) On the supply side or within the enclosure of the ac service-disconnecting means

~~(2) On the supply side or within the enclosure of the main disconnecting means for separate buildings as provided in 250.32(B).~~

~~(3)~~ (2) On the supply side or within the enclosure of the main disconnecting means or overcurrent devices of a separately derived system where permitted by 250.30(A)(1)

(B) Load-Side Equipment. Except as permitted in 250.30(A)(1) ~~and 250.32(B)~~ , a grounded circuit conductor shall not be used for grounding non-current-carrying metal parts of equipment on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means or the overcurrent devices for a separately derived system not having a main disconnecting means.

Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 5-119.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-294 Log #3351 NEC-P05 **Final Action: Accept**

(250.142(B) Exception No. 2)

Submitter: Paul Dobrowsky, Holley, NY

Recommendation: Revise as follows:

Exception No. 2: It shall be permissible to ground meter enclosures by connection to the grounded circuit conductor on the load side of the service disconnect where all of the following conditions apply:

(1) No service ground-fault protection is installed.

(2) All meter ~~socket~~ enclosures are located immediately adjacent to the service disconnecting means.

(3) The size of the grounded circuit conductor is not smaller than the size specified in Table 250.122 for equipment grounding conductors.

Exception No. 3: Direct-current systems shall be permitted to be grounded on the load side of the disconnecting means or overcurrent device in accordance with 250.164.

Substantiation: The word "socket" should be deleted so this section can be appiedy to CT cabinets also.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-294a Log #CP511 NEC-P05 **Final Action: Accept**

(250.144)

Submitter: Code-Making Panel 5,

Recommendation: 250.144 Multiple Circuit Connections. Where equipment is ~~required to be~~ grounded and is supplied by separate connection to more than one circuit or grounded premises wiring system, a n ~~means for grounding~~ equipment grounding conductor termination shall be provided for each such connection as specified in 250.134 and 250.138.

Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC.

"Termination" was added for clarity and to retain the original intent of this section. This Proposal includes the action in Proposal 5-295.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-295 Log #1236 NEC-P05 **Final Action: Accept**
(250.144)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "required to be".
Substantiation: Edit. Where equipment is grounded by choice the rule should apply. 250.1 indicates Article 250 applies where grounding is "permitted". 90.1 states the purpose of the Code, which should apply to required or permitted provisions, such as 250.4(A)(1) which is not limited to required grounding.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

(Note: Sequence 5-296 was not used)

5-297 Log #628 NEC-P05 **Final Action: Accept**
(250.146)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
250.146 Connecting Receptacle Grounding Terminal to Box. An equipment bonding jumper shall be used to connect the grounding terminal of a grounding-type receptacle to a grounded box unless grounded as in 250.146(A) thru (D). <u>The equipment bonding jumper shall be sized in accordance with Table 250.122 based on the rating of the overcurrent device protecting the circuit conductors.</u>
Substantiation: This proposal is an effort to provide users with ready sizing information for the equipment bonding jumpers addressed in this section at outlet and junction boxes. It is understood that equipment bonding jumper sizing rules in 250.102(D) can be used and applied to this installation. There continues to be many inspected installations where the equipment bonding jumper is smaller than the branch circuit conductors (14 AWG for 20 ampere circuit for example). Having the sizing requirement within the rule that requires the bonding jumper adds usability. See exhibit 314.3 in the NEC Handbook (2005) where the equipment bonding jumper size could be an issue if it is not 12 AWG. In this two-gang box it appears like a 20-ampere circuit for the receptacle and a 15-ampere circuit for the switch, but this information is not provided. However, if this is the case, the equipment bonding jumper should be a AWG copper to the box from the wire connector. It appears that the bare 14 AWG conductor is wrapped around the grounding screw and then routed to the wire connector (wire nut). It is pretty common to see this in the field as well.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-298 Log #387 NEC-P05 **Final Action: Reject**
(250.146(A))

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Revise text to read as follows:
At least one of the ~~insulating~~ <u>retaining washers for the installation screws</u> shall be removed from receptacles that do not have a contact yoke or device that complies with 250.146(B) to ensure direct metal-to-metal contact.
Substantiation: The purpose of the washer is for retaining the screw during shipping, not insulating the receptacle. Even though the washer may have insulating properties, it is not intended to serve as an insulating medium between the receptacle and box. Calling it an insulating washer is not accurate and may create confusion. This change will provide clarity. Supporting material is a letter from Leviton Mfg. Technical Support stating this fact.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel concludes that only insulsated washers must be removed from surface mounted non self grounding receptacles. If a manufacturer chooses to make one of the washers from conductive metal, it does not have to be removed.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-299 Log #2247 NEC-P05 **Final Action: Reject**
(250.146(A))

Submitter: Joseph Penachio, Joe Penachio Electrician
Recommendation: Revise as follows:
(A) Surface Mounted Box. Where the box is mounted on the surface, direct metal-to-metal contact between the device yoke and the box, <u>or device extension, raised cover that is secured to the box with a minimum two 8/32 in. screws and is in direct metal-to-metal contact to the box and complies with 406.4(C)</u> , or a contact yoke or device that complies with 250.146(B) shall be permitted to ground the receptacle to the box. At least one of the insulating washers shall be removed from receptacles that do not have a contact yoke or device that complies with 250.146(B) to ensure direct metal-to-metal contact. ~~This provision shall not apply to cover mounted receptacles unless the box and cover combination are listed as providing satisfactory ground continuity between the box and the receptacle.~~
Substantiation: A 4 in. square blank cover is not required to have a bonding jumper installed to ground it to the box because it is considered effectively grounded by being secured by two screws and having metal to metal contact between the box and the cover. In fact, there is more yoke contact to a raised cover than there is from a yoke to a handy box which is allowed as metal to metal contact. Being secured by two 8/32 in. and complying with 406.4(C) makes the device electrically and mechanically secure. Removing the cover with the receptacle on it does not pose any more danger to a qualified person than if a jumper were installed.
Panel Meeting Action: Reject
Panel Statement: The proposal does not add clarity or improve usability of this section. The concerns of the submitter are addressed in the last sentence of this provision in 250.146(A) which addresses cover-mounted receptacles.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-300 Log #2484 NEC-P05 **Final Action: Accept**
(250.146(A))

Submitter: William Slater, South Bend, IN
Recommendation: Add additional text at the end of NEC 250.146(A) stating:
A listed exposed work cover shall be permitted to be the grounding and bonding means when (1) the device is attached to the cover with at least two fasteners that are permanent (such as a rivet) or have a thread locking or screw locking mans and (2) when the cover mounting holes are located on a flat non-raised portion of the cover (aka crushed corner cover).
Substantiation: (1) The present article applies only to receptacles of the grounding type. It does not apply to any other device nor to non-grounded (two wire) receptacles. (2) Exposed work covers are now required to have two fasteners to attach the receptacle to the cover in order to be listed. This has been found to be an acceptable grounding and bonding means. (3) Other covers such as mud rings are approved for grounding and bonding. The crushed corner exposed work covers attach to the box using the exact same screws as the mud rings. (4) The cover-mounting hole of the exposed work cover provides better electrical contact to the screw than the slots of the raised covers. (5) A ground wire from the receptacle to the box does not provide any shock protection when the cover is off and the power is on. It is not a GFCI. If you touch an exposed live wire or the brass screw of the receptacle, you will still be shocked with or without the ground wire. (6) To protect against shock from the cover becoming live using the prescribed ground wire requires the assumption there is an adequate bonding connection between the cover and device. The very thing that was assumed inadequate by the article in the first place. If it is not adequate, then the ground wire connection is also not adequate. You can't have it both ways. (7) If shock protection with the cover off and the power on is a concern why is it applied only to receptacles of the grounding type and no other device?
Panel Meeting Action: Accept
Panel Statement: Editorially correct "mans" to "means" in the recommendation. Editorially remove the statement (aka crushed corner cover).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
STEINMAN, G.: Under present NEC 250.146, a cover-mounted receptacle is required to be connected to ground by a jumper wire unless per 250.146(A) the box/cover combination is specifically Listed as insuring box/receptacle grounding continuity.
Grounding integrity to the receptacle's grounding contact is established by the quality of screw-fastening assembly at BOTH the cover-mounting AND the receptacle-mounting. Loosening of either on existing covers (i.e., those NOT specifically Listed as insuring box/receptacle grounding continuity) defeats grounding integrity. It is reasonable to expect that box-mounting screws might be later loosened for access and not fully re-torqued. Casual contact of the screw shank with the cover resulting from incomplete retightening of the cover-mounting screws might reestablish bonding of the cover but does not insure adequate grounding of the receptacle's grounding contact.
I disagree with the substantiation that GFCIs are not addressed; receptacle-type GFCIs are still receptacles. Switches and dimmers on branch circuits must be bonded; they are not grounded as they have no grounding contact nor do they convey grounding to connected equipment.
TOOMER, R.: The proposed additional language is unnecessary and does not add clarity. The last sentence of 250.146(A) already permits the type of installation described.

5-301 Log #3512 NEC-P05 **Final Action: Accept in Principle**
(250.146(A))

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Add the following sentence to 250.146(A).
<u>A listed surface mounted box shall be permitted as providing the continuity without an equipment bonding jumper if a listed exposed work cover is used to complete the enclosure.</u>

Substantiation: There has been a change in the product standard for these products. Receptacles must now be attached to exposed work covers with two screws in order to be listed. The nuts and machine screws required to do this must be supplied with the cover.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action and substantiation on Proposal 5-300.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
TOOMER, R.: The proposed additional language is unnecessary and does not add clarity. The last sentence of 250.146(A) already permits the type of installation described.

5-301a Log #CP514 NEC-P05 **Final Action: Accept**
(250.146(D))

Submitter: Code-Making Panel 5,
Recommendation: 250.146 (D) Isolated Receptacles. Where installed ~~required~~ for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. The receptacle grounding terminal shall be ~~grounded~~ connected ~~by~~ to an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor shall be permitted to pass through one or more panelboards, boxes, wireways, or other enclosures without a connection to the panelboard grounding terminal bar as permitted in 408.40, Exception, so as to terminate within the same building or structure directly at an equipment grounding conductor terminal of the applicable derived system or service.
FPN: Use of an isolated equipment grounding conductor does not relieve the requirement for grounding the raceway system and outlet box
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. Correlated with Panel action on Proposals 5-302 and 5-303.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-302 Log #438 NEC-P05 **Final Action: Accept in Principle**
(250.146(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(D) Isolated Receptacles. Where required for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. The receptacle grounding terminal shall be grounded by an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor shall be permitted to pass through one or more panelboards, boxes, wireways, or other enclosures without a grounding connection or without a connection to the panelboard grounding terminal bar as permitted in 408.40, Exception, so as to terminate within the same building or structure directly at an equipment grounding conductor terminal of the applicable derived system or service.
Substantiation: Isolated, insulated equipment grounding conductors installed in accordance with 250.146(D) and 408.40 Exception, not only have to pass through one or more panelboards to get to the point of grounding for the applicable service or separately derived system, but they generally also pass through outlet boxes, junction and pull boxes, wireways, etc. without connection to ground in those items so the conductor remains an isolated insulated equipment grounding conductor. No companion proposal has been submitted for Section 408.40 Exception since that section deals with just the panelboards.
Panel Meeting Action: Accept in Principle
Revise text to read as follows:
(D) Isolated Receptacles. Where ~~required~~ installed for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. The receptacle grounding terminal shall be grounded by an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor shall be permitted to pass through one or more panelboards, boxes, wireways, or other enclosures ~~without connection~~ without a connection to the panelboard grounding terminal bar as permitted in 408.40, Exception, so as to terminate within the same building or structure directly at an equipment grounding conductor terminal of the applicable derived system or service.
Panel Statement: These actions meet the intent of the submitter. The word "required" was changed to "installed" based on the recommendation and substantiation from Proposal 5-303.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
TOOMER, R.: The language as proposed does not address connections in boxes, wireways or other enclosures which the grounding conductor passes through since there is not a panelboard terminal bar located therein. The proposer had covered this by stating "...without a grounding connection or without a connection to the panelboard terminal bar...". That portion of the language, as originally proposed, should be restored to the change.

5-303 Log #1337 NEC-P05 **Final Action: Accept in Principle**
(250.146(D))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Replace "required" with "installed"
D) Isolated Receptacles. Where ~~required~~ installed for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. The receptacle grounding terminal shall be grounded by an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor shall be permitted to pass through one or more panelboards without connection to the panelboard grounding terminal as permitted in 408.40, Exception, so as to terminate within the same building or structure directly at an equipment grounding conductor terminal of the applicable derived system or service.
Substantiation: Generally speaking, isolated ground circuits are not required to be installed. When they are installed it is because of a designer's inclination, not a *Code* or manufacturer's requirement. This section should be changed to reflect this.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-302 and it meets the intent of the submitter.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-304 Log #1995 NEC-P05 **Final Action: Reject**
(250.146(D))

Submitter: Robert Schuerger, EYP Mission Critical Facilities, Inc.
Recommendation: Revise as follows:
250.146(D) ~~Isolated~~ Insulated Grounding Receptacles . Where required for the reduction...
FPN: Use of an ~~isolated~~ insulated equipment grounding conductor does not relieve the requirement for grounding the raceway system and outlet box.
Substantiation: The use of the term "isolated" has caused confusion which has led to improper and unsafe installations in which a separate grounding electrode and grounding system is installed isolated from the rest of the grounding system of the building. Since the separate grounding system is not properly bonded to the grounding system of the building, a hazardous voltage can be developed between the two grounding systems by an electrical fault or lightning strike.
There have been many cases of this type of installation in the past, with data procession equipment, machine tools and other sensitive electronic equipment. The 2005 edition of IEEE Standard 1100, Recommended Practice for Powering and Grounding Electronic Equipment has "insulated ground receptacle" as the recommended terminology and has recommended the "isolated ground" and "isolated ground receptacle" be avoided.
Panel Meeting Action: Reject
Panel Statement: The current wording has been used in the NEC for many years. The term "insulated equipment grounding conductor" is not technically correct. An insulated equipment grounding conductor can be used whether or not the receptacle is of the isolated equipment grounding type. The revised wording will not add clarity to the code. See Proposal 5-222.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
DOBROWSKY, P.: See my comment on proposal 5-222.
MELLO, C.: See my ballot comments on proposal 5-222. The panel should consider using the term "dedicated equipment grounding conductor" in the fine print note.

5-305 Log #2491 NEC-P05 **Final Action: Reject**
(250.146(D))

Submitter: Lanny G. McMahill, Phoenix, AZ
Recommendation: Revise text to read as follows:
(D) Isolated Receptacles. Where required for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. The receptacle grounding terminal shall be grounded by an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor shall ~~be permitted to pass through one or more panelboards without connection to the panelboard grounding terminal as permitted in 408.40, Exception, so as to~~ terminate within the same building or structure directly at an equipment grounding conductor terminal on the load side of the applicable derived system or service.
Substantiation: This proposal is intended to clarify the requirement and condense the language. As currently worded, the insulated equipment grounding conductor must be routed back to the applicable derived system or source. This seems overly restrictive. Where the insulated equipment grounding

conductor terminates should be a design consideration - especially when considering that it is required to terminate on the load side of the source or system. For example, the source could be 300 ft away from the receptacle. A designer may wish to provide the isolate equipment grounding terminal in a panelboard located within 50 ft of the receptacle. Why prohibit this or for that matter what is the safety concern? In addition, requiring the conductor to be routed all the way back to the source or system could be in conflict with the requirements for an "effective ground-fault current path." The code should not mandate on the load side of the source or system where this conductor must terminate as it has nothing to do with electrical safety. Whether the conductor terminates directly at the source or somewhere downstream should be a design consideration. In addition, the reference to 408.40, Exception is unnecessary, as it is only applicable to panelboards; "pass through one or more panelboards..." is unnecessary too as the conductor may need to pass through equipment, such as a junction or device box.

Panel Meeting Action: Reject

Panel Statement: Isolated ground circuits are not required to be installed. The use of the term permitted allows the isolated grounding conductor to be terminated in any panelboard in which the circuit is routed. See panel action and statement on Proposal 5-302.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-306 Log #475 NEC-P05 **Final Action: Reject**

(250.148)

Submitter: Ernest Harju, MJ Electric

Recommendation: Revise text to read:

A metal enclosure or box installed with a nonconductive raceway on a nonconductive surface shall be bonded to the equipment grounding conductor.

Substantiation: This section gives the impression that an equipment grounding conductor is in, all instances, not required to be bonded to the metal box if the wire is not broken in the box. When say 4 in. PVC is used with a metal box the box is left floating. Thus can become hot!

Panel Meeting Action: Reject

Panel Statement: The proposed revision does not add clarity or improve usability to this section. The concerns of the submitter are already addressed in the requirements contained in Sections 250.148 and 250.148(C).

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-307 Log #1077 NEC-P05 **Final Action: Reject**

(250.148)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

CONTINUITY and ATTACHMENT of EQUIPMENT GROUNDING <u>and BONDING CONDUCTORS</u> to <u>ENCLOSURES</u> ~~BOXES~~ . ~~Where circuit conductors are spliced within a box or terminated on equipment within or supported by a box, any~~ <u>Wire-type</u> equipment grounding or bonding conductors ~~associated with those circuit conductors shall be spliced or joined within the box or to the box~~ <u>entering metal enclosures other than conduit bodies shall be attached to the enclosure</u> . ~~With devices suitable for the use in accordance with 250.148(A) through (E).~~

Exception; no change.

(A) CONNECTIONS . Connections ~~and splices~~ shall be in accordance with <u>250.8</u> . ~~110.14(B) except that insulation shall not be required.~~

(B) GROUNDING <u>and BONDING</u> CONTINUITY . The arrangement of grounding <u>and bonding</u> connections shall be such that the disconnection or removal of ~~a receptacle, luminaire (fixture), or other device fed from the box~~ <u>any equipment supported by or supplied from the enclosure</u> does not interfere with or interrupt the grounding <u>or bonding</u> continuity.

Delete present (C) change present (D) to (C) and revise:

(C) NONMETALLIC ENCLOSURES BOXES . One or more equipment grounding or bonding conductors ~~brought into~~ <u>entering</u> a nonmetallic ~~outlet box~~ <u>enclosure</u> shall be arranged such that a connection can be made to any ~~fitting or device~~ <u>equipment</u> in ~~that box~~ or supplied from the <u>enclosure</u> ~~requiring grounding~~ <u>that is to be grounded or bonded</u> .

Delete (E).

Substantiation: Edit. Enclosures other than "boxes" should be included. Reference to circuit conductors is superfluous and irrelevant and limits the requirements to where circuit conductors are spliced or terminated on equipment within or supported by a box but not where conductors run through without a splice. Wire type grounding and bonding conductors should be specified, as grounding and bonding can be done by other means. Bonding conductors (wire type) may also enter enclosures by way of raceways per 250.102(E). Where installed on the outside of raceways, terminal fittings with lugs provide for attachment. The phrase "or to the box" appears to literally be an option NOT to connect it to the box. "Devices suitable for use" is superfluous, already covered by (A). In (A), a reference to 250.8 is more specific for grounding and bonding conductors. In (B), a reference to bonding conductors is also applicable. The proposed reference to 250.8 in (A) makes present (C) and (E) unnecessary. The requirement in present (D) should apply whether grounding is required or done by choice.

Panel Meeting Action: Reject

Panel Statement: This proposal is not editorial. The is no technical substantiation to remove the phrase "spliced or joined within the box or to the box ". The proposed text does not add clarity.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-308 Log #534 NEC-P05 **Final Action: Reject**

(250.148(C) Exception)

Submitter: Scott Cooper, Piper Electric Co.

Recommendation: Revise text to read:

(C) Metal Boxes. A connection shall be made between the one or more equipment grounding conductors and a metal box by means of a grounding screw that shall be used for no other purpose, or a listed grounding device.

<u>Exception: If the metal box is used solely as a pull box and there are no splices, devices, or terminations present, and no concentric or eccentric knock outs were utilized, the grounding requirement shall be waived.</u>

Substantiation: 250.148 states where circuit conductors are spliced within in a box, or terminated on equipment within or supported by a box, any equipment grounding conductor(s) associated with those circuit conductors shall be spliced or joined within the box or to the box with devices suitable for the use in accordance with 250.148(A) through (E).

250.148(C) only makes reference to metal boxes. Addressing pull boxes specifically, would help eliminate any confusion with the interpretation of this section of the code.

Panel Meeting Action: Reject

Panel Statement: The proposal does not add clarity or improve usability of this section. The concerns of bonding are already addressed in Sections 250.110, 250.134, and 314.4.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-309 Log #1012 NEC-P05 **Final Action: Reject**

(250.160)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

GENERAL . Direct-current systems shall comply with Part VIII and other <u>applicable</u> sections of Article 250 ~~not specifically intended for alternating-current systems.~~

Substantiation: Many of the rules in Article 250 specifically relate to ac systems; some do not. In the 2004 ROP, the panel statement was 250.28 does not exclude dc systems. However, that section requires a main bonding jumper at the service disconnect which is not permitted by 250.164(A). Also, the size of the bonding jumper specified in 250.28(D) conflicts with 250.168. An assumption can be made that 250.28 does not apply to dc systems.

Panel Meeting Action: Reject

Panel Statement: The proposed text does not add clarity. The existing wording is clear.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-310 Log #2064 NEC-P05 **Final Action: Accept**

(250.166)

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise 250.166 as follows so that 250.166 (C), (D), and (E) are clearly exceptions to 250.166 (A) and (B) as they were in the *1996 NEC* .

250.166 Size of the Direct-Current Grounding Electrode Conductor. The size of the grounding electrode conductor for a dc system shall be as specified in 250.166 (A) and (B), <u>except as permitted by 250.166 (C) through (E).</u>

Substantiation: As Section 250.166 is currently written, sections 250.166 (A) and (B) are in direct conflict with sections 250.166(C), (D), and (E). Many electricians and inspectors are not able to determine which section takes precedence. For example, many dc systems are not as described in Section 260.166 (A), so section 250.166 (B) applies. However, the use of a ground rod electrode would require Section 250.166(C) to be applied. Sections 250.166 (B) and (C) dictate two different sizes of grounding electrode conductors. Revising the first sentence in this section as shown will add clarity to the code. This language parallels the language in 250.66 for ac grounding-electrode conductors.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-311 Log #956 NEC-P05 **Final Action: Reject**

(250.166(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

(A) Where the dc system consists of a 3-wire balancer set or a balancer winding with overcurrent protection as provided in 445.12(D) the grounding electrode conductor shall not be smaller than the largest conductor supplied by

the system if made of the same material, or if made of different materials shall have an ampacity not less than the ampacity of the largest conductor supplied by the system and not smaller than 8 AWG copper or 6 AWG aluminum.
Substantiation: Edit. Consideration should be given to neutral and grounding conductors of different material.
Panel Meeting Action: Reject
Panel Statement: This proposal is not editorial. The proposed text does not add clarity. The present text is clear.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-312 Log #1112 NEC-P05 **Final Action: Reject**
(250.167 (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
GROUNDING ELECTRODE CONDUCTOR TAPS . It shall be permissible to connect taps from multiple direct-current separately derived systems to a common grounding electrode conductor provided:
1. Each tap conductor is sized in accordance with 250.166.
2. All tap connections to the common grounding electrode conductor are accessible and made by irreversible compression connections, listed connectors to a copper busbar not less than 6 mm x 50 mm (1/4 in. x 2 in.) or by exothermic welding, in a manner such that the common grounding electrode conductor is continuous without splice or joint. The common grounding electrode conductor shall be sized in accordance with 250.166 based on the total area of the neutral conductor(s) as covered in 250.166(A), or the largest conductor(s) as covered in 250.166(B), as applicable.
Exception: The common grounding electrode conductor shall be permitted to be sized in accordance with 250.166(C), (D), an (E).
Substantiation: 250.30(A)(4) and 250.64(D) have provisions for ac system taps which should be applicable for separately derived dc systems.
Panel Meeting Action: Reject
Panel Statement: There is no demonstrated need for such a provision. There is no technical substantiation for this proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-313 Log #999 NEC-P05 **Final Action: Reject**
(250.168)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
DIRECT CURRENT SYSTEMS B onding J umper. For direct current grounded systems an unspliced bonding jumper shall be used to connect the equipment grounding conductor(s) to the grounded conductor at the source where the system is grounded. ~~For direct current systems~~ T he size of the bonding jumper shall not be smaller than the system grounding electrode conductor s pecified in 250.166 and shall comply with the provisions of 250.28(A), (B), and (C) .
Substantiation: There doesn't seem to be a specific requirement to install a bonding jumper for a grounded conductor and equipment grounding conductors. 250.28 doesn't appear to include dc systems. (See my proposas for 250.160, 250.34(C) doesn't cover dc generators since the reference to 250.26 involves only ac systems.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 5-312.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-313a Log #CP512 NEC-P05 **Final Action: Accept**
(250.170)

Submitter: Code-Making Panel 5,
Recommendation: 250.170 Instrument Transformer Circuits. " …shall be grounded irrespective of voltage."
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC. The panel has decided to revert back to the original in 2005 NEC text. This action correlates with Proposal 5-314.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-314 Log #2158 NEC-P05 **Final Action: Accept in Principle**
(250.170 Exception No. 2 (New))

Submitter: Thomas F. Mueller, Southern Company Services
Recommendation: Add another exception to this paragraph as follows:
Exception No. 2: Where current transformer secondaries are connected in a three phase delta configuration.
Substantiation: Differential relaying circuits that "wrap around" wye-delta transformers are required to also be connected wye and delta. That is, the set on the delta side is connected in wye while the set on the wye side is connected in delta. Grounding of the delta side current transformers cannot be done if proper relaying is to be accomplished.
Panel Meeting Action: Accept in Principle
Revise the recommendation to add another exception to this paragraph as follows:
Exception No. 2: Current transformer secondaries connected in a three phase delta configuration shall not be required to be grounded.
Panel Statement: The panel action meets the intent of the submitter. The exception was reworded to form a complete sentence.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-315 Log #1567 NEC-P05 **Final Action: Accept**
(250.182)

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.182:
Change "neutral" to "neutral point."
The revised text would appear as follows:
A system neutral point derived from a grounding transformer shall be permitted to be used for grounding high-voltage systems.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-316 Log #1568 NEC-P05 **Final Action: Accept in Principle**
(250.184(A)(1) Exception No. 1)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.184(A)(1) Exception No. 1:
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
Exception No. 1: Bare copper conductors shall be permitted to be used for the neutral conductor of service entrances and the neutral conductor of direct-buried portions of feeders.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 5-317.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-317 Log #3335 NEC-P05 **Final Action: Accept in Principle in Part**
(250.184(A)(1) Exception No. 1)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read:

Bar copper conductors shall be permitted for the ~~neutral~~ grounded conductor of service-entrance conductors and service-lateral conductors and the ~~neutral~~ grounded conductor of direct-buried portions of feeders.

Substantiation: Edit. Conductors which are grounded but not neutrals, and service lateral conductors should be included. The FPN to the definition of Service-Entrance Conductors, Underground System, indicates there may be no service entrance conductors.

Panel Meeting Action: Accept in Principle in Part

Revise Exception No. 1 to read as follows:

Exception No. 1: Bare copper conductors shall be permitted to be used for the neutral conductor of ~~service entrance~~ the following:

a) Service entrance conductors

b) Service laterals

~~c) and the neutral of~~ D ~~d~~ irect-buried portions of feeders.

Panel Statement: The panel Accepts in Principle the addition of "conductors" after Service entrance and the addition of "Service laterals". The panel reorganized Exception No. 1 into a list for clarity. Also the panel added the word "conductor" after neutral based on the work of the TCC Task Group on Definition of Neutral Conductor.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-318 Log #2429 NEC-P05 **Final Action: Reject**
(250.184(A)(1) Exception No. 1, 2 & 3)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Delete Section 250.184 (A) (1) Exception 1 & Exception 2 and Exception 3.

Substantiation: It is important to re-state the **PURPOSE OF THE NEC: It is the safeguarding of persons from hazards arising from the use of electricity.**

By continuing to allow the "grounded circuit conductors", commonly referred to as the neutral to be installed bare allows the neutral current to flow uncontrolled over the earth. This uncontrolled flow of "stray current" results in the potential to harm not only humans but to cows and pigs.

When a person reports to me that, they are getting an electric shock from their swimming pool, hot tub, shower or a dairy farmer with cows, the first thing I determine is if the neutral conductors within the structure is free from neutral conductor-to-earth faults. This eliminates the owner of the property from contributing to the problem. The NEC by continuing to allow the installation of bare grounded circuit conductors, the neutral, contributes to the flow of uncontrolled dangerous and hazardous neutral currents over the earth.

There are three (3) sources of these dangerous and hazardous stray currents. One is from stray bare grounded circuit conductors (NEC) the neutral originating from the utility's secondary power, the service entrance source. The second source is the bastardized transformer's high voltage primary neutral to secondary neutral connection.

The third source is multigrounded neutral electrical distribution system neutral connection to earth four (4) times per mile. The stray current either enter the bare neutral conductor and travel back to the substation or conversely the stray current flows into the bare grounded conductor and enters the earth on its way back to the substation. In either case, the dangerous and hazardous stray current is flowing one way or the other and the NEC allowed bare neutral conductor is in the circuit.

EPRI: "Created by the nation's electric utilities in 1973, EPRI is one of America's oldest and largest research consortia, with some 700 members and an annual budget of about $ 500 million. Linked to a global network of technical specialists, EPRI scientists and engineers develop innovative solutions to the world's toughest energy problems while expanding opportunities for a dynamic industry."

An EPRI document states that 40 to 60 percent of the neutral return current in a multigrounded neutral electrical distribution system returns over the earth. We have measured 88 percent of the neutral current returning over the earth (Court documents).

This dangerous and hazardous stray current will use the bare grounded circuit conductor, the neutral, that is presently allowed by the NEC to either flow from the multigrounded neutral electrical distribution system into the earth on its way back to the substation or will flow onto the bare neutral conductor, the neutral, and onto the multigrounded neutral electrical distribution system in order to get back to the substation.

I suggest that for your own edification you obtain the proposal to eliminate the equipotential planes in 547.2 and 547.10. In addition, if you are interested in more information on multigrounded neutral electrical distribution system see the technical paper titled, "The Hazardous Multigrounded Neutral Distribution System and Dangerous Stray Currents", Copyright Material IEEE Paper No. PCIC-03-03.

Zipse's Law states "In order to have and maintain an electrical installation safe from electrical shocks and to prevent electrocution from stray current: All continuously, flowing current shall be contained within a conductor, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth."

This is accomplished within industrial facilities since they do not make the bastardized electrical transformer connection between the primary neutral and the secondary neutral, which allows the continuous flow of dangerous and hazardous high voltage neutral current over the equipment grounding conductor and the earth. The industrial facilities keep the neutral insulated and carry the ground conductor with the phase conductors. (See IEEE Standard 141, "Recommended Practice for Industrial Electrical Power Distribution", The Red Book.

Panel Meeting Action: Reject

Panel Statement: The submitter has presented no credible evidence that supports his claim that normal neutral return current that leaves the confines of an un-insulated grounded conductor, is "dangerous or hazardous". The exceptions the submitter wishes to delete do not mandate any type of installation. They are permissive statements that provide options for design. The NEC is a minimum standard of electrical safety. It is not a design standard. The design of an electrical system is specific to its purpose. For systems in excess of 1000 volts there are a variety of factors that may dictate system design (e.g. industrial processes, system size, system location, etc.). The existing code for Systems and Circuits of 1 kV and Over appropriately allows for a variety of grounding alternatives. Acceptance of this proposal would significantly limit system design capabilities and unnecessarily make the affected section of the NEC a design standard, not a safety standard.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

RAPPAPORT, E.: The submitter has presented credible evidence both here and in Proposal 5-327 of the hazards of multi-ground neutral systems. In this case, he is attempting to remove a hazard in Exception No. 1 that occurs when either a multi-grounded neutral system or a single point grounded system has a bare neutral conductor in the ground. In the multi-grounded neutral system, the neutral conductor has a continuous connection to the earth which is not permitted. What is permitted is the connection to earth every 400 meters and at transformers - not continuous connection. In the single point grounded system, the neutral is being connected to ground at more than one point in violation of 250.184(B)(7). See also Negative Comment on Proposal 5-327.

Comment on Affirmative:

HAMMEL, D.: See my comment on Proposal 5-327.

5-319 Log #1569 NEC-P05 **Final Action: Accept**
(250.184(A)(1) Exception No. 2)

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 250.184(A)(1) Exception No. 2:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

Exception No. 2: Bare conductors shall be permitted for the neutral conductor of overhead portions installed outdoors.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-320 Log #1570 NEC-P05 **Final Action: Accept**

(250.184(A)(1) Exception No. 3)

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 250.184(A)(1) Exception No. 3:

Change "neutral grounded conductor" to "grounded neutral conductor."

The revised text would appear as follows:

Exception No. 3: The ~~neutral grounded~~ grounded neutral conductor shall be permitted to be a bare conductor if isolated from phase conductors and protected from physical damage.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

In this section, a grammatical change is proposed to be consistent with the proposed new defintition

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-321 Log #1571 NEC-P05 **Final Action: Accept**

(250.184(B))

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 250.184(B):

Add the word "Neutral" to the Title.

The revised text would appear as follows:

(B) Single Point Grounded <u>Neutral</u> System. Where a single point grounded neutral system is used, the following shall apply:

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals.

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

In this section, a clarification is proposed for consistency with modifications done last cycle.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-322 Log #1572 NEC-P05 **Final Action: Accept**

(250.184(B)(1))

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 250.184(B)(1):

Add the word "neutral" before "system."

The revised text would appear as follows:

(1) A single point grounded <u>neutral</u> system shall be permitted to be supplied from (a) or (b):

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

In this section, a clarification is proposed for consistency with modifications done last cycle.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-323 Log #1573 NEC-P05 **Final Action: Accept**

(250.184(B)(1)b.)

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Make the following change in 250.184(B)(1):

Change "neutral" to "neutral conductor." Add the word "neutral" before "system."

The revised text would appear as follows:

b. A multigrounded neutral system with an equipment grounding conductor connected to the multigrounded neutral <u>conductor</u> at the source of the single point grounded <u>neutral</u> system.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

In addition in this section, a clarification is proposed for consistency with modifications done last cycle.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-324 Log #1574 NEC-P05 **Final Action: Accept**
(250.184(B)(3))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.184(B)(3):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(3) A grounding electrode conductor shall connect the grounding electrode to the system neutral conductor .
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-325 Log #1575 NEC-P05 **Final Action: Accept**
(250.184(B)(6))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.184(B)(6):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(6) A neutral connductor shall only be required where phase to neutral loads are supplied.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Panel Statement: Editorially correct the spelling of conductor in the recommendation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-326 Log #1576 NEC-P05 **Final Action: Accept**
(250.184(B)(7))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.184(B)(7):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(7) The neutral conductor , where provided, shall be insulated and isolated from earth except at one location.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-327 Log #3638 NEC-P05 **Final Action: Reject**
(250.184(C))

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.
Recommendation: Delete Section 250.184 (C).
Substantiation: I thank Code Making Panel 5 for the detailed response to my 2005 Proposal.
I remind the Panel of Zipse's Law which states "In order to have and maintain an electrical installation safe from electrical shocks and to prevent electrocution from stray current: All continuously, flowing current shall be contained within a conductor, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth." This should be your guiding light.
Over the past three years additional information has been obtained that clearly shows the error of Code Making Panel 5 in accepting the expanded section on the multigrounded neutral electrical distribution system into the NEC.
The following peer reviewed Institute of Electrical and Electronic Engineers Technical paper will provide the previously requested existing science or engineering principles, which is attached. See NFPA 70, Report on Proposals – May 2004 page 622, 5-257 Log #3370. The basis of the paper is technical papers by others dating back to the early 1900s.
The studies cited in the Panel's Statement are slowly being negated and proven to be false especially since most were funded by the utilities. (Fact) Consult Gorewit v. Behr defamation suit that will result in the demand on the Journal of Dairy Science to retract the two articles published in 1992 reporting this research and placing Cornell studies in questionable state.
It is doubtful if the reader of the final report of VitaTech Engineering, hired by the National Regulatory Institute was analyzed since it is clearly evident that in the prime case (FACT) 5.5 amperes of stray current was returning over the earth as Vita Tech measured at the substation. This was in addition to the stray current that Vita Tech found all over the area. (Opinion DWZ) It is also evident from the testimony present to the New Jersey Board was one sided and failed to present the whole picture.
Since you want facts and you used Vita Tech in you reply, I therefore can also use the very same information to prove my point that stray current is harmful. Pity anyone of the Panel members who have similar stray current problems as (FACT) it is doubtful if your house will be accepted by a realtor for sale, nor will a mortgage be available to any house with stray current problems similar to the NJ problem.
(FACT) I have measured the NJ house and there is stray current coming from the utilities multigrounded neutral electrical distribution system that shocked the homeowner.

(FACT) It should be noted that Vita Tech recommendation did not work out. I am quoted in the Asbury Park Press as stating increasing the neutral to a larger size would not solve the stray current problem. In fact, a year later Georgia Institute of Technology also stated the solution suggested by Vita Tech would not work. I wonder why the Panel selected such a questionable report for a response to my proposal.

In fact, in the New Jersey case the electrical distribution system was a three wire with the transformers connected phase-to-phase. (FACT) It was not until the distribution system was changed about 5 years ago to the unsafe multigrounded neutral electrical distribution system that there were any stray voltage, stray current problems.

As far as California is concerned, the GO-95 is not retroactive as is the NEC. In September 2004, I personally visited several electric companies in the north-central part of the state where the dairy industry is re-locating, and found NOT ONE company using the multigrounded neutral electrical distribution system. In fact, they were aware of the dangers and stated how unsafe the multigrounded neutral electrical distribution system was.

Now let us discuss the Minnesota Science Advisors report that the Panel relies upon to discredit D. W. Zipse's proposal.

(FACT) The Supreme Court of Wisconsin states the utility "WEPCO also references the report of the so-called Minnesota Science Advisors concerning the influence of ground currents on dairy farms. It quotes a conclusion in that report at page 14 of its Brief, but fails to note evidence introduced at trial that one of the Science Advisors, Dr. Charles Polk publicly disagreed with the way the conclusion was expressed. According to Dr. Polk, the Science Advisors "could have just as well said that we have not found credible, scientific evidence that (ground currents) are **not** causes of poor health and milk production in dairy herds." (R.169, p. 89) Further, the Science Advisors made no mention in the Conclusion of their report of finding "significant differences between high and low-producing herds in the levels of electrical step potentials and soil resistivity in the field." (R.169, p. 90) "

So the citing of the Minnesota Science Advisors report is less than a foolproof document supporting the Panel's position. For more comments against the report see Hoffmann v. WEPCO STATE OF WISCONSIN SUPREME COURT, Appeal No. 00-2703.

The Panel's Statement included the following: "The fact that multi-grounded systems above 1000 volts are presently allowed in the NEC and have been there for many years, seems to contradict the submitter's comment that these systems are a recent addition to the NEC." That is partially true. It was extensively revised about two cycles ago by a special committee led by Mr. William M. Lewis. I did not learn of the extent of the danger and hazard of the multigrounded neutral electrical distribution systems until I under took an extensive 2 to 3 month research project on multigrounded neutral electrical distribution systems begun in January of 2002.

The panel stated that I was "attempting to mandate as the only method" the uni-grounded system. (Last paragraph page 623, 2005 ROP) (FACT) Section 250.184 allows only two methods, a safe and an unsafe solidly grounded method. Section 250.186 also allows another type of electrical system.

If one were to read the attached technical paper, they would see that there are several safe wiring methods. There are several variations of the uni-grounded system. All begin at the substation transformer with a single point ground on the neutral, uni-grounded. However, there are several variations of the uni-grounded systems:

1) Three wire delta distribution systems with phase-to-phase connected transformers;

2) The four-wire delta distribution system with phase-to-phase connected transformers with a multiple grounded conductor (equipment ground) and

3) The five-wire electrical distribution system with a multigrounded (equipment) ground conductor and an insulated and isolated neutral which is similar if not exactly the same as is used extensively in industry and commercial buildings.

In addition, there exist substations with un-grounded distributions systems.

There are options, two safe types of distributions systems and one unsafe system, the multigrounded neutral electrical distribution system.

NEW INFORMATION

EPRI: "Created by the nation's electric utilities in 1973, EPRI is one of America's oldest and largest research consortia, with some 700 members and an annual budget of about $ 500 million. Linked to a global network of technical specialists, EPRI scientists and engineers develop innovative solutions to the world's toughest energy problems while expanding opportunities for a dynamic industry."

(FACT) An EPRI document states that 40 to 60 percent of the neutral return current in a multigrounded neutral electrical distribution system returns over the earth. (TR-113566, section 1- page 5) We have measured 88 percent of the neutral current returning over the earth (Court documents).

(FACT) The multigrounded neutral distribution system came into use after the Second World War. One of the first Institute of Electrical and Electronic Engineers' technical papers on multigrounded neutral distribution systems was published in 1946 and it detailed the savings in installation costs - no words about safety as the hazardous and dangerous effects of the multigrounded neutral distribution system were not known or recognized until about 1980.

(FACT) 1914 J. P. Jollyman, et al., writes about the Pacific Gas and Electric Company's practices of using the neutral allowing one less wire, one less fuse cutout, one less lightning arrester, less insulators, the list goes on and on of the cost savings. Many farms were not still connected to the electrical distribution systems and those that were had only a well pump and a cream separator along with resistance loads such as lights, ovens and hot water heaters.[Electricity On The Farm, Feb. to Aug. 1930, G. E. History, Schenectady Museum, Schenectady, NY.] The loads were small and insufficient amounts of stray current flowed over the earth and did little harm then. As the electrical loads increased more and more electric current flowed over the earth resulting in more and more harm.

(FACT) Farmers were forced out of the business (Allen v. WPS) Since the utility, WPS failed to correct the electrical distribution system Mr. Allen was forced to sell his cows. (FACT) Three years ago on one farm alone five cows died per day, over 1800 per year - the herd was replaced twice - as a result of stray current emanating from the utility multigrounded neutral distribution system. (Victory Farms v. Wheatstone, SD) (FACT) Cows will not drink since they get shocked. Without water, they develop mastitis and die. (Consult the Ag. Red Book)

Do not forget Zipse's Law.

The multigrounding of the neutral results in uncontrolled flow of current across the earth causing harm to animals, cows and pigs and to humans. For the latest human electrical problems resulting from multigrounded neutrals & stray current also know (incorrectly) as stray voltage see www.app.com and scroll down to "stray voltage" where there are over a dozen articles of persons in NJ with problems with multigrounded neutrals.

California Public Service Commission has prohibited using the earth as a return conductor, either partial or total since 1994. There are no reports of stray current from the utilities electrical distribution systems in the dairy areas of CA. (FACT – Testimony of Mr. L. C. Neubauer). Multigrounded neutral electrical distribution systems are inherently hazardous and dangerous. Otherwise why would the Attorney General of Michigan be bringing cause in the PUC against a utility that admits that 70 percent of the return current flows uncontrolled over the earth causing fatal harm to cows.

Multiple legal cases are in the courts against the utilities now for causing harm against animals and humans. (FACT) Wisconsin Supreme court has ruled on such a suit requiring the utility to rewire the multigrounded neutral electrical distribution system to a farm and it was decided for the dairy farmer. Since this case went all the way to the WI Supreme Court, the details follow. (ALLAN HOFFMANN and BEVERLY HOFFMANN, Plaintiffs-Respondents-Cross-Appellants, Supreme Court WI, Appeal No. 00-2703 vs. WISCONSIN ELECTRIC POWER CO., Defendant-Appellant-Cross-Respondent-Petitioner. Appeal From The Circuit Court Of Waupaca County The Honorable Philip M. Kirk, Presiding Trial Court Case No: 97-CV-144)

(FACT) One of the questions asked, "Was the jury's verdict supported by substantial evidence?" The Court answered, "This question was answered in the affirmative by both the trial court and the Court of Appeals."

(FACT) The Court also stated, "The plaintiffs also introduced substantial evidence that ground currents harmed their cows." Healthy cows and humans have approximately the same internal resistance, 500 Ohms.

Now the Panel's reply to this proposal in the 2005 cycle consisted mainly of using the following reason, "The submitter's use of farm and livestock examples are not only anecdotal in nature, they are off the mark." As has been shown above the statements have now been declared "FACT" by submitting court records, other factual substantiation and best of all using the panel's own citation of Vita Tech report, which actually agreed with Mr. Zipse's statements.

When jury after jury made up of non-electrical persons and also lack knowledge about electrical distribution systems, the common folk can understand the harm of multigrounded neutral electrical distribution systems, one would expect the panel members with electrical knowledge to acquiesce, comply without protest, agree with this proposal.

The problem with multigrounded neutral electrical distribution systems will not go away. They are unsafe and the Panel needs to remove the section NOW and not after another 17 years.

The following paper is attached:

"The Hazardous Multigrounded Neutral Distribution System And Dangerous Stray Currents", Copyright Material IEEE, Paper No. PCIC-03-03

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The submitter has presented no credible evidence that supports his claim that normal neutral return current that leaves the confines of an un-insulated grounded conductor, is "dangerous or hazardous".

The section the submitter wishes to delete does not mandate any type of installation. This section provides guidance if a multi-grounded neutral system is chosen by a designer. The NEC is a minimum standard of electrical safety. It is not a design standard. The design of an electrical system is specific to its purpose. For systems in excess of 1000 volts there are a variety of factors that may dictate system design (e.g. industrial processes, system size, system location, etc.). The existing code for Systems and Circuits of 1 kV and Over appropriately allows for a variety of grounding alternatives. Acceptance of this proposal would significantly limit system design capabilities and unnecessarily make the affected section of the NEC a design standard, not a safety standard.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

RAPPAPORT, E.: This proposal should be Accepted.

The panel statement that no credible evidence has been presented indicates that the panel has not bothered to read the substantiation with an open mind.

Mr. Zipse has presented example after example of the effects of stray current. He has included numerous additional substantiation not previously submitted. In addition, he included, in Proposal 5-318, an EPRI report that indicated that 40 to 60 percent of neutral current (on multi-grounded neutral systems) return through the earth. EPRI is primarily a Utility funded organization. How much more substantiation is necessary? As a matter of fact, this section was added into this Article several cycles ago based upon the substantiation that the same text exists in the National Electrical Safety Code. The fact that the NESC is applicable to electric utility wiring and not applicable to premises wiring was not relevant at the time.

The submitter has presented credible documented evidence of how stray currents from multi-grounded neutral systems get into the earth and are hazardous. It doesn't take a rocket scientist to see that the earth is in parallel with each multiple grounding point and, by Kirchoff's Laws, the current will divide inversely proportional to the impedance in each path.

What were the arguments to reject this proposal? This method is permitted by the NESC and the utilities follow this practice. This Code is not applicable to the utilities as clearly stated in the Scope in 90.2(B)(5) which states under the heading "Not Covered" "Installations under the exclusive control of an electric utility...". Another argument was that there are some large tracts of land (such as logging) that are fed primary and the distribution is premises wiring. Industrials with similar large tract installations have installed dedicated transformers to supply the required load without multi-grounding neutral conductors. One alternative is to provide an exception for existing installations. This would insure that all new installations after the effective date of the Code would use single point neutral grounding systems only. If multi-point neutral grounding is acceptable for high voltage systems (1 Kv and over), why is similar flexibility not provided for low voltage systems (below 1 Kv)? Is it the panel's rationale that it is unsafe to multi-ground neutral conductors in systems below 1 Kv but it is OK to do so in systems of 1 Kv and over?

This issue will not go away. It is a safety issue and not a design issue. It would be informative to have feedback from the public on the use, disuse, or misuse of multi-grounded neutral systems for premises wiring by deleting this option at this time.

Comment on Affirmative:

HAMMEL, D.: This section should provide some guidance as to where a multi-grounded neutral system can be safely chosen by a designer. The NEC is a minimum standard of electrical safety. There is a need to design safety into an electrical system.

5-328 Log #1577 NEC-P05 **Final Action: Accept**
(250.184(C)(1))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.184(C)(1):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(1) The neutral <u>conductor</u> of a solidly grounded neutral system shall be permitted to be grounded at more than one point. Grounding shall be permitted at one or more of the following locations:

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-329 Log #1578 NEC-P05 **Final Action: Accept**
(250.184(C)(1)b.)

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.184(C)(1):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

b. Underground circuits where the neutral <u>conductor</u> is exposed.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-329a Log #CP516 NEC-P05 **Final Action: Accept**
(250.184(C)(2))

Submitter: Code-Making Panel 5,
Recommendation: Revise Section 250.184(C)(2) as follows:
The multigrounded neutral conductor shall be grounded at each transformer and at other locations by connection to a ~~made or existing~~ grounding electrode.
Substantiation: The editorial revisions to the TCC Task Group on Grounding and Bonding proposals are incorporated into the identified sections to be consistent with the work of CMP-5 at the Report on Proposal Meeting for the 2008 NEC.
The panel deleted "made or existing" because of activity to Proposals 5-330 and 5-77. The panel removed the word "connected" and restored the word "grounded" to original text of the 2005 NEC.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-330 Log #587 NEC-P05 **Final Action: Accept in Principle**
(250.184(C)(2))

Submitter: Joe Tedesco, Boston, MA
Recommendation: Revise 250.184(C)(2) as follows:

"The multigrounded neutral conductor shall be grounded at each transformer and at other additional locations by connection to any new or existing electrode."

Substantiation: Use of the term "made electrode" was changed to "electrode" in the NEC.
Panel Meeting Action: Accept in Principle

Revise 250.184(C)(2) as follows:

"The multigrounded neutral conductor shall be grounded at each transformer and at other additional locations by connection to a grounding electrode."

Panel Statement: The revised text meets the submitters intent and conforms to the NEC Style Manual.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-331 Log #1579 NEC-P05 **Final Action: Accept**
(250.184(C)(3))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.184(C)(3):
Delete the word "circuit."
The revised text would appear as follows:
(3) At least one grounding electrode shall be installed and connected to the multigrounded neutral ~~circuit~~ conductor every 400 m (1300 ft).
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
In this section, the word "circuit" is not needed with the new proposed definition of "neutral."
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-332 Log #1580 NEC-P05 **Final Action: Accept**
(250.186(C))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.186(C):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(C) System Neutral Connection. The system neutral <u>conductor</u> shall not be connected to ground, except through the neutral grounding impedance.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Panel Statement: Editorially revise the title of (c) to read as follows: System Neutral <u>Conductor</u> Connection.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-333 Log #1581 NEC-P05 **Final Action: Accept**
(250.188(A))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 250.188(A):
Change "neutral" to "neutral conductor" in first location. Change second appearance of "neutral" to "neutral point and associated neutral conductor."
The revised text would appear as follows:
(A) Portable or Mobile Equipment. Portable or mobile high-voltage equipment shall be supplied from a system having its neutral <u>conductor</u> grounded through an impedance. Where a delta-connected high-voltage system is used to supply portable or mobile equipment, a system <u>neutral point and associated neutral conductor</u> shall be derived.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
●The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Panel Statement: Editorially adjust underlined text in last sentence of 250.188(A) in the recommendation to read as follows:
Where a delta-connected high-voltage system is used to supply portable or mobile equipment, a system neutral <u>point and associated neutral conductor</u> shall be derived.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-334 Log #1668 NEC-P05 **Final Action: Reject**
(251 (New))

Submitter: Ben Jacks, Seattle, WA
Recommendation: Add new Article 251 Electrical Bonding. Along with the proposed general requirements, new definitions, scope, and sections related to the proper bonding of all conductors, etc. to read as follows:

Article 251
ELECTRICAL BONDING

I. General
251.1 Scope. This article governs general requirements for bonding of electrical conductors and requirements in the following (1) through (6) parameters:
(1) Surfaces permitted, or not permitted to be bonded.
(2) Conductor bonding of dissimilar metal surfaces
(3) Surface parent material plating or coating maintained
(4) Area bonding surface for conductor sizes
(5) Methods of Permanent and Semi-permanent bonds
(6) Electrical Conditions bond connection requirements
251.2 Definitions
Bond Fault. An unintentional, electrically non-conducting connection between current-carrying conductors or parts and other intended bonded conductors.
Effective bonding joint path. An intentionally constructed permanent or semi-permanent conductive connection interface between metal or semi-conductors designed and intended to carry current under environmental conditions from all points of mechanical installation.
Faying Surface. Joining surfaces that allow an intentional unimpeded current flow through the conductive parts.
Permanent Bond. Fused, welded, compressed, or crimped electrical conductors joined to be inseparable as comparable to current carrying parent material conductors.
Semi-Permanent Bond. Mechanical connections of conductors that require fastening hardware for a properly torqued connection force value to maintain an effective low impedance or low dc resistive characteristic applicable.

251.3 Application of Other Articles. In other articles applying to particular cases of installation of conductors and equipment, requirements of electrical condition purposes and classifications for bonds are identified in Table 251.3

251.4 General Requirements for Bonding. The general requirements identify what bonding of electrical conductors are required to accomplish. The methods contained in Article 250 shall be compliant to the prescriptive baseline of TABLE 251.3 requirements.

251.5 Circuit Power-Return Path (Class C). Circuit power quality is maintained with a default voltage drop standard value of 3.5% (4 volts for 120-volt systems). The drop allowed divided by the maximum current delivered shall give a total resistance in a circuit. The resistance includes the conductor wire, its connectors, and all the bonded joints in the path. The resistance limit for each joint can then be allocated.

251.6 Equipment Fault Protection (Class H). Fault current due to equipment case, frame, and structure, etc. leakage may develop potentials by induced or shorted failures. An electrical conductive bond with a resistance of 0.1 ohm or less at each joint connection is required to ensure operation of overcurrent protection devices to trip within 0.2 seconds after a hard short to case. Metallic conduit, cable trays, and other conductive objects susceptible to short circuits shall have a low resistance of 0.1 ohm or less for each joint connection to the system single point ground at the main service disconnect equipment.

251.7 Lightning Strike, Transients (Class L). Provisions for the lightning current and high voltage transients through bond joint areas of interfacing enclosure equipment include conduit, frames, and all conductive materials that converge into the single point ground bus of the main disconnect panel. This main ground bus also comprises both the grounded neutral and equipment grounding conductor terminal bars and is the main channel for lightning passage through the bond connected low impedance grounding of grounding electrode conductors and the grounded service conductor leading to any present earth embedded parallel electrodes.

251.8 Electromagnetic & Radio Frequency (Class R)
Direct contact between mating parts is the preferred faying surface method of electrical bonding. The dc resistance across each bond joint is 5 milliohm maximum to provide a uniform low-impedance path through the system. Where equipment is vibration prone or thermally isolated, bonding straps are alternate.

251.9 Electrostatic & Frictional Static (Class S).
Static and triboelectric charges can usually be dissipated through a low resistance requirement obtained by good bond contact between conductive and semi-conductive surfaces. Non-metallic plastic materials or composite structures are known to accumulate and discharge static energy that is capable of igniting reactive or unstable vapors, battery fumes, combustion fuels, and even suspended dust particles. A one-ohm strap bonded to ground is normally sufficient.

251.10 Services.

(A) Bonding of Services. The non-current-carrying metal parts of equipment indicated in 251.10 (A) (1), (A) (2), and (A) (3)
shall effectively bonded together.

(1) The service raceways, cable trays, cablebus framework, auxiliary gutters, or service cable armor or sheath except as permitted in 250.84.

(2) All service enclosures containing service conductors, including meter fittings, boxes or the like, interposed in the service raceway or armor.

(3) Any metallic raceway or armor enclosing a grounding electrode conductor as specified in 250.64(B). Bonding shall apply at each end and to all intervening raceways, boxes, and enclosures between the service equipment and the grounding electrode.

(B) Method of Bonding at the Service. Electrical continuity
at service equipment, service raceways, and service conductor enclosures shall be ensured by one of the following methods:

(1) Bonding equipment to the grounded service conductor in a manner provided in 250.8

(2) Connections utilizing threaded couplings or threaded
bosses on enclosures where made up wrench tight.

(3) Threadless couplings and connectors where made up tight for metal raceways and metal-clad cables

(4) Other listed devices, such as bonding-type locknuts, bushings, or bushings with jumper conductors.

Bonding jumpers meeting the other requirements of this article shall be used around concentric or eccentric knockouts that
are punched or otherwise formed as to impair the electrical connection to ground. Standard locknuts or bushings shall not be the sole means for the bonding required by this section.

Table 251.3 Bond Classifications Requirements

BOND CLASSIFICATIONS ESTABLISHED FOR ELECTRICAL CONDITIONS*

BOND CLASS	PURPOSE OF BOND	BOND REQUIREMENT	DC BOND RESISTANCE	FREQUENCY	CURRENT
CLASS 'C' CIRCUIT POWER & RETURN	Maintain power & reduce voltage losses of conductors required for intentional circuit current return to the AC system source.	Requires low impedance & low voltage across joints to assure adequate power prescribed to the load.	Bond resistance maximum depends load current.	Low	High
CLASS 'H' SHOCK HAZARD FAULT PROTECTION	Increases protection from inadvertent fire and shock hazards due to fault current shorts to equipment case, frame, parts or structure.	Requires low impedance & low voltage across joints to prevent fire hazards and reduce shock due to electrical shorts on non-energized metallic parts. Straps & jumpers are acceptable	Bond resistance 0.1 ohm or less. Special requirements when near flammable environs	Low	High
CLASS 'L' LIGHTING & TRANSIENTS PROTECTION	Applies to equipment, structure, and other parts that would carry current resulting from a lightning strike.	Requires low impedance at moderate frequency. Bonding components must withstand high current. Straps, conduit, jumpers stable at high magnetic forces.	Bond resistance requirement depends on current. Low inductance required.	High	High
CLASS 'R' RADIO FREQUENCY & ELECTRO-MAGNETIC INTERFERENCE	Applies to equipment that could generate retransmit, or be susceptible to RFI or EMI energy. Covers wide frequency range.	Requires low RF impedance at high frequency. Direct contact preferred without jumpers. Short wide strap may be used as last resort.	Bond resistance requirement 5.0 millonhms or less. Low inductance Required.	High	Low
CLASS 'S' ELECTRO STATIC	Protects materials from electrostatic charge or any item subject to static charging.	Allows moderate impedance. Jumpers & straps acceptable	Typical bonding resistance 1.0 ohm or less.	Low	Low

• Permanent Bond =Weld, compress, crimp. • High Frequency Bonds require low inductance paths. • High Current Bonds require large cross-sectional areas. • Semi-permanent=Bolt, Screw, rivet, clamp. • Low Frequency Bonds allow use of straps and jumpers. • Low Current Bonds allow use of small contact areas.

*Classification data taken from NASA-STD-PO23

251.11 Bonding for Other Systems. An accessible means external to enclosures for connecting intersystem grounding electrode conductors shall be provided at the service
equipment and at the disconnecting means for any additional buildings or structures by at least one of the following means:

(1) Exposed non-flexible metallic raceways

(2) Exposed grounding electrode conductor

(3) Approved means for the external bond connection of a copper or other corrosion-resistant grounding conductor to the grounded raceway or equipment

FPN No. 1: A 6 AWG copper conductor with one end bonded to the grounded non-flexible metallic raceway or equipment and with 150 mm (6 in.) or more of the other end made accessible on the outside wall is an example of the approved means as covered in 251.11(3).

FPN No. 2: See 800.100, 810.21, and 820.100 for grounding requirements for communication circuits, radio, and television equipment, and CATV circuits. Bonding is applicable to 251.3.

251.12 Bonding Other Enclosures.

(A) General. Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal non-current-carrying parts that are to serve as grounding conductors, with or without the use of supplementary equipment grounding conductors, shall be effectively bonded where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them. Any non-conductive paint, enamel, or similar coating shall be removed at threads, contact points, and faying surfaces to be connected by means of fittings designed so as to make such removal unnecessary.

(B) Isolated Grounding Circuits. Where required for the reduction of electrical noise from Radio Frequency or Electromagnetic Interference on the grounding circuit, an equipment enclosure supplied by a branch circuit shall be permitted to be isolated from a raceway containing circuits supplying only that equipment by one or more listed non-metallic raceway fittings located at the point of attachment of the raceway to the equipment enclosure. The metal raceway shall comply with provisions of this article and shall be supplemented by an internal insulated equipment grounding conductor installed in accordance with 250.146(D) to ground the equipment enclosure.

FPN: Use of an isolated equipment grounding conductor does not relieve the requirement for grounding the raceway system.

251.13 Bonding for Over 250 volts. For circuits of over 250 volts to ground, the electrical continuity of metal raceways and cables with metal sheaths that contain any conductor other than service conductors shall be ensured by one or more of the methods specified for services in 251.10(B), except for (B)(1).

Exception: Where oversized, concentric, or eccentric knockouts are not encountered, or where a box or enclosure with concentric or eccentric knockouts is listed to provide a permanent, reliable electrical bond, the following methods shall be permitted:

(1) Threadless couplings and connectors for cables with metal sheaths

(2) Two locknuts, on rigid metal conduit or intermediate metal conduit, one inside and one outside of boxes and cabinets

(3) Fittings with shoulders that seat firmly against the box or cabinet, such as electrical metallic tubing connectors, flexible metal conduit connectors, and cable connectors, with one locknut on the inside of boxes and cabinets

(4) Listed fittings

251.14 Bonding Loosely Jointed Metal Raceways. Expansion fittings and telescoping sections of metal raceways shall be made electrically continuous by bonding equipment with jumpers or other means.

251.15 Bonding in Hazardous (Classified) Locations. Regardless of the voltage of the electrical system, the electrical continuity of non-current-carrying metal parts of equipment, raceways, and other enclosures in any hazardous location as defined in Article 500 shall be ensured by any of the methods specific in 251.10(B)(2) through (B)(4) that are approved for the wiring method used. One or more of these bonding methods shall be used whether or not supplementary equipment grounding conductors are installed.

251.16 Equipment Ground Jumpers.

(A) Material. Equipment jumpers shall be of copper or other corrosion-resistant material. A jumper shall be a wire, strap, terminal bar or bus, screw, or similar suitable conductor with capacity for the bond connection.

(B) Attachment. Equipment jumpers shall be attached in the manner specified by the applicable provisions of 250.8 for circuits and equipment and by 250.70 for grounding electrodes.

(C) Size- Equipment Grounding Jumper on the Supply Side of the Service. The jumper conductor shall not be smaller than the sizes shown in Table 250.66 for grounding electrode conductors. Where the service-entrance phase conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum, the jumper shall have an area not less than 12 ½ percent of the area of the largest phase conductor except that, where the phase conductors and the grounding jumper are of different materials (copper or aluminum), the minimum size of the grounding jumper shall be based on the assumed use of phase conductors of the same material as the jumper conductor and with an ampacity equivalent to that of the installed phase conductors. Where the service-entrance conductors are paralleled in two or more raceways or cables, the equipment grounding jumper conductor where routed with the raceways or cabling shall be run in parallel. The size of the jumper conductor for each raceway or cable shall be based on the size of the service-entrance conductors in each raceway or cable.

(D) Size-Equipment Grounding Jumper on the Load Side of the Service. The equipment jumper conductor on the load side of the service overcurrent devices shall be sized, as a minimum in accordance with the sizes listed in Table 250.122, but shall not be required to be larger than the largest ungrounded circuit conductors supplying the equipment and shall not be smaller than 14 AWG. A single common continuous equipment grounding jumper conductor shall be permitted to bond two or more raceways or cables where the jumper conductor is sized in accordance with Table 250.122 for the largest overcurrent device supplying circuits therein.

(E) Installation. The equipment grounding jumper conductor shall be permitted to be installed inside or outside of a raceway or enclosure. Where installed on the outside, the length of the equipment grounding jumper conductor shall comply with the requirements of 250.119 and 250.148.

Exception: An equipment grounding jumper conductor longer than 1.8 m(6ft) shall be permitted at outside pole locations for the purpose of grounding isolated sections of metal raceways or elbows installed in exposed risers of metal conduit or other metal raceway.

251.17 Bonding of Piping Systems and Exposed Structural Steel.

(A) Metal Water Piping. The metal water piping system shall be bonded as required in (A) (1), (A) (2), or (A) (3) of this section. The jumpers shall be installed in accordance with 250.64(A), (B), and (E). The bond points of attachment jumpers shall be accessible.

(1) General. Metal water piping system(s) installed in or attached to a building or structure shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size or to the one or more grounding electrodes used. The jumper conductor(s) shall be sized in accordance with Table 250.66 except as permitted in 251.17 (A) (2) and (A) (3).

(2) Buildings of Multiple Occupancy. In buildings of multiple occupancy where the metal water piping system(s) installed in or attached to a building or structure for the individual occupancies is metallically isolated from all other occupancies by use of non-metallic water piping, the metal water piping system(s) for each occupancy shall be permitted to be bonded to the equipment grounding terminal bar or the panelboard or switchboard enclosure (other than service equipment) supplying that occupancy. The grounding jumper conductor(s) shall be sized in accordance with Table 250.122.

(3) Multiple Buildings or Structures Supplied by a Feeder(s) or Branch Circuit(s). The metal water piping system(s) installed in or attached to a building or structure shall be bonded to the building or structure disconnecting means enclosure where located at the building or structure,
to the grounding equipment conductor run with the supply conductors or to the one or more grounding electrodes used. The jumper conductor(s) shall be sized in accordance with Table 250.66 based on the size of the feeder or branch circuit conductors that supply the building.

(B) Other Metal Piping. Where installed in or attached to a building or structure, metal piping system(s), including gas piping, that is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The jumper conductor(s) shall be sized in accordance with 250.122, using the rating of the circuit that is likely to energize the piping system(s). The equipment grounding conductor for the circuit that is likely to energize the piping shall be permitted to serve as the bonding means. The bond points of the jumper conductor attachments shall be accessible.

FPN: Bonding all piping and metal air ducts within the premises will provide additional safety.

(C) Structural Metal. Exposed structural metal that is interconnected to form a metal building frame and is not intentionally grounded and is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or the one or more grounding electrodes used. The jumper conductor(s) shall be sized in accordance with Table 250.66(A), (B), and (E). The points of attachment of the jumper conductor bonds shall be accessible.

(D) Separately Derived System(s). Metal water piping systems and structural metal that is interconnected to form a building frame shall be bonded to separately derived systems in accordance with (D) (1) through (D) (3).

(1) Metal Water Piping Systems(s). The grounded conductor of each separately derived system shall be bonded to the nearest available point of the metal water piping system(s) in the area served by each separately derived system. This bond connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper conductor shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

Exception No. 1: A separate bonding jumper conductor to the metal water piping system shall not be required where the metal water piping system is used as the grounding electrode for the separately derived system.

Exception No.2: A separate water piping bonding jumper conductor shall not be required where the metal frame of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the metal water piping in the area served by the separately derived system.

(2) Structural Metal. Where exposed structural metal exists to form an interconnected building frame in the area served by the separately derived system, the frame(s) shall be bond-connected to the grounded conductor of each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode

conductor is connected. Each bonding jumper conductor shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

Exception No. 1: A separate bonding jumper conductor to the building structural metal shall not be required where the metal frame of a building or structure is used as the grounding electrode for the separately derived system.

Exception No. 2: A separate bonding jumper conductor to the building structural metal shall not be required where the water piping of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the building structural metal in the area served by the separately derived system.

(3) Common Grounding Electrode Conductor. Where a common grounding electrode conductor is installed for multiple separately derived systems as permitted by 250.30 (A) (4), and exposed structural metal that is interconnected to form the building frame or interior metal piping exists in the area served by the separately derived system, the metal piping and the structural member shall bond to the common grounding electrode conductor.

Exception: A separate bonding jumper conductor from each derived system to metal water piping and to structural metal members shall not be required where the metal water piping and the structural metal members in the area served by the separately derived system are bonded to the common grounding electrode conductor.

251.18 Lightning Protection Systems. The lightning protection system ground terminals shall be bonded to the building or structure grounding electrode system.

FPN No.1: See 250.60 for use of air terminals. For further information, see NFPA 780-2004. Standard for the Installation of Lightning Protection Systems, which contains detailed information on grounding, bonding, and spacing from lightning protection systems.

FPN No. 2: Metal raceways, enclosures, frames, and other non-current-carrying metal parts of electric equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780-2004, Standard for the Installation of Lightning Protection Systems. Separation from lightning protection conductors is typically 1.8 m
(6 ft.) through air or 900 mm (3 ft.) through dense material such as concrete, brick, or wood.

Substantiation: This new section defines bonding with physical requirements for connection integrity of all conductive surface interfaces. (i.e. new installation rules that eliminate substandard assembly habits from “loose” interpretation of bonding and quality work.)

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The proposed new Article 251 does not add clarity or improve usability in the NEC. Bonding requirements are covered with Article 250 which covers both grounding and bonding. See Proposal 5-49. The submitter has not provide technical substantiation for the introduction of new terminology. The submitter has not identified the material that has been extracted from that which is new or any substantiation for new material.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

ARTICLE 280 — SURGE ARRESTERS

5-335 Log #2599 NEC-P05 **Final Action: Accept in Principle**
(280)

TCC Action: The Technical Correlating Committee advises that Article Scope statements and Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

Submitter: Joseph P. DeGregoria, Underwriters Laboratories Inc.

Recommendation: Revise text to read:

ARTICLE 280 Surge Arresters , 1 kV and Over

I. General.

280.1 Scope. This article covers general requirements, installation requirements, and connection requirements for surge arresters installed on premises wiring systems.

~~280.2 Definition.~~

~~Surge Arrester. A protective device for limiting surge voltages by discharging or bypassing surge current, and it also prevents continued flow of follow current while remaining capable of repeating these functions.~~

280.3 Number Required. Where used at a point on a circuit, a surge arrester shall be connected to each ungrounded conductor. A single installation of such surge arresters shall be permitted to protect a number of interconnected circuits, provided that no circuit is exposed to surges while disconnected from the surge arresters.

~~280.4 Surge Arrester Selection.~~

~~(A) Circuits of Less Than 1000 Volts. Surge arresters installed on a circuit of less than 1000 volts shall comply with all of the following:~~

~~(1) The rating of the surge arrester shall be equal to or greater than the maximum continuous phase-to-ground power frequency voltage available at the point of application.~~

~~(2) Surge arresters installed on circuits of less than 1000 volts shall be listed.~~

~~(3) Surge arresters shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current tis in excess of that rating.~~

~~(4) Surge arresters shall not be installed on ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems.~~

~~(B) Circuits of 1 kV and Over~~ 280.4 Silicon Carbide Types. The rating of a silicon carbide-type surge arrester shall be not less than 125 percent of the maximum continuous phase-to-ground voltage available at the point of application.

FPN No. 1: For further information on surge arresters, see ANSI/IEEE C62.1-1989, Standard for Gapped Silicon-Carbide Surge Arresters for AC Power Circuits; ANSI/IEEE C62.2-1987, Guide for the Application of Gapped Silicon-Carbide Surge Arresters for Alternating-Current Systems; ANSI/IEEE C62.11-199 9 ~~3~~ , Standard for Metal Oxide Surge Arresters for Alternating-Current Power Circuits (> 1 kV) ; and ANSI/IEEE C62.22-199 7 ~~1~~ , Guide for the Application of Metal-Oxide Surge Arresters for Alternating-Current Systems.

FPN No. 2: The selection of a properly rated metal oxide arrester is based on considerations of maximum continuous operating voltage and the magnitude and duration of over voltages at the arrester location as affected by phase-to-ground faults, system grounding techniques, switching surges, and other causes. See the manufacturer’s application rules for selection of the specific arrester to be used at a particular location.

280.5 Listing. A surge arrester shall be a listed device.

II. Installation.

280.11 Location. Surge arresters shall be permitted to be located indoors or outdoors. Surge arresters shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.

280.12 Routing of Surge Arrester Connections. The conductor used to connect the surge arrester to line or bus and to ground shall not be any longer than necessary and shall avoid unnecessary bends.

III. Connecting Surge Arresters.

280.21 Installed at Services ~~of Less Than 1000 Volts~~ . ~~Line and ground connecting conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.~~ The arrester grounding conductor shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

~~280.22 Installed on the Load Side Services of Less Than 1000 Volts. Line and ground connecting conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum. A surge arrester shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the surge arrester during a surge.~~

280.23 ~~Circuits of 1 kV and Over~~ Surge-Arrester Conductors. The conductor between the surge arrester and the line and the surge arrester and the grounding connection shall not be smaller than 6 AWG copper or aluminum.

~~280.24 Circuits of 1 kV and Over~~ Interconnections. The grounding conductor of a surge arrester protecting a transformer that supplies a secondary distribution system shall be interconnected as specified in 280.24(A), (B), or (C).

(A) Metallic Interconnections. A metallic interconnection shall be made to the secondary grounded circuit conductor or the secondary circuit grounding conductor provided that, in addition to the direct grounding connection at the surge arrester, the following occurs:

(1) The grounded conductor of the secondary has elsewhere a grounding connection to a continuous metal underground water piping system. However, in urban water-pipe areas where there are at least four water-pipe connections on the neutral and not fewer than four such connections in each mile of neutral, the metallic interconnection shall be permitted to be made to the secondary neutral with omission of the direct grounding connection at the surge arrester.

(2) The grounded conductor of the secondary system is a part of a multiground neutral system or static wire of which the primary neutral or static wire has at least four ground connections in each mile of line in addition to a ground at each service.

(B) Through Spark Gap or Device. Where the surge arrester grounding conductor is not connected as in 280.24(A) or where the secondary is not grounded as in 280.24(A) but is otherwise grounded as in 250.52, an interconnection shall be made through a spark gap or listed device as follows:

(1) For ungrounded or unigrounded primary systems, the spark gap or listed device shall have a 60-Hz breakdown by voltage of at least twice the primary circuit voltage but not necessarily more than 10 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge arrester grounding electrode.

(2) For multigrounded neutral primary systems, the spark gap or listed device shall have a 60-Hz breakdown of not more than 3 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge arrester grounding electrode.

(C) By Special Permission. An interconnection of the surge arrester ground and the secondary neutral, other than as provided in 280.24(A) or (B), shall be permitted to be made only by special permission.

280.25 Grounding. Except as indicated in this article, surge arrester grounding connections shall be made as specified in Article 250. Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

Substantiation: This is one of several related proposals affecting Articles 100, 230, 250, 280, 285, 501, and 502 based on the following:

1) UL intends to combine the categories of Surge Arresters (Article 280) and Transient Voltage Surge Suppressors (Article 285) into one category and Standard, UL 1449, renamed Surge Protective Devices(SPDs).

UL 1449 will include SPD designations Type 1 and Type 2 for permanently connected devices for use on circuits not exceeding 600 V.

The technology of both low voltage Surge Arresters and TVSSs are now basically the same, thereby justifying coverage under one Standard, UL 1449, and one test program with consideration given to the installation location on the line side (Type 1) or load side (Type 2) of the service disconnect overcurrent protection.

2) The Surge Arrester designation will only be retained for devices used in circuits of 1 kV and over and evaluated to IEEE C62.11-1999.

Panel Meeting Action: Accept in Principle

Revise the recommendation to read as follows:

ARTICLE 280 Surge Arresters , Over 1 kV

I. General

280.1 Scope. This article covers general requirements, installation requirements, and connection requirements for surge arresters installed on premises wiring systems over 1 kV.

~~280.2 Definition.~~
~~Surge Arrester. A protective device for limiting surge voltages by discharging or bypassing surge current, and it also prevents continued flow of follow current while remaining capable of repeating these functions.~~

280.2 Uses Not Permitted. A surge arrester shall not be installed where the rating of the surge arrester is less than the maximum continuous phase-to-ground power frequency voltage available at the point of application.

280.3 Number Required. Where used at a point on a circuit, a surge arrester shall be connected to each ungrounded conductor. A single installation of such surge arresters shall be permitted to protect a number of interconnected circuits, provided that no circuit is exposed to surges while disconnected from the surge arresters.

~~280.4 Surge Arrester Selection.~~
~~(A) Circuits of Less Than 1000 Volts. Surge arresters installed on a circuit of less than 1000 volts shall comply with all of the following:~~
~~(1) The rating of the surge arrester shall be equal to or greater than the maximum continuous phase-to-ground power frequency voltage available at the point of application.~~
~~(2) Surge arresters installed on circuits of less than 1000 volts shall be listed.~~
~~(3) Surge arresters shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating.~~
~~(4) Surge arresters shall not be installed on ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems.~~
~~(B) Circuits of 1 kV and Over —~~

280.4 Surge Arrester Selection. The surge arresters shall comply with all of the following:

(A) The rating of a surge arrester shall be equal to or greater than the maximum continuous phase-to-ground voltage available at the point of application.

(B) Silicon Carbide Types. The rating of a silicon carbide-type surge arrester shall be not less than 125 percent of the maximum continuous phase-to-ground voltage available at the point of application.

FPN No. 1: For further information on surge arresters, see ANSI/IEEE C62.1-1989, Standard for Gapped Silicon-Carbide Surge Arresters for AC Power Circuits; ANSI/IEEE C62.2-1987, Guide for the Application of Gapped Silicon-Carbide Surge Arresters for Alternating-Current Systems; ANSI/IEEE C62.11-199 9 ~~3~~ , Standard for Metal-Oxide Surge Arresters for Alternating-Current Power Circuits (> 1kV) ; and ANSI/IEEE C62.22-199 7 ~~1~~ , Guide for the Application of Metal-Oxide Surge Arresters for Alternating-Current Systems.

FPN No. 2: The selection of a properly rated metal oxide arrester is based on considerations of maximum continuous operating voltage and the magnitude and duration of overvoltages at the arrester location as affected by phase-to-ground faults, system grounding techniques, switching surges, and other causes. See the manufacturer's application rules for selection of the specific arrester to be used at a particular location.

280.5 Listing. A surge arrester shall be a listed device.

II. Installation

280.11 Location. Surge arresters shall be permitted to be located indoors or outdoors. Surge arresters shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.

280.12 Routing of Surge Arrester Grounding Conductors ~~Connections~~ . The conductor used to connect the surge arrester to line, bus, or equipment and to a grounding conductor connection point as provided in 280.21 ~~ground~~ shall not be any longer than necessary and shall avoid unnecessary bends.

III. Connecting Surge Arresters

280.21 Connection ~~of Less Than 1000 Volts.~~
~~Line and ground connecting conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.~~ The arrester grounding conductor shall be connected to one of the following:

(1) Grounded service conductor
(2) Grounding electrode conductor
(3) Grounding electrode for the service
(4) Equipment grounding terminal in the service equipment

~~280.22 Installed on the Load Side Services of Less Than 1000 Volts.~~
~~Line and ground connecting conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum. A surge arrester shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the surge arrester during a surge.~~

280.23 ~~Circuits of 1 kV and Over —~~ Surge-Arrester Conductors. The conductor between the surge arrester and the line and the surge arrester and the grounding connection shall not be smaller than 6 AWG copper or aluminum.

280.24 ~~Circuits of 1 kV and Over —~~ Interconnections.
The grounding conductor of a surge arrester protecting a transformer that supplies a secondary distribution system shall be interconnected as specified in 280.24(A), (B), or (C).

(A) Metallic Interconnections. A metallic interconnection shall be made to the secondary grounded circuit conductor or the secondary circuit grounding conductor provided that, in addition to the direct grounding connection at the surge arrester, the following occurs:

(1) The grounded conductor of the secondary has elsewhere a grounding connection to a continuous metal underground water piping system. However, in urban water-pipe areas where there are at least four water-pipe connections on the neutral conductor and not fewer than four such connections in each mile of neutral conductor, the metallic interconnection shall be permitted to be made to the secondary neutral conductor with omission of the direct grounding connection at the surge arrester.

(2) The grounded conductor of the secondary system is a part of a multiground neutral system or static wire of which the primary neutral conductor or static wire has at least four ground connections in each mile of line in addition to a ground at each service.

(B) Through Spark Gap or Device. Where the surge arrester grounding conductor is not connected as in 280.24(A) or where the secondary is not grounded as in 280.24(A) but is otherwise grounded as in 250.52, an interconnection shall be made through a spark gap or listed device as follows:

(1) For ungrounded or unigrounded primary systems, the spark gap or listed device shall have a 60-Hz breakdown voltage of at least twice the primary circuit voltage but not necessarily more than 10 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge arrester grounding electrode.

(2) For multigrounded neutral primary systems, the spark gap or listed device shall have a 60-Hz breakdown of not more than 3 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge arrester grounding electrode.

(C) By Special Permission. An interconnection of the surge arrester ground and the secondary neutral conductor, other than as provided in 280.24(A) or (B), shall be permitted to be made only by special permission.

280.25 Grounding Conductor Connections and Enclosures. Except as indicated in this article, surge arrester grounding conductor connections shall be made as specified in Article 250, Parts III and X. ~~Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure~~ . Grounding conductors installed in metal enclosures shall comply with 250.64(E).

Panel Statement: The panel accepts concepts and some proposed text from proposals 5-336, 5-337, 5-344, 5-345, 5-347, 5-348. The definitions were moved to Article 100 by action on Proposal 5-340. Revised text for clarity and to correlate with revisions from other proposals. The panel understands that the article title and scope statement in this revised article is under the purview of the Technical Correlating Committee.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

STEINMAN, G.: Silicon Carbide Type arresters have not been manufactured for several years. Presently, only metal oxide arresters are available for new installations or upgrading of existing installations.

In 280.4 delete all present text for (B) and replace this text with that of FPN No. 2, changing the first sentence to read: "The selection of a properly rated metal oxide arrester shall be based on the maximum continuous operating voltage and the magnitude and duration of overvoltage at the arrester location as affected by phase-to-ground faults, system grounding techniques, switching surges, and other causes." Delete FPN No. 2.

Revise FPN No. 1 by deleting all text referring to C62.1 and C62.2. Correct the year of C62.11 to be C62.11-2005.

Revise text of 280.12 by deleting "Grounding" in the title as the text refers to line and ground conductors.

Delete new 280.5 requiring listing of surge arresters.

These arresters are not presently listed. There was no substantiation provided to demonstrate listing is required or serves a safety purpose.

280.11 requires these be installed inaccessible to unqualified persons.

Presently, there are no listed surge arresters. A listing requirement will preclude use of surge arresters in premises wiring systems, leaving these systems subject to damage from lighting and switching surge voltages. These arresters are supplied in large numbers to electric utilities and only a small number (less than 0.1%) are installed in premises wring systems. The vast utility experience shows no value in listing.

5-336 Log #1208 NEC-P05 **Final Action: Accept in Principle in Part (280 and 285)**

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.

Recommendation: Revise Article 280 as follows. Article 285 should be removed:

I. General.

280.1 Scope. This article covers general requirements, installation requirements, and connection requirements for surge protective devices (SPDs) installed on premises wiring systems. SPDs include both secondary surge arresters (Type 1 SPDs) and panel type TVSS devices (Type 2 SPDs).

Type 1 - Permanently connected SPD intended for installation between the secondary of the distribution transformer and the line side of the service disconnect overcurrent device, including the watt-hour meter socket enclosures.

Type 2 - Permanently connected SPD intended for installation on the load side of the service disconnect overcurrent device at the branch panel, utilization equipment, etc.

280.2 Definition.

Surge Protective Device (SPD). An assembly of one or more component(s) intended to limit or divert surges. The device contains at least one nonlinear component.

280.3 Number Required. Where used at a point on a circuit, the SPD shall be connected to each ungrounded conductor.

280.4 Listing. A SPD shall be a listed device.

280.5 Short Circuit Current Rating. The SPD shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating. This marking requirement shall not apply to receptacles.

280.6 SPD Selection.

(A) Circuits of less than 1000 Volts. SPDs installed on a circuit of less than 1000 volts shall comply with all of the following:

(1) The rating of an SPD shall be equal to or greater than the maximum continuous phase-to-ground power frequency voltage available at the point of application.

(2) SPDs shall not be installed on ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems.

(B) Circuits of 1 kV and Over — Silicon Carbide Types. The rating of a silicon carbide-type surge arrester shall be not less than 125 percent of the maximum continuous phase-to-ground voltage available at the point of application.

FPN No. 1: For further information on surge arrestors, see ANSI/IEEE 6211-1989, Standard for Gapped Silicon-Carbide Surge Arresters for AC Power Circuits; ANSI/IEEE C62.21-1987, Guide for the Application of Gapped Silicon - Carbide Surge Arresters for Alternating-current Systems; ANSI/IEEE C62.11-1993, Standard for Metal-Oxide SPDs for Alternating-Current Power Circuits; and ANSI/IEEE C62.22-1991, Guide for the Application of Metal-Oxide SP's for Alternating-Current Systems.

FPN No. 2; The selection of a properly rated metal oxide arrester is based on considerations of maximum continuous operating voltage (MCOV) and the magnitude and duration of Temporary Overvoltages at the arrester location as affected by phase-to ground faults, system grounding techniques, switching surges and other causes. See the manufacturer's application rules for selection of the specific SPD to be used at a particular location.

II. Installations.

280.11 Location. SPDs shall be permitted to be located indoors or outdoors. SPDs shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.

280.12 Routing of SPD Connections. The conductor used to connect the SPD to line or bus and to ground shall not be longer than necessary and shall avoid unnecessary bends.

280.13 Where the rating of the SPD is less than the maximum continuous phase-to-ground power frequency voltage available at the point of application.

III. Connecting SPDs

280.21 Installed at Services of Less Than 1000 Volts. Line and ground connecting conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum. The arrester grounding conductor shall be connected to one of the following:

(1) Grounded service conductor
(2) Grounding electrode conductor
(3) Grounding electrode for the service
(4) Equipment grounding terminal in the service equipment

280.22 Installed on the Load Side Services of Less than 1000 Volts. A Surge Arrestor (Type 1) SPD shall be permitted to be connected between any two conductors ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the surge arrester during a surge.

280.23 Circuits of 1 kV and Over — Surge-Arrester Conductors. The conductor between the surge arrester and the line and the surge arrester and the grounding connection shall not be smaller than 6 AWG copper or aluminum.

280.24. Circuits of 1 kV and Over — Interconnections. The grounding conductor of a surge arrester protecting a transformer that supplies a secondary distribution system shall be interconnected as specified in 280.24(A), (B), or (C).

(A) Metallic Interconnections. A metallic interconnection shall be made to the secondary grounded circuit conductor or the secondary circuit grounding conductor provided that, in addition to the direct grounding connection at the surge arrester, the following occurs:

(1) The grounded conductor of the secondary has elsewhere a grounding connection to a continuous metal underground water piping system. However, in urban water-pipe areas where there are at least four water-pipe connections on the neutral and not fewer than four such connections in each mile of neutral, the metallic interconnection shall be permitted to be made to the secondary neutral with omission of the direct grounding connection at the surge arrester.

(2) The grounded conductor of the secondary system is a part of a multiground neutral system or static wire of which the primary neutral or static wire has at least four ground connections in each mile of line in addition to a ground at each service.

(B) Through Spark Gap or Device. Where the surge arrester grounding conductor is not connected as in 280.24(A) or where the secondary is not grounded as in 280.24(A) but is otherwise grounded as in 250.52, an interconnection shall be made though a spark gap or listed device as follows:

(1) For ungrounded or ungrounded primary systems, the spark gap or listed device shall have a 60-Hi breakdown voltage of at least twice the primary circuit voltage but not necessarily more than 10 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distance from the surge arrester grounding electrode.

(2) For ungrounded neutral primary systems, the spark gap or listed device shall have a 60-Hz breakdown of not more than 3 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distance from the surge arrester grounding electrode.

(C) By Special Permission. An interconnection of the surge arrester ground and the secondary neutral, other than as provided in 280.24(A) or (B) shall be permitted to be made only by special permission.

280.25 Grounding. Except as indicated in this article, surge arrester grounding connections shall be made as specified in Article 250. Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

FPN: For further information on TVSS Type SPD's see NEMA LS-1; 1992. Standard for Low Voltage Surge Suppression Devices. The selection of a properly rated SPD is based on criteria such as maximum continuous operating voltage the magnitude and duration of the overvoltages at the suppressor location as affected by phase-to-ground faults, system grounding techniques and switching surges.

III. Connecting Transient voltage Surge Suppressors.

280.21 Connection. Where an SPD (Type 2) is installed, it shall be connected as follows:

(A) Location.

(1) Service Supplied Building or Structure. The transient voltage surge suppressor shall be connected on the load side of a service disconnect overcurrent device required in 230.91, unless installed in accordance with 230.82(8).

(2) Feeder Supplied Building or Structure. The transient voltage surge suppressor shall be connected on the load side of the first overcurrent device at the building or structure.

(3) Separately Derived System. The SPD (Type 2) shall be connected on the load side of the first overcurrent device in a separately derived system.

(B) Conductor Size. Line and ground connecting conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.

(C) Connection Between Conductors. A SPD shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the TVSS during a surge.

285.25 Grounding. Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

Substantiation: The UL 1449 3rd edition is combing Surge Arrestors with TVSS into one standard and all devices are Surge Protective Devices (SPDs). A surge arrestor is a Type 1 SPD and a Panel Type Hard Wired TVSS is a type 2 SP. The NEC should be changed also to harmonize with UL.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: Accepting the concept for addition and use of term "SPDs". Rejecting the part to combine Articles 280 and 285 into one article. The panel concludes that the application of surge arresters for systems over 1 kV and the associated products designed and constructed to the ANSI/IEEE standards should be kept separate from the application and SPD listed to UL 1449 for systems 1 kV and under. See panel action and statement Proposal 5-335.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-337 Log #1534 NEC-P05 **Final Action: Accept in Principle**
(280 and 285)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Revise Articles 280 and 285 as described in the following, relative to the terms bonding and grounding.

280.12 Revise the title and this section as follows:

280.12 Routing of Surge Arrester <u>Grounding Conductor</u> ~~Connections~~

The conductor used to connect the surge arrester to line or bus and <u>to a grounding conductor connection point as provided in 280.21 or 280.22</u> shall not be any longer than necessary and shall avoid unnecessary bends.

280.21 Revise this section as follows:

Revise this section as follows:

280.21 Installed at Services of Less Than 1000 Volts. Line and ground <u>ing</u> ~~connecting~~ conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum. The arrester grounding conductor shall be connected to one of the following:

280.22 Revise 280.22 as follows:

280.22 Installed on the Load Side Services of Less Than 1000 Volts. Line and ground <u>ing</u> ~~connecting~~ conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum. A surge arrester shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the surge arrester during a surge.

280.25 Revise this section as follows:

280.25 Grounding <u>Conductor Connections and Enclosures.</u> Except as indicated in this article, surge arrester grounding <u>conductor</u> connections shall be made as specified in Article 250. Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

285.21(B) Revise this section as follows:

(B) Conductor Size. Line and ground <u>ing</u> ~~connecting~~ conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.

285.25 Revise the title of 285.25 as follows:

285.25 Grounding <u>Conductor Enclosures.</u> Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

Substantiation: 280.12: The proposed revision title and section is intended to clarify what is specifically covered in this section. This section covers both the surge arrester grounding conductor connection and its routing.

280.21: The proposed revision in this section is intended to clarify what is specifically covered in this section. This section covers both the surge arrester line conductor and the surge arrester grounding conductor.

280.22: The proposed revision in this section is intended to clarify what is specifically covered in this section. This section covers both the surge arrester line conductor and the surge arrester grounding conductor.

280.25: The proposed revision title and section is intended to clarify what is specifically covered in this section. This section covers both the surge arrester grounding conductor connections and installations in metal enclosures.

285.21(B): The proposed revision in this section is intended to clarify what is specifically covered in this section. This section covers both the surge arrester line conductor and the surge arrester grounding conductor.

285.25: The word grounding in the title of this section is too broad in coverage in its current form. This section provides the rules for surge arrester grounding conductor enclosures.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement Proposal 5-335 and 5-349.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRENDER, D.: This proposal references two different code Articles, a violation of the instructions for submitting proposals and Section 4.3.3 of the Regulations Governing Committee Projects.

5-338 Log #508 NEC-P05 **Final Action: Reject**
(280.1, FPN (New))

Submitter: Technical Committee on Lightning Protection,

Recommendation: Add the following FPN following the text of 280.1:

FPN: NFPA 780-2004, Standard for the Installation of Lightning Protection Systems, requires surge protective devices to be installed at all power service entrances and at entrances of signal, data, CATV, and communication lines at facility entrances.

Substantiation: Premises wiring systems are often designed and installed without consideration of the possibility that a lightning protection system could be installed. NFPA 780 provides design requirements for surge protection installed as a part of a lightning protection system. The proposed change would alert architects and engineers, electrical system designers, electrical inspectors and other authorities having jurisdiction to what will be required should lightning protection system installation be considered. The design and installation of the surge protection system is most efficiently and economically accomplished as a part of the electrical system design and installation effort.

Panel Meeting Action: Reject

Panel Statement: Adding this fine print note is confusing and is not necessary to clarify the scope of Article 280.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-339 Log #509 NEC-P05 **Final Action: Reject**
(280.2)

Submitter: Technical Committee on Lightning Protection,

Recommendation: Add Section 280.2 as follows:

In buildings provided with a lightning protection system, surge protection shall comply with the design requirements provided in NFPA 780-2004, Standard for the Installation of Lightning Protection Systems. Renumber remaining sections.

Substantiation: NFPA 780 provides design levels for surge protection devices that are to be installed, in accordance with Article 280, for the purpose of providing protection from the direct and indirect effects of lightning. The design and installation of the surge protection system is most efficiently and economically accomplished as a part of the electrical system design and installation effort. This change would ensure that the necessary surge protective levels have been designed and installed as a part of the initial installation and save any costly retrofits to the electrical system during the lightning protection system installation. Such a change would also go a long way in resolving jurisdictional issues associated with the installation of surge protection hardware for the purpose of lightning protection.

Panel Meeting Action: Reject

Panel Statement: The NEC Style Manual prohibits having references to other standards in prescriptive text.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

5-340 Log #2601 NEC-P05 **Final Action: Accept in Principle**
(280.2.Surge Arrester, Surge Protective Devices (SPDs))

Submitter: Joseph P. DeGregoria, Underwriters Laboratories Inc.
Recommendation: Add new definitions to Article 100 to read:
Surge Arrester. A protective device for limiting surge voltages by discharging or bypassing surge current, and it also prevents continued flow of follow current while remaining capable of repeating these functions.
Surge Protective Devices (SPDs). A protective device for limiting transient voltages by diverting or limiting surge current; it also prevents continued flow of follow current while remaining capable of repeating these functions and designated as follows:
Type 1. Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service disconnect overcurrent device, including watt-hour meter socket enclosures.
Type 2. Permanently connected SPDs intended for installation on the load side of the service disconnect overcurrent device; including SPDs located at the branch panel.
FPN No. 1: For further information on Type 1 and Type 2 SPDs, see UL 1449, Standard for Surge Protective Devices.
Delete the following section:
~~280.2 Definition. Surge Arrester. A protective device for limiting surge voltages by discharging or bypassing surge current, and it also prevents continued flow of follow current while remaining capable of repeating these functions.~~
Substantiation: Move Surge Arrester definition, referenced in several articles, from 280.2 to Article 100.
Add definition for surge protective device (replacing the term transient voltage surge suppressor in 285.2), referenced in several articles, to Article 100.
This is one of several related proposals affecting Articles 100, 230, 250, 280, 285, 501, and 502 based on the following:
1) UL intends to combine the categories of Surge Arresters (Article 280) and Transient Voltage Surge Suppressors (Article 285) into one category and Standard, UL 1449, renamed Surge Protective Devices(SPDs).
UL 1449 will include SPD designations Type 1 and Type 2 for permanently connected devices for use on circuits not exceeding 600 V.
The technology of both low voltage Surge Arresters and TVSSs are now basically the same, thereby justifying coverage under one Standard, UL 1449, and one test program with consideration given to the installation location on the line side (Type 1) or load side (Type 2) of the service disconnect overcurrent protection.
2) The Surge Arrester designation will only be retained for devices used in circuits of 1 kV and over and evaluated to IEEE C62.11-1999.
Panel Meeting Action: Accept in Principle
Add the following definitions to Article 100
Surge Arrester. A protective device for limiting surge voltages by discharging or bypassing surge current, and it also prevents continued flow of follow current while remaining capable of repeating these functions.
Surge Protective Devices (SPDs) A protective device for limiting transient voltages by diverting or limiting surge current; it also prevents continued flow of follow current while remaining capable of repeating these functions and designated as follows:
Type 1- Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service disconnect overcurrent device.
Type 2- Permanently connected SPDs intended for installation on the load side of the service disconnect overcurrent device; including SPDs located at the branch panel.
Type 3 – Point of utilization SPDs.
Type 4 – Component SPDs, including descrete components, as well as assemblies.
FPN No. 1 For further information on Type 1, Type 2, Type 3, and Type 4 SPDs, see UL 1449, Standard for Surge Protective Devices.
Move Surge Arrester definition, referenced in several articles, from Section 280.2 to Article 100.

Panel Statement: Add definition for surge protective device (replacing the term transient voltage surge suppressor in article 285.2), referenced in several articles, to Article 100.
This is one of several related proposals affecting Articles 100, 230, 250, 280, 285, 501 and 502.
See panel action and statement proposal 5-335 and 5-349.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-341 Log #1258 NEC-P05 **Final Action: Reject**
(280.4)

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.
Recommendation: Revise as follows:
280.4 Surge Arrestor Selection.
(A) Circuits of Less than 1000 Volts. Surge arrestor installed on a circuit less than 1000 volts shall comply with all of the following:
(5) Surge Arrestors shall not be contained within an enclosure containing overcurrent protective devices.
Substantiation: Surge arrestors contain combustible materials (metal oxide varistors) that produce conductive smoke (carbon residue) in an overvoltage failure mode that could increase the risk of an arc flash. UL permits the release of conductive residue following the results of the surge arrestors tests and this conductive residue can lead to arc flash within an energized enclosure containing overcurrent protective devices. The section was numbered for ease of use.
Panel Meeting Action: Reject
Panel Statement: No technical substantiation was provided to document the conditions identified by the submitter have actually occurred in the field or from documented testing, such as through a fact finding report. SPDs have been tested within panels containing overcurrent devices as part of the listing process and no evidence of the type failure identified has occurred during this process.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-342 Log #1665 NEC-P05 **Final Action: Reject**
(280.4(A)(4) and 285.3(2))

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.
Recommendation: Revise text to read as follows:
280.4(A)(4) Surge Arrestors shall not be installed on ungrounded systems or impedance grounded systems unless listed specifically for use on these systems. SPDs intended for use on an ungrounded system and provided with a L-G mode of protection, shall have the mode rated at the L-L voltage minimum.
285.3(2) On ungrounded systems or impedance grounded systems unless listed specifically for use on these systems. SPDs intended for use on an ungrounded system and provided with a L-G mode of protection, shall have the mode rated at the L-L voltage minimum.
Substantiation: This section was numbered for ease of use.
Panel Meeting Action: Reject
Panel Statement: The proposal does not meet the requirements set forth in Section 4-3.3 of the NFPA Regulations Governing Committee Projects. There is no substantiation to make these technical changes.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-343 Log #3475 NEC-P05 **Final Action: Accept in Principle**
(280.21)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
280.21 ~~Installed at Services of Less Than 1000 Volts~~ Connection
(A) Location.
(1) Service Supplied Building or Structure. The surge arrester is allowed to be connected on the line side of the service disconnect overcurernt device or on the load side of services of less than 1000 volts. Line and ground, etc.
Substantiation: This article needs rewording in order to stay consistent with wording in Article 285.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement Proposals 5-335 and 5-349.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-344 Log #1586 NEC-P05 **Final Action: Accept in Principle**
(280.24(A)(1))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 280.24(A)(1):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(1) The grounded conductor of the secondary has elsewhere a grounding connection to a continuous metal underground water piping system. However, in urban water-pipe areas where there are at least four water-pipe connections on the neutral conductor and not fewer than four such connections in each mile of neutral conductor , the metallic interconnection shall be permitted to be made to the secondary neutral conductor , with omission of the direct grounding connection at the surge arrester.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word ”neutral” as a noun should be avoided. The terms “neutral conductor” or “neutral point” should be used wherever grammatically possible.

● The phrase “grounded circuit conductor (neutral)” should be avoided. The phrases “grounded circuit conductor” or “grounded circuit conductor or neutral conductor” should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement Proposals 5-335 and 5-349.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-345 Log #1587 NEC-P05 **Final Action: Accept in Principle**
(280.24(A)(2))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of “Neutral Conductor” for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 280.24(A)(2):

Change “neutral” to “neutral conductor.”

The revised text would appear as follows:

(2) The grounded conductor of the secondary system is a part of a multiground neutral system or static wire of which the primary neutral <u>conductor</u> or static wire has at least four ground connections in each mile of line in addition to a ground at each service.

Substantiation: This proposal was developed by the TCC Task Group on the definition of “Neutral Conductor.” Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word ”neutral” as a noun should be avoided. The terms “neutral conductor” or “neutral point” should be used wherever grammatically possible.

● The phrase “grounded circuit conductor (neutral)” should be avoided. The phrases “grounded circuit conductor” or “grounded circuit conductor or neutral conductor” should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement Proposal 5-335.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-346 Log #1588 NEC-P05 **Final Action: Accept in Principle**
(280.24(C))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of “Neutral Conductor” for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 280.24(C):

Change “neutral” to “neutral conductor.”

The revised text would appear as follows:

(C) By Special Permission. An interconnection of the surge arrester ground and the secondary neutral <u>conductor</u> , other than as provided in 280.24(A) or (B), shall be permitted to be made only by special permission.

Substantiation: This proposal was developed by the TCC Task Group on the definition of “Neutral Conductor.” Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word ”neutral” as a noun should be avoided. The terms “neutral conductor” or “neutral point” should be used wherever grammatically possible.

● The phrase “grounded circuit conductor (neutral)” should be avoided. The phrases “grounded circuit conductor” or “grounded circuit conductor or neutral conductor” should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement Proposal 5-335.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-347 Log #802 NEC-P05 **Final Action: Accept in Principle**
(280.25)

Submitter: Joe Tedesco, Boston, MA
Recommendation: Delete the last sentence in 280.25:

“Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.” and replace with the following:

“Ferrous metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode and shall be securely fastened to the ground clamp or fitting. Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor.

Bonding shall apply at each end and to all intervening ferrous raceways, boxes, and enclosures between the service equipment and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than, the required enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.”

Substantiation: Because it is a better rule, and includes the important new changes made in Article 250 in the last edition.

A FPN could do the same, but I feel that adding the words will be easily understood by Code Scholars and users of the NEC.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement Proposals 5-335 and 5-349.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-348 Log #3474 NEC-P05 **Final Action: Accept in Principle**
(280.25)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:

280.25 Grounding. Except as indicated in this article, surge arrester grounding connections shall be made as specified in Article 250. <u>Single</u> grounding <u>electrode</u> conductors shall not be run in metal enclosures <u>or raceways</u> unless bonded to both ends of such enclosures <u>or raceway made of ferrous material</u> .

Substantiation: This article needs rewording in order to clarify the whole intent of grounding and bonding of these items.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement Proposal 5-335.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

ARTICLE 285 — TRANSIENT VOLTAGE SURGE SUPPRESSORS: TYSSs

5-349 Log #2604 NEC-P05 **Final Action: Accept in Principle**
(285)

TCC Action: The Technical Correlating Committee advises that Article Scope statements and Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
Submitter: Joseph P. DeGregoria, Underwriters Laboratories Inc.
Recommendation: Revise text to read:

ARTICLE 285 Surge Protective Devices (SPDs) ~~Transient Voltage Surge Suppressors: TVSSs~~

I. General.

285.1 Scope. This article covers general requirements, installation requirements, and connection requirements for SPDs ~~transient voltage surge suppressors (TVSSs)~~ permanently installed on premises wiring systems.

~~285.2 Definition. Transient Voltage Surge Suppressor (TVSS). A protective device for limiting transient voltages by diverting or limiting surge current; it also prevents continued flow of follow current while remaining capable of repeating these functions.~~

285.3 Uses Not Permitted. A SPD ~~TVSS~~ device shall not be installed in the following:

(1) Circuits exceeding 600 volts

(2) On ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems

(3) Where the rating of the SPD ~~TVSS~~ is less than the maximum continuous phase-to-ground power frequency voltage available at the point of application

FPN: For further information on SPDs ~~TVSSs~~ , see NEMA LS 1-1992, Standard for Low Voltage Surge Suppression Devices. The selection of a properly rated SPD ~~TVSS~~ is based on criteria such as maximum continuous operating voltage, the magnitude and duration of overvoltages at the suppressor location as affected by phase-to-ground faults, system grounding techniques, and switching surges.

285.4 Number Required. Where used at a point on a circuit, the SPD ~~TVSS~~ shall be connected to each ungrounded conductor.

285.5 Listing. A SPD ~~TVSS~~ shall be a listed device.

285.6 Short Circuit Current Rating. The SPD ~~TVSS~~ shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating. This marking requirement shall not apply to receptacles.

II. Installation.

285.11 Location. SPDs ~~TVSSs~~ shall be permitted to be located indoors or outdoors and shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.

285.12 Routing of Connections. The conductors used to connect the SPD ~~TVSS~~ to the line of bus and to ground shall not be any longer than necessary and shall avoid unnecessary bends.

III. Connecting SPDs ~~Transient Voltage Surge Suppressors~~

285.21 Connection. Where a SPD ~~TVSS~~ is installed, it shall comply with 285.23 through 285.27. ~~285.21(A) through (C).~~

285.23 Type 1 SPDs

(A) Type 1 SPDs shall be connected to the supply side of the service disconnect as permitted in 230.82(4). Type 1 SPDs shall be permitted to be connected as specified in 285.24.

(B) When installed at services, the grounding conductor of a Type 1 SPD shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

285.24 Type 2 SPDs

~~(A) Location.~~

(~~1~~ A) Service Supplied Building or Structure. Type 2 SPDs ~~The transient voltage surge suppressor~~ shall be connected on the load side of a service disconnect overcurrent device required in 230.91, unless installed in accordance with 230.82(8).

(~~2~~ B) Feeder Supplied Building or Structure. Type 2 SPDs ~~The transient voltage surge suppressor~~ shall be connected at the building or structure in accordance with (1) or (2)

(1) On the load side of the first overcurrent device where the main disconnect for the building or structure consists of a circuit breaker or fused disconnect switch.

(2) On the load side of a branch circuit overcurrent protective device in the first panel where the building or structure main disconnect does not contain an overcurrent protective device. ~~on the load side of the first overcurrent device at the building or structure.~~

~~Exception to (1) and (2): Where the TVSS is also listed as a surge arrester, the connection shall be as permitted by Article 280.~~

(~~3~~ C) Separately Derived System. The SPD ~~TVSS~~ shall be connected on the load side of the first overcurrent device in a separately derived system.

~~(B)~~ 285.25 Conductor Size. Line and ground connecting conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.

~~(C)~~ 285.26 Connection Between Conductors. A SPD ~~TVSS~~ shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only the normal operation of the SPD ~~TVSS~~ during a surge.

285.2 ~~5~~ 7 Grounding. Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

Substantiation: This is one of several related proposals affecting Articles 100, 230, 250, 280, 285, 501, and 502 based on the following:

1) UL intends to combine the categories of Surge Arresters (Article 280) and Transient Voltage Surge Suppressors (Article 285) into one category and Standard, UL 1449, renamed Surge Protective Devices(SPDs).

UL 1449 will include SPD designations Type 1 and Type 2 for permanently connected devices for use on circuits not exceeding 600 V.

The technology of both low voltage Surge Arresters and TVSSs are now basically the same, thereby justifying coverage under one Standard, UL 1449, and one test program with consideration given to the installation location on the line side (Type 1) or load side (Type 2) of the service disconnect overcurrent protection.

2) The Surge Arrester designation will only be retained for devices used in circuits of 1 kV and over and evaluated to IEEE C62.11-1999.

Panel Meeting Action: Accept in Principle

ARTICLE 285 Surge Protective Devices (SPDs) 1kV or less ~~Transient Voltage Surge Suppressors: TVSSs~~

I. General

285.1 Scope. This article covers general requirements, installation requirements, and connection requirements for SPDs ~~transient voltage surge suppressors (TVSSs)~~ permanently installed on premises wiring systems 1 kV or less .

FPN: Transient Voltage Surge Suppressors (TVSSs) are also known as SPDs.

~~285.2 Definition. Transient Voltage Surge Suppressor (TVSS). A protective device for limiting transient voltages by diverting or limiting surge current; it also prevents continued flow of follow current while remaining capable of repeating these functions.~~

285.3 Uses Not Permitted. A SPD ~~TVSS~~ device shall not be installed in the following:

(1) Circuits exceeding ~~600~~ 1 kV ~~volts~~

(2) On ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems.

(3) Where the rating of the SPD ~~TVSS~~ is less than the maximum continuous phase-to-ground power frequency voltage available at the point of application

FPN: For further information on SPDs ~~TVSSs~~ , see NEMA LS 1-1992, Standard for Low Voltage Surge Suppression Devices. The selection of a properly rated SPD ~~TVSS~~ is based on criteria such as maximum continuous operating voltage, the magnitude and duration of overvoltages at the suppressor location as affected by phase-to-ground faults, system grounding techniques, and switching surges.

285.4 Number Required.
Where used at a point on a circuit, the SPD ~~TVSS~~ shall be connected to each ungrounded conductor.

285.5 Listing. A SPD ~~TVSS~~ shall be a listed device.

285.6 Short Circuit Current Rating. The SPD ~~TVSS~~ shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating. This marking requirement shall not apply to receptacles.

II. Installation

285.11 Location. SPDs ~~TVSSs~~ shall be permitted to be located indoors or outdoors and shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.

285.12 Routing of Connections. The conductors used to connect the SPD ~~TVSS~~ to the line or bus and to ground shall not be any longer than necessary and shall avoid unnecessary bends.

III. Connecting SPDs ~~Transient Voltage Surge Suppressors~~

285.21 Connection. Where a SPD ~~TVSS~~ device is installed, it shall comply with 285.23 through 285.28. ~~285.21(A) through (C)~~ .

285.23 Type 1 SPDs. Type 1 SPDs shall be installed in accordance with 285.23(A) and 285.23(B)

(A) Installation. Type 1 SPDs shall installed as follows:

(1) Type 1 SPDs shall be permitted to be connected to the supply side of the service disconnect as permitted in 230.82(4) or
(2) Type 1 SPDs shall be permitted to be connected as specified in 285.24.

(B) At the Service. When installed at services, the grounding conductor of a Type 1 SPD shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

285.24 Type 2 SPDs. Type 2 SPDs shall be installed in accordance with 285.24(A) through 285.24(C).

~~(A) Location~~ .
(~~1~~ A) Service Supplied Building or Structure. Type 2 SPDs ~~The transient voltage surge suppressor~~ shall be connected anywhere on the load side of a service disconnect overcurrent device required in 230.91, unless installed in accordance with 230.82(8).

(~~2~~ B) Feeder Supplied Building or Structure. Type 2 SPDs ~~The transient voltage surge suppressor~~ shall be connected at the building or structure in accordance with (1) or (2)
(1) Anywhere on the load side of the first overcurrent device where the main disconnect for the building or structure consists of a circuit breaker or fused disconnect switch.
(2) Anywhere on the load side of a branch circuit overcurrent protective device in the first panel where the building or structure main disconnect does not contain an overcurrent protective device . ~~on the load side of the first overcurrent device at the building or structure.~~
~~Exception to (1) and (2): Where the TVSS is also listed as a surge arrester, the connection shall be as permitted by Article 280.~~

(~~3~~ C) Separately Derived System. The SPD ~~TVSS~~ shall be connected on the load side of the first overcurrent device in a separately derived system.

285.25 Type 3 SPDs Type 3 SPDs shall be permitted to be installed anywhere on the load side of branch circuit overcurrent protection up to the equipment served, provided the connection is a minimum 10 m (30 ft.) of conductor distance from the service panel or separately derived system.

~~(B)~~ 285.26 Conductor Size. Line and ground ing ~~connecting~~ conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.

~~(C)~~ 285.27 Connection Between Conductors. A SPD ~~TVSS~~ shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the SPD ~~TVSS~~ during a surge.

285.2 ~~5~~ 8 Grounding Conductor Connections and Enclosures . ~~Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.~~
Except as indicated in this article, SPD grounding connections shall be made as specified in Article 250, Part III. Grounding conductors installed in metal enclosures shall comply with 250.64(E).
Panel Statement: The p roposed revised text incorporating proposals 5-337, 5-343, 5-351, 5-352 and added text covering type 3 SPDs. Set the voltage level to segregate surge arresters in Article 280 to SPDs in Article 285. Revised text for clarity and to correlate with revisions from other proposals. The panel understands that the article title and scope statement in this revised article is under the purview of the Technical Correlating Committee.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-350 Log #1257 NEC-P05 **Final Action: Reject**
(285.3(4)(4))

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.
Recommendation: Revise as follows:
285.3(4) Uses Not Permitted. A TVSS device shall not be installed in the following:
(4) Within an enclosure containing overcurrent protective devices.
Substantiation: TVSS contain combustible materials (metal oxide varistors) that produce conductive smoke (carbon residue) in an overvoltage failure mode that could increase the risk of an arc flash. UL 1449 Section 37.1.7 permits the release of conductive residue following the results of the abnormal overvoltage tests and this conductive residue can lead to arc flash within an energized enclosure containing overcurrent protective devices.
The section was numbered for ease of use.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: No technical substantiation was provided to document the conditions identified by the submitter have actually occurred in the field or from documented testing, such as through a fact finding report. SPDs have been tested within panels containing overcurrent devices as part of the listing process and no evidence of the type failure identified has occurred during this process.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-351 Log #803 NEC-P05 **Final Action: Accept in Principle**
(285.25)

Submitter: Joe Tedesco, Boston, MA
Recommendation: Delete: “285.25 Grounding. Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.”
Replace with the following:
“285.25 Grounding. Ferrous metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode and shall be securely fastened to the ground clamp or fitting. Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous metal enclosures that are not physically continuous from cabinets or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor.
Bonding shall apply at each end and to all intervening ferrous raceways, boxes, and enclosures between the service equipment and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than, the required enclosed grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.”
Substantiation: To correlate with changes made in Article 250 for the 2005 NEC.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement Proposal 5-349 which includes reference to Section 250.64(E).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

5-352 Log #3473 NEC-P05 **Final Action: Accept in Principle**
(285.25)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
285.25 Grounding. Except as indicated in this article, TVSS grounding connections shall be made as specified in Article 250. Single grounding electrode conductors shall not be run in metal enclosures or raceways unless bonded to both ends of such enclosures or raceway made of ferrous material .
Substantiation: This article needs rewording in order to clarify the whole intent of grounding and bonding of these items.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 5-349 which includes reference to 250.64(E).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

ARTICLE 300 — WIRING METHODS

3-5 Log #1532 NEC-P03 **Final Action: Accept in Principle in Part**
(300, 590, 720)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to the Technical Correlating Committee Grounding and Bonding Task Group for comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 300, 590, and 720 as described in the following, relative to the terms bonding and grounding.
300.5(I) Exception No. 1: Exception No. 1: Conductors in parallel in raceways or cables shall be permitted, but each raceway or cable shall contain all conductors of the same circuit including equipment grounding conductors.
300.5(J) Revise the title of the section as follows:
(J) Earth ~~Ground~~ Movement. Where direct-buried conductors, raceways, or cables are subject to movement by settlement or frost, direct-buried conductors, raceways, or cables shall be arranged so as to prevent damage to the enclosed conductors or to equipment connected to the raceways.
300.40 Revise 300.40 as follows:
300.40 Insulation Shielding. Metallic and semiconducting insulation shielding components of shielded cables shall be removed for a distance dependent on the circuit voltage and insulation. Stress reduction means shall be provided at

all terminations of factory-applied shielding.
Metallic shielding components such as tapes, wires, or braids, or combinations thereof, and their associated conducting or semiconducting components shall be connected to an equipment grounding conductor ~~grounded~~ .

590.4(D): Revise 590.4(D) as follows:

(D) Receptacles. All receptacles shall be of the grounding type. Unless installed in a continuous grounded metal raceway or metal-covered cable that qualifies as an equipment grounding conductor in accordance with 250.118, all branch circuits shall include contain a separate equipment grounding conductor, and all receptacles shall be electrically connected to the equipment grounding conductors. Receptacles on construction sites shall not be installed on branch circuits that supply temporary lighting. Receptacles shall not be connected to the same ungrounded conductor of multiwire circuits that supply temporary lighting.

590.6(B)(2)(a): Revise Section 590.6(B)(2)(a) as follows:

(2) Assured Equipment Grounding Conductor Program. A written assured equipment grounding conductor program continuously enforced at the site by one or more designated persons to ensure that equipment grounding conductors for all cord sets, receptacles that are not a part of the permanent wiring of the building or structure, and equipment connected by cord and plug are installed and maintained in accordance with the applicable requirements of 250.114, 250.138, 406.3(C), and 590.4(D).

(a) The following tests shall be performed on all cord sets, receptacles that are not part of the permanent wiring of the building or structure, and cord-and-plug-connected equipment required to be connected to an equipment grounding conductor ~~grounded~~ : …

720.10: Revise Section 720.10 as follows:

720.10 Grounding and Bonding. Grounding and bonding shall be as provided in Article 250.

Substantiation: 300.5(I) Exception No. 1: This proposed revision clarifies the specific conductor referred to in this section. Grounding conductor is defined in Article 100. The specific conductor being referenced in this rule is the equipment grounding conductor.

300.5(J): The definition of ground has been revised. The more appropriate word to use in the title of this section is "earth" since this section deals with movement of the earth or grade levels.

300.40: The proposed revision is intended to be more specific to where the connection of the shielding is to be made. As previously worded, connected to ground could mean just connected to the earth through an electrode. The equipment grounding conductor, by definition establishes the connection to ground.

590.4(D): The proposed revisions to this section are intended to be more prescriptive and specific to require the metal raceway or metal-covered cable referred to in this section to qualify as an equipment grounding conductor rather than just indicate that the raceway or metal-covered cable could just be grounded.

590.6(B)(2)(a): Contain is changed to include which is more appropriate since the equipment grounding conductor is generally included with the branch circuit and is not contained within it. (Editorial revision proposed)

590.62(B)(2)(a): This proposed revision clarifies the specific conductor referred to in this section. The specific grounding conductor referenced in this rule is the equipment grounding conductor which accomplishes the grounding and provides an effective ground-fault current path.

720.10: Both grounding and bonding functions are necessary for these installations. The title and section have been revised to include both.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

Revise 590.4(D) as follows:

(D) Receptacles. All receptacles shall be of the grounding type. Unless installed in a continuous grounded metal raceway or metal-covered cable that qualifies as an equipment grounding conductor in accordance with 250.118, all branch circuits shall include ~~contain~~ a separate equipment grounding conductor, and all receptacles shall be electrically connected to the equipment grounding conductor (s) . Receptacles on construction sites shall not be installed on branch circuits that supply temporary lighting. Receptacles shall not be connected to the same ungrounded conductor of multiwire circuits that supply temporary lighting.

Panel Statement: The panel accepts the recommendation made for 300.5(I) Exception No. 1 to add the word "equipment".

The panel accepts the recommendation made for 300.5(J) to change the word "Ground" to the word "Earth".

The panel accepts in principle the recommendation made for 590.4(D) with the editorial changes shown in the panel action text. The "(s)" was added to indicate that the receptacles could be connected through an equipment bonding jumper to an equipment grounding conductor or multiple equipment grounding conductors.

The panel rejects the recommendation made for 300.40 since the present text adequately covers the intent to connect metallic shielding components to a grounded point in the system.

The panel rejects the recommendation made for 590.6(B)(2)(a) since this directly relates to text used by OSHA in their acceptance of this alternative method of protection.

The panel rejects the recommendation made for 720.10. Refer to the panel action and statement on Proposal 3-136 which deleted this section.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-6 Log #556 NEC-P03 **Final Action: Reject**

(300.1(D) (New))

Submitter: R. K. Varma, State of PA, DCED

Recommendation: Add new text to read:

All staples under Article 300 - Wiring Methods shall be insulated and listed by an approved listing agency. Number of different size cables under a staple shall be a part of listing.

Substantiation: Currently, there is no requirement for staples to be insulated or listed under Article 300 - Wiring Methods. Only prudence is called upon to safeguard against damage to the jacket of the cable and prudence cannot be quantified.

Panel Meeting Action: Reject

Panel Statement: The need for insulated staples for various wiring methods should be determined in the individual articles for that particular wiring method. Often the difference in lumber, kiln-dried versus non-kiln-dried lumber, will affect the ability to install a staple in the wood without potentially damaging the cable and may be an issue in some areas of the country but not others.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-7 Log #1000 NEC-P03 **Final Action: Reject**

(300.2(A) Exception (New))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add:

Exception: Individual conductors shall be permitted, where installed in accordance with 225.6.

Substantiation: Edit. Wiring method of 225.6 is permitted but not covered in Chapter 3.

Panel Meeting Action: Reject

Panel Statement: The intended section referenced in the proposal is understood as 300.3(A) rather than 300.2(A). The proposed text already exists in 300.3(A). There is no need to provide a duplicate of this text.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-8 Log #3588 NEC-P03 **Final Action: Reject**

(300.3)

Submitter: Jeff Jonas, Generac Power Systems, Inc.

Recommendation: Change to 300.3(B):

(B) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors and bonding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, cablebus assembly, trench, cable, or cord, unless otherwise permitted in accordance with 300.3(B)(1) through (B)(~~4~~)(5).

Add 300.3(B)(5):

300.3(B)(5) Listed Assemblies. Where a listed device is mounted adjacent to the panelboard, the neutral conductors shall be permitted to originate in the panelboard.

Note: We feel this is the best place to make this change but would be open to other suggestions.

Substantiation: Typically all conductors of a circuit are to be in the same raceway, conduit, etc. This general rule is to reman consistent with electrical theory, that is, to reduce inductive heating and to avoid increases in overall circuit impedance, all circuit conductors of an individual circuit must be grouped. This also is to help in the identification of same circuit conductors.

These devices vary from the above statement. However, we feel that the variance is occurring in a controlled environment. The control aspect comes from the fact that the TSS is a Listed Device and a pre-wired conduit is provided for field installation.

When a device is listed, such as this TSS, the system has been investigated by an independent third party, in many cases Underwriters Laboratories, Inc. during the listing process a prototype is built. Normal operation of the device is tested by energizing all circuits to their maximum rating. Temperatures are measured, verified to be within the limits of the materials involved, and certified to be safe. This temperature test verified that there are no adverse affects from inductive heating. The assembly is documented and Follow Up Service inspections are routinely conducted to verify that it continues to be manufactured as it was at the time of submittal.

The pre-wired conduit limits the length of the conduit that the 2 circuit conductors are not run together. With 2 ft. conduit length, everything is in sight and there should be no confusion as to which circuits are which. We feel the short length of conduit is like the alternate installation called out in 300.3(b)(4).

With this information in mind we feel that it is an acceptable design that meets good engineering practice and the intent of the NEC would hope the code-making panel give it serious consideration.

The inspection in the field should be to determine if the device is installed tot he manufacturers specifications and being used as the manufacturer's 3rd party listing specifies. However, in some cases the NEC is being used as the basis to review listed product, and the interpretation of NEC as it relates to the device and its installed intent is a point of subjective interpretation at times, as has been the case with a small portion of installations.

Note: Supporting material available upon request for review at NFPA headquarters.

Panel Meeting Action: Reject

Panel Statement: (1) There is a conflict with existing 210.4(A). Section 210.4(A), last sentence states in a multiwire branch circuit, all conductors shall originate from the same panelboard or similar distribution equipment. (2) Section 300.3(B) really deals with conductors of the same circuit within the wiring method and not the requirements in Article 210 for branch circuits.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

GUIDA, T.: Section 300.3(B) requires all conductors of the same circuit, including any grounded conductors, where used, and any equipment grounding conductors to be installed together to ensure that lines of flux for the entire circuit will cancel. This is accomplished by routing all of the conductors in close proximity to each other within the same raceway, auxiliary gutter, cable tray, cablebus assembly, cable or cord, or, where installed in a trench, in the earth in close proximity to each other.

In the case presented in the proposal, a new panelboard was established within the transfer switch. This new panelboard was supplied with normal power from a new feeder circuit breaker in the existing panel and with backup power from the generator. The feeder conductors consisted of both ungrounded conductors from a new breaker and a neutral conductor in the existing panel connected to the new panel in the transfer switch.

Ungrounded branch circuit conductors from the existing panel were removed from the branch circuit breakers in the existing panel and reconnected to new circuit breakers in the new panel within the transfer switch but the neutrals in the existing panel were left connected to the existing panelboard neutral block. The feeder neutral for the new panelboard was sized large enough for any maximum unbalanced load from the ungrounded branch circuit conductors so there is no issue of induced current between the two panels and thus no safety problem from induction. Furthermore, the entire assembly is a listed assembly, as substantiated in the proposal, with third party testing to indicate there was no inductive current to either the raceway or the enclosures for either panelboards during either normal power or generator power operation.

The Panel 3 Statement for reject alludes to a possible violation of Section 210.4(A), which covers multiwire branch circuits. Section 210.4(A) only applies where multiwire branch circuits are being reconnected with the ungrounded conductors being relocated into the transfer switch panelboard but the multiwire branch circuit neutrals left in the old panelboard. There would not be a Code violation if individual branch circuits were installed in this manner.

The last sentence of this section states that all conductors shall originate from the same panelboard or similar distribution equipment. This was inserted into 210.4(A) in the 1981 NEC to ensure that multiwire branch circuits supplying more than one device or equipment on the same yoke have circuit breakers either with internal trip or have identified tie bars so both circuits can be simultaneously disconnected. This section would not apply to a panelboard where all of the branch circuits were individual branch circuits, not multiwire branch circuits. There is no technical or safety reason to restrict the use of these listed transfer switches due to 210.4(A) last sentence because the neutrals for the branch circuits are in the existing panelboard, less than two feet away from the new panelboard/transfer switch. This proposal should be accepted and inserted as a new 300.3(B)(5).

3-9 Log #2748 NEC-P03 **Final Action: Reject**
(300.3(5))

Submitter: Daniel Baker, URS Corporation, Inc.

Recommendation: Revise text to read:

(5) Airfield Lighting Circuits. Conductors of series circuits used for airfield lighting and that are powered by regulators which limit current to 20 amperes, or less may be separated.

Substantiation: 300.3(B) Conductors of the Same Circuit. Reads: "All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors and bonding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, cablebus assembly, trench, cable, or cord, unless otherwise permitted in accordance 300.(B)(1) through (4)."

It is common practice in airfield lighting series circuits which are powered by regulators to separate the conductors and run single conductors along the edge of a taxiway or runway. This saves on wiring costs which can be significant because of the long runs involved, runways are usually over 5,000 feet long. The practices and methods used in airfield lighting are based on Federal Aviation Administration (FAA) Advisory Circulars (ACs). An example of separated single conductor series circuit is shown on the left in **Figure 23** of Appendix 1 of Advisory Circular AC 150/5340-30A "Design and Installation Details for Airport Visual Aids", issued April 11, 2005. The ACs stipulate that the series circuits be connected to "Constant Current Regulators" (CCRs). There are two classes of CCRs, one with a maximum rating of 6.6 amperes and the other with a rating of 20 ampleres, maximum.

Although many airfield installations are not inspected by local inspectors, there are times where this occurs and these installations are cited for lack of compliance with this provision of the NEC. This proposal adds a fifth condition to the list at the end of the above NEC provision.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Section 300.3(B)(3) already permits individual conductors of series circuits to be separated if installed in non-ferrous-type raceways or conduits. Runway series circuits are typically installed in direct buried applications or in non-metallic PVC conduit, both of which satisfy 300.3(B)(3). Series circuits installed in ferrous raceways are not permitted since they will experience induction heating that would violate the intent of The Code and be a cause for concern. To add an exception to permit something that is already presently allowed is not necessary.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-10 Log #1275 NEC-P03 **Final Action: Reject**
(300.3(B), FPN (New))

Submitter: W. Brian Poykko, Poykko Engineering

Recommendation: Add:

FPN: Use 4 pole transfer switches or 3 pole transfer switches with overlapping contacts to eliminate multiple neutral current return paths in systems with emergency or standby power supplies and more than one transfer switch.

Substantiation: If there is more than one transfer switch, the use of 3 pole switches creates more than one neutral current return path. This would not meet the requirements of "Conductors of the Same Circuit" requirements of 300.3(B).

Panel Meeting Action: Reject

Panel Statement: Section 3.1.3 of the NEC Style Manual does not permit requirements or mandatory text in a fine print note. Section 90.5(C) states that finepPrint notes are for informational purposes only and are not enforceable. Four pole transfer switches with overlapping contacts do not eliminate multiple neutral paths but ensure that the neutral is not opened while the normal phase conductors are still in the circuit, leaving a series circuit connection through the ungrounded phase conductors. The substantiation is also not correct since a truly balanced load without a grounded or neutral conductor can use multiple three-pole transfer switches without creating more than one neutral path.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-11 Log #2229 NEC-P03 **Final Action: Reject**
(300.3(B)(1) Exception)

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Delete the following:

<u>Exception: Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase installations. The raceways shall be installed in close proximity, and the conductors shall comply with the provisions of 300.20(B).</u>

Substantiation: The exception is not required. Such installations are permitted by 300.3(B)(3) in all locations, not just underground locations.

Panel Meeting Action: Reject

Panel Statement: This exception is necessary to permit installations where nonmetallic raceways are installed in close proximity with all of Phase A in one raceway, all of Phase B in another raceway, all of Phase C in another, and all the grounded conductors in another raceway. Where this is useful is between underground manholes so the phase conductors can exit the raceways and be easily racked within the manhole, taking up less space, and making it easier to do testing and maintenance on the installation. This would not be permissible without this exception.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-12 Log #1142 NEC-P03 **Final Action: Accept in Principle**
(300.3(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence:
Conductors of AC and DC circuits rated 600 volts, nominal, or less, ~~ac and dc circuits~~ shall be permitted to occupy the same wiring enclosure, cable, or raceway.
Substantiation: Edit. The commas in the present sentence structure, construed as "and" separates the ac and dc circuits from the 600 volt limitation.
Panel Meeting Action: Accept in Principle
In the proposed text, use the lower case on both the "ac" and "dc" circuits and add a comma after "circuits". With these changes the first sentence of 300.3(C)(1) is revised to read as follows:
Conductors of ac and dc circuits, rated 600 volts, nominal, or less, shall be permitted to occupy the same equipment wiring enclosure, cable, or raceway.
Panel Statement: The change to the proposed text is editorial in nature. The substantiation is not correct in stating that the commas are construed as "and" in the present Code text. A comma is a punctuation mark that provides separation within a sentence or causes the reader to pause at a specific location within a sentence.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-13 Log #3352 NEC-P03 **Final Action: Reject**
(300.3(D) (New))

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Add new Subdivision (D) to Section 300.3 as follows:
(D) Listing. Cables and insulated conductors installed in enclosures or raceways shall be listed for use in wet locations where the enclosures or raceways are in wet locations.
Substantiation: Enclosures and raceways that are in locations that are exposed to rain or other liquids typically have liquid or at least moisture in the enclosure or raceway. Conductors need to be suitable for this location.
Panel Meeting Action: Reject
Panel Statement: The requirement for cables to be suitable for the location in which they are to be installed is presently addressed in 310.8 and Table 310.13 applicable locations. Article 310 covers the general requirements for conductors such as insulation types, designations, and uses. To add the proposed text to Article 300 would be inappropriate, since 300 deals with wiring methods in general. Repeating this requirement in Article 300 does not add clarity to the Code.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CASPARRO, P.: Neither 310.8 nor Table 310.13 specifically address the fact that conductors installed in raceways are required to be suitable for wet locations.
It is sometimes interpreted that the interior of raceways are a dry location, even when the raceway is located outdoors.
Due to condensation and the eventual entrance of moisture into the raceway; stating that the interior of the raceway is considered a wet location if the exterior is in a wet location will add clarity.
CMP 3 may believe that this requirement should be in another section, but the proposed text should be added to provide clarity.

3-14 Log #3044 NEC-P03 **Final Action: Reject**
(300.4)

Submitter: Melvin K. Sanders, TECo Inc.
Recommendation: Delete the following text as indicated.
300.4 Protection Against Physical Damage
Where subject to physical damage, conductors shall be protected.
~~**(A) Cables and Raceways Through Wood Members.**~~
~~**(1) Bored Holes.** In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in joists, rafters, or wood members, holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/ 4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.~~
~~*Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.*~~
~~*Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.*~~
~~**(2) Notches in Wood.** Where there is no objection because of weakening the building structure, in both exposed and concealed locations, cables or raceways shall be permitted to be laid in notches in wood studs, joists, rafters, or other wood members where the cable or raceway at those points is protected against nails or screws by a steel plate at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width, installed to cover the area of the wiring. The steel plate shall be installed before the building finish is applied.~~
~~*Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.*~~
~~*Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.*~~
~~**(B) Nonmetallic-Sheathed Cables and Electrical Nonmetallic Tubing Through Metal Framing Members.**~~
~~**(1) Nonmetallic-Sheathed Cable** . In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings or listed grommets covering all metal edges that are securely fastened in the opening prior to installation of the cable.~~
~~**(2) Nonmetallic-Sheathed Cable and Electrical Nonmetallic Tubing.** Where nails or screws are likely to penetrate nonmetallic-sheathed cable or electrical nonmetallic tubing, a steel sleeve, steel plate, or steel clip not less than 1.6 mm (1/ 16 in.) in thickness shall be used to protect the cable or tubing.~~
~~*Exception: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.*~~
(C) Cables Through Spaces Behind Panels Designed to Allow Access. Cables or raceway-type wiring methods, installed behind panels designed to allow access, shall be supported according to their applicable articles.
~~**(D) Cables and Raceways Parallel to Framing Members and Furring Strips.** In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed parallel to framing members, such as joists, rafters, or studs, or is installed parallel to furring strips, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (1-1/ 4 in.) from the nearest edge of the framing member or furring strips where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1.6 mm (1/ 16 in.) thick.~~
~~*Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.*~~
~~*Exception No. 2: For concealed work in finished buildings, or finished panels for prefabricated buildings where such supporting is impracticable, it shall be permissible to fish the cables between access points.*~~
~~*Exception No. 3: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.*~~
~~**(E) Cables and Raceways Installed in Shallow Grooves.** Cable- or raceway-type wiring methods installed in a groove, to be covered by wallboard, siding, paneling, carpeting, or similar finish, shall be protected by 1.6 mm (1/ 16 in.) thick steel plate, sleeve, or equivalent or by not less than 32-mm (1-1/ 4-in.) free space for the full length of the groove in which the cable or raceway is installed.~~
~~*Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.*~~
~~*Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.*~~
(F) Insulated Fittings. Where raceways containing ungrounded conductors 4 AWG or larger enter a cabinet, box enclosure, or raceway, the conductors shall be protected by a substantial fitting providing a smoothly rounded insulating surface, unless the conductors are separated from the fitting or raceway by substantial insulating material that is securely fastened in place.
Exception: Where threaded hubs or bosses that are an integral part of a cabinet, box enclosure, or raceway provide a smoothly rounded or flared entry for conductors.
Conduit bushings constructed wholly of insulating material shall not be used to secure a fitting or raceway. The insulating fitting or insulating material shall have a temperature rating not less than the insulation temperature rating of the installed conductors.
Substantiation: The wiring methods typically installed in wooded frame structures are Article 320 (Type AC), Article 330 (Type MC), Article 334 (Types NM, NMC, and NMS), and Article 362 (ENC). Insofar as Article 340 (Type UF) is installed in lieu of Article 334 wiring methods, its installation must meet the requirements of Article 334 Parts II and III, and also subject to the same installation restrictions.
Since the 1975 Edition of the NEC, there has been a requirement in Section 300.4 that steel plates or bushings be installed to provide protection of certain wiring method against damage from ordinary nails or screw-nails when they pass through wooden members or laid in notches or grooves and the distance from the nail direction could not be the required 1-1/4 inch (32 mm).
This restriction placed in Article 300 has prevented those CMP's most knowledgeable in application of these products from using any other protection schemes or technology for this purpose. During the 2005 ROP/ROC stage, fact-finding reports were presented to CMP 3 highlighting the steel plates called for provide little or no protection against nails or screw-nails larger than #8 or equivalent trade designation. Since Section 300.4 first paragraph was changed

in 2005 ROP to emphasize conductors are to be protected against physical damage, it is obvious that such protection is to be provided by the wiring method in which they are contained, as spelled out in Section 300.3(A). Because the Scopes of Section 320.1, 330.1, 334.1, 340.1 and 362.1 state they govern the installation of those wiring methods which, by Section 300.3(A), contain the conductors that are to be protected, as stated in Section 300.4 first paragraph.

Sections 320.12(1), 330.12(1), 340(10), and 362.12(10) state those wiring methods are not to be exposed to physical damage, therefore the contained conductors are inherently protected against damage which meets the intent of Section 300.4 first paragraph, and Section 300.3(A) is satisfied.

The proposed deletions would leave 300.4 first paragraph, 300.4(D), and 300.4(F) and need to be re-identified. This would allow Article 300 to set the general guidelines and allow CMP 7 and CMP 8 to set rules deemed necessary to protect appropriate wiring methods.

Separate proposals are being made to CMP 7 and CMP 8 to address this text proposed to be deleted from here and moved into their jurisdiction. Coordination between all affected CMP's will be essential in order for this to be accomplished in one ROP/ROC cycle.

Panel Meeting Action: Reject

Panel Statement: The purpose of Article 300 is to provide an introduction to Chapter 3 for wiring methods and to provide general rules that can be easily accessed by the user of the Code, rather than having to look for these general rules in each article. Following this line of thinking by the submitter, all of Article 300 could be inserted into the various articles in Chapter 3, depending on the type of wiring method to be employed, but it would not be as user-friendly as it is now.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-15 Log #108 NEC-P03 **Final Action: Reject**

(300.4(A)(1))

Submitter: Michael Meyers, St. Charles, MI

Recommendation: Revise the section to require holes bored through horizontal framing members to be not closer than 50 mm (2 in.) from the edge. The revised section will then read as follows:

"(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in <u>wood studs and vertical framing members</u> ~~joists, rafters, or wood members,~~ holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member, <u>and for joists, rafters, beams and other horizontal framing holes shall be bored so that the edge of the hole is not less than 50 mm (2 in.) from the nearest edge of the wood member.</u> Where this distance cannot be...

Substantiation: There are two issues, potential damage to the cable by screws, and weakening of the horizontal member. Screws are frequently used to attach ceiling materials to the underside of horizontal framing members and frequently long screws are used. The incidences of damage to cable by fasteners are on the rise. This increased spacing from the edge of joists and rafters will help reduce the damage to cables. As another issue, framing members especially when they support loads are sometimes severely weakened when holes are bored as close as 1 1/4 in. from the bottom surface of the joist. Stresses near the hole will be much less when the spacing is 2 in. from the edge of the wood member.

Panel Meeting Action: Reject

Panel Statement: Steel plates and other methods of protection can be used to provide protection for cables or raceway type wiring methods installed through wood framing members, joists, and similar framing where construction methods dictate a longer screw or fastener. Inserting structural damage requirements in the NEC would not be feasible since the size of the structural member would determine where the hole should be drilled to prevent weakening of the structure.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

GUIDA, T.: The International Residential Code (IRC) has this 2-inch requirement for bored holes in joists, rafters, beams, and other horizontal structural framing members in Table E3702.1 but this makes a bored hole through the top plate (horizontal run of two 2 X 4 framing members) of a 2 X 4 support wall a Code violation. In many installations, there may be no other way for the electrician to access the attic with NM cable in a one or two family dwelling than to drill through the top plate of a wall. Assuming he is using a one-inch drill bit, there are no structural problems with this bored hole where the hole is drilled in the center of the studs. There was no technical substantiation submitted to justify increasing from a 1 and 1/4 inch distance as required by the NEC to a 2-inch distance as covered in the IRC.

3-16 Log #422 NEC-P03 **Final Action: Reject**

(300.4(A)(1))

Submitter: Timothy Bosman, City of Riverview

Recommendation: Revise text to read as follows:

300.4 Protection Against Physical Damage. Where subject to physical damage, conductors shall be adequately protected.

(A) Cables and Raceways Through Wood Members.

(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring methods is installed through bored holes in joists, rafters, or wood members, ~~holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.~~ <u>shall have a steel plate or bushing, at least 1.6 mm (1/16 in.) thick or a harden steel plate at least 1.32 mm (1/32 in.) thick and of appropriate length and width installed to cover the area of the writing. The holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member.</u>

Substantiation: The problem is that a nail or screw will penetrate the wiring, raceway cable running in the joists, rafters or wood members, and can cause an electrical short or electrical fire.

The other problem is that the inspector does not examine all the joists, rafters and wood members to see if they are to code, which means that houses, apartments, condominiums and buildings go uninspected. It would be thousands and thousands of wood members not being checked for code; however, the visibility of a steel plate would indicate it is protected.

However, it is not always the inspector's fault, sometimes it is the contractor's who use power tools and also use too long of a nail or screw, but a steel plate would stop the nails and screws and consequently save lives.

Panel Meeting Action: Reject

Panel Statement: Steel plates and other methods of protection are already permitted to be used to provide protection for cables or raceway-type wiring methods installed through wood framing members, joists, and similar framing where construction methods dictate a longer screw or fastener. Requiring a steel plate or bushing for all wiring penetrations through a wood structure would be overly restrictive, since there are many applications where drilling the hole not less than 1 ¼ inch from the nearest edge of the wood member provides sufficient clearance for protection of the raceways and cables from nail and screw penetration. This proposed change would also require a steel plate over EMT, rigid metal conduit, IMC, and other raceways where damage by screws or nails is not an issue.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-17 Log #423 NEC-P03 **Final Action: Reject**

(300.4(A)(1))

Submitter: Ronald Wendel, Riverview, MI

Recommendation: Revise text to read as follows:

300.4 Protection Against Physical Damage. Where subject to physical damage, conductors shall be adequately protected.

(A) Cables and Raceways Through Wood Members.

(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in joists, rafters, or wood members, ~~holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.~~ <u>shall have a steel plate or bushing, at least 1.6 mm (1/16 in.) thick or a harden steel plate at least 1.32 mm (1/32 in.) thick and of appropriate length and width installed to cover the area of the writing. The holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member.</u>

Substantiation: The problem is that a nail or screw will penetrate the wiring, raceway or cable running in the joists, rafter or wood members, and can cause an electrical short or electrical fire.

The other problem is that the inspector does not examine all the joists, rafters and wood members to see if they are up to code, which means that houses, apartments, condominiums and buildings go uninspected. It would be thousands and thousands of wood members not being checked for code; however, the visibility of a steel plate would indicate it is protected.

However, it is not always the inspector's fault, sometimes it is the contractor's who use power tools and also use too long of a nail or screw, but a steel plate would stop the nails and screws and consequently save lives.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-16.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-18 Log #482 NEC-P03 **Final Action: Reject**

(300.4(A)(1))

Submitter: Ronald Wendel, Bren Products

Recommendation: Revise text to read:

300.4 Protection Against Physical Damage. Where subject to physical damage, conductors shall be adequately protected.

(A) Cables and Raceways Through Wood Members.

(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in joists, rafters,

or wood members, ~~holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.~~ shall have a steel plate or bushing, at least 1.6 mm (1/16 in.) thick or a hardened steel plate at least 1.32 mm (1/32 in.) thick and of appropriate length and width installed to cover the area of the wiring. The holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member.

Exception: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.

Substantiation: The problem is that a nail or screw will penetrate the wiring, raceway or cable running in the joists, rafters or wood members, and can cause an electrical short or electrical fire.

The average house has between 600 and 2400 wood members; therefore, the city inspector would not have adequate time to inspect all wood members to ensure they are up to code.

According to the electrical survey of house fires, when wires are penetrated, the likelihood of an electrical short goes up 63 percent and electrical house fires go up 38 percent.

Panel Meeting Action: Reject

Panel Statement: Steel plates and other methods of protection are already permitted to be used to provide protection for cables or raceway-type wiring methods installed through wood framing members, joists, and similar framing where construction methods dictate a longer screw or fastener. Requiring a steel plate or bushing for all wiring penetrations through a wood structure would be overly restrictive, since there are many applications where drilling the hole not less than 1 ¼ inch from the nearest edge of the wood member provides sufficient clearance for protection of the raceways and cables from nail and screw penetration.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-19 Log #692 NEC-P03 **Final Action: Reject**
(300.4(A)(1))

Submitter: Dennis Ness, Guardian Inspection Services Inc.

Recommendation: Revise as follows:

300.4 (A)(1) Bored holes. In both exposed and concealed locations, where a cable or raceway type method installed through bored holes in joists, rafters, or wood members, holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.

300.4(A)(1) Revised text:

Bored holes. In both exposed and concealed locations, where a cable or raceway-type method s installed through bored holes in joists, rafters, or wood members, holes shall be bored so that the edge of the hole is not less than <u>50 mm (2 in.)</u> from the nearest edge of the wood member. <u>In both exposed and concealed locations, where a cable or raceway-type method is installed through bored holes in studs, holes, shall be bored so that the edge of the hole is not less than 32 mm (1 1/4 in.) from the nearest edge of the wood member.</u> Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.

Substantiation: An an inspector it has come to my attention there is difference in location for bored holes between the International Residential Code (IRC) and the National Electrical Code (NEC). The present language in the NEC [300.4(A)(1)] states "joists, rafters, or wood members" and does not specify studs. The IRC (E3302 electrical) does not have this section and it simply states wood-framed structural members shall not be drilled, notched or altered in any manner except as provided for in this code, which generally refers to the building sections.

I have inspected homes where the electrician has bored holes 1 1/2 in. from the edge of the floor joists, passing the electrical inspection and the building inspector has rejected the work as not being within the 2 in. from the edge required in the IRC. Some inspectors are requiring an engineering evaluation on the location of the holes and an engineered fix of the problem which is expensive.

I believe this proposed change in language will solve this problem.

Panel Meeting Action: Reject

Panel Statement: The proposed action has two different requirements for the depth of the hole, 1 and ¼ inches from the edge of wood members and 2 inches from the edge of wood members. The two-inch dimension in the IRC is dealing with bored holes in joists, rafters, beams, and other horizontal framing members. The proposed text is applying this 2-inch measurement to joists, rafters, or wood members, which is even more restrictive than the IRC with absolutely no technical substantiation for the increase from 1 and ¼ inch to 2 inches.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

GUIDA, T.: Same Affirmative Comment as Proposal 3-15.

3-20 Log #2284 NEC-P03 **Final Action: Reject**
(300.4(A)(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Add new text as shown:

"...or <u>other</u> wood members,...nearest edge of the wood member. <u>Where the wood member sits against another wood member or members, they may be treated as a single member for the purpose of measuring this distance.</u> ... <u>Exception No. 3: This requirement shall not apply to an edge of the wood member that is against masonry</u> ."

Substantiation: Adding "other" is merely a grammatical correction. As for the other lines whose addition I propose, technically cable in bored holes in such locations is in violation, even though the cable patently is protected as well as in the presently-legal uses. A hole bored near the edge of a stud that's against another, being part of a double stud assembly, is quite safe. Masonry protects as well as a nail plate.

Panel Meeting Action: Reject

Panel Statement: The added text does not provide any additional clarity to this section and, in fact, may cause some confusion since studs can be installed against each other from the 1 and ½ inch side and not back to back with each other from the 3 and ½ inch side. The proposed exception can also be misapplied since the 2 X 4 could be installed with the 3 and ½ inch side flat against the masonry wall so that there is still a problem with possible penetration where the hole is bored through the 2 X 4 from side to side.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-21 Log #3045 NEC-P03 **Final Action: Accept in Principle**
(300.4(A)(1))

Submitter: Melvin K. Sanders, TECo Inc.

Recommendation: Add to the end of the paragraph the following.

<u>"The steel plates shall be permitted to be single or ganged."</u>

Substantiation: Some jurisdictions are interpreting the phase of the present last sentence to mean only single strips or plates are permitted when providing the "appropriate length and width." There was no information provided to CMP 03 during the 2005 ROP or ROC that ganging was a problem. The interpretation represents a restriction beyond that intended by CMP 3 or required by the NEC.

Panel Meeting Action: Accept in Principle

Add a "(s)" to "plate" and "bushing" in the last sentence of the existing text in 300.4(A)(1) to read as follows:

Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate(s) or bushing(s), at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.

Panel Statement: Adding the "(s)" at the end of both "plate" and "bushing" provides clarity that one or more plates or bushings can be used to ensure the protection of these cables and raceways.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-22 Log #3220 NEC-P03 **Final Action: Reject**
(300.4(A)(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise text to read as follows:

"...or <u>other</u> wood members,...nearest edge of the wood member. <u>Where the wood member sits against another wood member or members, that may be treated as a single member for the purpose of measuring this distance</u> ... <u>Exception No. 3: This requirement shall not apply to an edge of the wood member that is against masonry."</u>

Substantiation: Adding "other" is merely a grammatical correction. As for the other lines whose addition I propose, technically cable in bored holes in such locations is in violation, even though the cable patently is protected as well as in the presently-legal uses. A hole bored near the edge of a stud that's against another, being part of a double stud assembly, is quite safe. Masonry protects as well as a nail plate.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-20.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-23 Log #3663 NEC-P03 **Final Action: Reject**
(300.4(A)(1))

Submitter: Wayne Clevenger, Durham City/ County Inspections
Recommendation: Revise text to read as follows:
In both exposed and concealed locations, where a cable or raceway type wiring method is installed through bored or cut holes in joist rafters wood members or metal studs holes shall be bored or cut so the edge of hole is not less than 1 1/4 in. from the nearest edge of wood member or metal stud.
Substantiation: Contractors argue code does not read so to require protection of MC or AC cable when installed in a metal stud application.
Panel Meeting Action: Reject
Panel Statement: Section 300.4(A)(1) is titled to apply only to bored holes in wood members. Metal framing is covered by 300.4(B) and applies only to nonmetallic-sheathed cables and electrical nonmetallic tubing and does not cover MC or AC cable in metal studs. AC, MC, or flex installed in a metal stud wall can easily be installed in the center of the steel stud and well away from any tech screw penetration hazards.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-24 Log #2760 NEC-P03 **Final Action: Reject**
(300.4(A)(1), FPN (New))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: After the main paragraph and before the exceptions add a new fine print note as follows:
FPN: Distances greater than 32 mm (1 1/4 in.) may be required by other codes, standards, or manufacturer's specifications.
Substantiation: This section implies that a spacing of 32 mm (1 1/4 in.) is acceptable while a greater spacing may be required. An example is the requirement of a 50 mm (2 in.) spacing for bored holes in horizontal members. This requirement originates in the building code and is, therefore, stated in Table E3702.1 of the International Residential Code. It needs to be called to the attention of the installing electrician that other codes may override the spacings in the NEC.
Panel Meeting Action: Reject
Panel Statement: There is no reason to provide a fine print note, such as the one proposed, that may cause more confusion in the industry than clarity. An electrician who is wiring a residence in an area under the jurisdiction of the IRC should also be familiar with any differences in the NEC and the IRC, or at least he will very quickly find out after his first inspection.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
GUIDA, T.: Same Affirmative Comment as Proposal 3-15.

3-25 Log #2951 NEC-P03 **Final Action: Reject**
(300.4(A)(1) Exception No. 1)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 300.4(A)(1) Exception No. 1 as follows:
Exception No 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, ~~or~~ electrical metallic tubing or Type AC and MC cables of the interlocked armor type .
Substantiation: The Fact Finding Study by Underwriters Laboratories on "Nail Penetration of Types AC and MC Cable Installed Parallel to Framing Members" proves conclusively that interlocked armor Type AC and MC cables perform better than EMT and PVC conduits in providing protection from physical damage from nails and screws during and after construction. A copy of this Fact Finding Study is enclosed for your information and review.
A summary of the Fact Finding Study follows. Note that the corrugated aluminum armored cable product is excluded as it is not proposed to be included in the Exception.

Wiring Method	Penetrations and Damage		
	Nails	Screws	Total
Type AC AL Interlocked Armor	4	12	16
Type AC Steel Interlocked Armor	0	3	3
Type MC Steel Interlocked Armor	0	7	7
Electrical Metallic Tubing	0	26	26
Rigid Nonmetallic Conduit	85	44	102

Metal-clad cables with corrugated armor were the only type of cable that performed worse than EMT and RNC. This Comment proposes to exclude metal-clad cables having corrugated armors and thus correlate directly with the Fact Finding Study.
Since EMT and RNC are exempted from nail plate requirements, this Proposal should be accepted so the appropriate Type AC and MC cables have equal and fair treatment.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: While the report does suggest that AC and MC interlocked cable may provide better protection from nail or screw penetration than other wiring methods, this does not in itself permit the removal of this cabling method from this section of the Code. Installations of AC, MC, or other assembled cables should be protected within the 1-1/4 in. dimension to reduce the possibility of reworking the installation after the building finish materials are complete. Raceways and conduits systems provide a way to remove damaged wiring and cable assemblies do not. Added protection should be required for assembled cables for this purpose.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-26 Log #1438 NEC-P03 **Final Action: Reject**
(300.4(A)(1) Exception No. 3 (New))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Add new text as follows:
Exception No. 3: Steel plates shall not be required to protect steel-clad cables where the diameter of the cable(s) and hole are such that the cable(s) can be moved freely to where the part of the cable closest to the nearest edge of the wood member is no less than 32 mm (1 1/4 in.).
Substantiation: As presently worded, 300.4(A)(1) has an unfortunate implication. Given the same size cable, and the same hole location, the larger the hole, the more likely the section will require protection, even though the cable is less likely to be trapped in place to be pierced by a nail or screw. One could argue that the larger the hole, the more likely additional cables will be pulled through. However, the NEC tradition is not one of adding requirements to protect against the hazards that might be created by someone coming by after rough inspection, but before actual concealment. One could argue that even a loose cable could be nicked and harmed by a screw. Hence, the restriction of this exception to tough cable that is most unlikely to be nicked, as opposed to accepting the nudge and moving out of the way.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 3-25.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-27 Log #1439 NEC-P03 **Final Action: Reject**
(300.4(A)(1) Exception No. 4 (New))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Add new text as follows:
Exception No. 4: In a wall that has previously-applied finish material on one side, steel plates shall not be required to protect cables where the required distance is maintained to the outer surface of the existing wall finish material.
Substantiation: The present measurement is considered reasonably adequate to prevent cable penetration when finish material is applied to structural members. Once such finish material is in place, the concern is for cable penetration when items are attached to the surface of that finish material. One might argue that with this wording the cable is at risk if the finish material is removed and replaced, but that is a stretch. And when cables are run by boring through fully-closed walls with the extra-long drills that now are available, no one enforced 300.4(A)(1). Moreover, the NEC tradition is not one of adding requirements to protect against the remote hazards. I use the wording, "the required distance," to coordinate with my proposed Exception No. 3.
Panel Meeting Action: Reject
Panel Statement: There is still a cable penetration hazard once the finish is applied to the wall or ceiling where items such as pictures, mirrors, and other fairly heavy items are hung on the wall. Where these items are installed on a finished wall, a stud finder is often used to locate the structural stud and a screw is then inserted through the finish and into the stud where, without the cable or raceway protection, penetration into the cable or raceway could occur, creating a safety hazard.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-28 Log #2953 NEC-P03 **Final Action: Reject**
(300.4(A)(2) Exception No. 1)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 300.4(A)(2) Exception No 1 as follows:
Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, ~~or~~ electrical metallic tubing or Type AC and MC cables of the interlocked armor type .
Substantiation: The Fact Finding Study by Underwriters Laboratories on "Nail Penetration of Types AC and MC Cable Installed Parallel to Framing Members" proves conclusively that interlocked armor Type AC and MC cables perform better than EMT and PVC conduits in providing protection from physical damage from nails and screws during and after construction. This Fact Finding Study was furnished with the Proposal and is attached to this Comment for your convenience.

A summary of the Fact Finding Study follows. Note that the corrugated aluminum armored cable product is excluded as it is not proposed to be included in the Exception.

Wiring Method	Penetrations and Damage		
	Nails	Screws	Total
Type AC AL Interlocked Armor	4	12	16
Type AC Steel Interlocked Armor	0	3	3
Type MC Steel Interlocked Armor	0	7	7
Electrical Metallic Tubing	0	26	26
Rigid Nonmetallic Conduit	85	44	102

Metal-clad cables with corrugated armor were the only type of cable that performed worse than EMT and RNC. This Comment proposes to exclude metal-clad cables having corrugated armors and thus correlate directly with the Fact Finding Study.

Since EMT and RNC are exempted from nail plate requirements, this Proposal should be accepted so the appropriate Type AC and MC cables have equal and fair treatment.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-25.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-29 Log #3470 NEC-P03 **Final Action: Reject**

(300.4(B)(2))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read:

300.4(B)(2 Nonmetallic-Sheathed Cable and Electrical Nonmetallic Tubing. Where nails or screws are likely to penetrate nonmetallic-sheathed cable ~~or~~ electrical nonmetallic tubing, type MC or type AC cable, a steel sleeve, steel plate, etc.

Substantiation: Wiring installers take 300.4(B)(2) as gospel and never think to look at Articles 320 or 330. 300.4(B)(2) as it stands now is actually misleading the reader by not mentioning types MC and AC cables as cables that definitely need protection.

Panel Meeting Action: Reject

Panel Statement: Metal framing is covered by 300.4(B) and applies only to nonmetallic-sheathed cables and electrical nonmetallic tubing and does not cover MC or AC cable in metal studs. AC, MC, or flex installed in a metal stud wall can easily be installed in the center of the steel stud and well away from any tech screw penetration hazards. With a 2 X 4 metal stud wall, unlike a wood stud wall, the dimensions are true dimensions so the flex, AC, and MC cable can be located in the middle with a 2 inch clearance from either edge. There was no technical substantiation provided in the proposal to require AC or MC cable to comply with the same requirements for NM and ENT in a metal stud wall.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-30 Log #3340 NEC-P03 **Final Action: Reject**

(300.4(D))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Delete this subsection.

Substantiation: This is a companion proposal to one made for Section 334.17 to include this provision for nonmetallic sheathed cables. Taken together, both proposals transfer this restriction to the type of cable for which it is appropriate. There have been many studies done that well demonstrate that armored cables roll out of the way of a penetrating nail or screw. In fact, it is much more difficult to damage an armored cable assembly than it is a rigid steel raceway, whether EMT or even rigid or intermediate steel conduit, and certainly more difficult than rigid nonmetallic conduit. The difficulty of making inadvertent penetrations of metal sheathed cables has been conclusively established in a UL fact-finding study done in a prior code cycle.

Panel Meeting Action: Reject

Panel Statement: The purpose of Article 300 is to provide an introduction to Chapter 3 for wiring methods and to provide general rules that can be easily accessed by the user of the Code, rather than having to look for these general rules in each article. Following this line of thinking by the submitter, all of Article 300 could be inserted into the various articles in Chapter 3, depending on the type of wiring method to be employed, but it would not be as user-friendly as it is now.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-31 Log #3310 NEC-P03 **Final Action: Reject**

(300.4(E))

Submitter: William Benard, State of New Hampshire,

Recommendation: Revise text to read as follows:

(E) Cables and Raceways installed under metal roof decking. Exposed and concealed locations, where a cable- or raceway-type wiring method is installed under metal roof decking, such as metal corrugated sheeting, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (1 1/4 in.) from the nearest surface of the sheet metal decking where screws are likely to penetrate when roofing repairs or replacement occurs after the initial raceway installation. Where this distance is not maintained, the cable or raceway shall be protected from penetration by screws by a steel plate, sleeve, or equivalent at least 6.4 mm (1/4 in.) thick.

~~(E)~~ (F) Cables and Raceways Installed in Shallow Grooves

(Remaining text unchanged)

~~(F)~~ (G) Insulated Fittings

(Remaining text unchanged)

Substantiation: The proposed subsection is intended to address the "real world" problem of physical damage to cables and raceway methods installed below roof decks with insulating and waterproofing material secured above using screws intended to penetrate the decking by at least 1 in. to meet minimum manufacturer windsheer specifications. This method of fastening the roofing material is fairly new to the industry replacing the old "ballast hold down" method typically utilized until the later '80s. The new method of screwing the roofing material down is causing substantial damage to all wiring methods secured to the underside or located within 1.25 in. of the lowest point of the decking material. Generally, roofing materials are replaced within 15 years of the original installation according to roofing manufacturers. The probability of damage to the existing wiring methods increases substantially during the re-roof process as longer screws are utilized to secure the new roofing material.

The.25 in. protection allowance where the space is not maintained was selected because it will provide sufficient protection to a cable or raceway method installed in the suspect area. It is standard practice of a roofing installation to not push the screw through the steel flange of the junior beam supporting the decking from the underside of the deck. The flange of the junior beam is typically at least.25 in. thick and, therefore, this would allow a cable or raceway method to be run parallel to the underside of the supporting flange of the junior beam.

Documentation exists to substantiate costly repairs required to replace damaged raceways and cables in buildings where the wiring methods were installed within the identified area subject to physical damage. The incidents of damage are not limited to economic impact only, but can be linked to injury to unqualified individuals attempting to reenergize the circuits while unaware of the cause of the original failure.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The installation covered in the proposal already seems to be covered by the existing subsections in 300.4, so additional text in this section would not seem to accomplish anything constructive. Roofers are faced with exposed and concealed electrical raceways installed in existing buildings, and they must be able to install the new roof without damage to the electrical system. This proposal deals with repair or replacement of a metal roof, but raceway and cable protection during a remodel would require a similar change or a change would then be required where trusses or joists are removed during structural damage repair. The individual building trades must take responsibility for all work during repair or replacement of a roof or whatever part of structure or building is under repair.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

CASPARRO, P.: I disagree with the panel statement that this particular installation is covered in the existing subsections of 300.4. I do agree with the submitter's statement that a 1/4 in. spacing from the nearest surface of the sheet metal roofing may not be enough. The presentation made during the panel meeting showed decking screws as long as 6 in. with 3 in. to 4 in. protruding below the sheet metal roof surface. The 1/4 in. protection plate could also be penetrated by these screws since they are designed to penetrate the roof decking. The answer is to not allow the conduits of any system; power, communications, or life safety; to be that close to the roof decking.

3-32 Log #147 NEC-P03 **Final Action: Reject**

(300.4(F))

Submitter: John Smith, Wire Guard, Inc.

Recommendation: Add new text to read as follows:

Conductors, inside electrical boxes, subject to physical damage (such as router bits, sheetrock saws or knives) or nonconductive coatings (such as drywall mud, paint, lacquer or enamel) must be temporarily protected by means of a rigid metal coverplate, not less than.047 inches thick (the required thickness to prevent the router from penetrating the metal plate).

Exception No. 1: Listed covers to have equivalent strength and characteristics shall be permitted.

Substantiation: Conductors inside electrical boxes during the construction phase are physically damaged by sheet rock routers, sheet rock saws and knives, etc. When the conductors are cut into by the aforementioned objects, the amperage rating of the conductor is compromised or lessened. This can result in overheating which often leads to fires (refer to the NFPA's Fire Analysis Report and the US Home Products Report which I have provided). The leading cause of fires in electrical boxes is short circuit or ground fault. The form of material first ignited is electrical wire or cable insulation, which is mostly caused by damaged wires undetected during construction. Nonconductive coatings such as drywall mud, paint, lacquer and enamel will compromise the identification markings or colors of the conductors and cause noncompliance with NEC 2005 310.12 Conductor Identification. This will cause the electrician to cut, scrape or remove coatings, which could damage the insulation on the conductor, thus resulting in noncompliance with NEC 2005 Table 310.13 Conductor Application and Insulation referring to thickness of insulation. NEC 2005 250.12 Clean Surfaces can be compromised by drywall mud, paint, lacquer and enamel causing poor grounding to device or fixture.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Section 110.12(C) already adequately covers the integrity of electrical equipment, including conductors with insulation, by stating there shall be no damaged parts that may adversely affect safe operation or mechanical strength of the equipment. Paint, plaster, or other foreign materials are not permitted to contaminate wiring terminals, wire, and other electrical components. This protection can be provided in many different and varied ways, one of which could be with a metal or plastic cover placed over the box during the rough-in stages of construction. Shorter router blades can be used on drywall that will not penetrate into the electrical boxes; however, the electrician must ensure the drywall installer understands the potential damage that can occur within a box where using longer blades.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 9 Negative: 4

Explanation of Negative:

CASPARRO, P.: Although the panel statement refers to 110.12(C) Integrity of Electrical Equipment and Connections which states that... There shall be no damaged parts that may adversely affect safe operation or mechanical strength of the equipment such as parts that are broken; bent; cut; or deteriorated by corrosion, chemical action, or overheating.

The fact of the matter is that wires are being cut by routers and paint, speackling and other substances used in the construction process are contaminating the wires in outlet boxes. This problem has been going on for years and will continue until addressed by the NEC. For the sake of safety, let's fix the problem now.

EGESDAL, S.: It makes sense to protect electrical conductors from construction debris, until final electrical installation. The fire alarm industry manufacturers ship smoke detectors with a protective covering, which is removed after there is no longer potential damage from the various construction trades. Some fire alarm control panels are shipped with a protective device (often a piece of cardboard) to place over the fire alarm system wiring and terminals in a rough-in-box for protection from paint, plaster, and general construction site grime. While it may not be necessary to require a listed product, it makes sense to require installers to protect the wiring against typical construction debris.

KEDEN, R.: I disagree with the panel meeting action (reject) and the panel statement.

Even though Section 110-12(C) covers the subject, reality is that the people who cause physical damage and contamination (drywall installers, plaster workers, and painters) do not read the NEC and the electrician ends up replacing wires and cleaning out boxes. Without endorsing specific products and materials, the code needs to give some specific guidance. I would have preferred an accept in principle.

OWEN, R.: See my Explanation of Negative Vote on Proposal 3-35.

3-33 Log #1338 NEC-P03 **Final Action: Accept in Principle**
(300.4(F))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete the word "ungrounded" so that the requirement will apply to the grounded conductor as well.

(F) Insulated Fittings. Where raceways containing ~~ungrounded~~ conductors 4 AWG or larger enter a cabinet, box enclosure, or raceway, the conductors shall be protected by a substantial fitting providing a smoothly rounded insulating surface, unless the conductors are separated from the fitting or raceway by substantial insulating material that is securely fastened in place.

Substantiation: As written, this important protection requirement does not apply to grounded conductors. The grounded conductor, in many cases, is every bit as dangerous as the ungrounded conductor. This is especially true when multi-wire circuits are employed. Isolated phase installations permitted by 300.3(B)(1) are an example of where this would apply.

Panel Meeting Action: Accept in Principle

In the first sentence of 300.4(F) change the word "ungrounded" to the words "insulated circuit".

Panel Statement: Grounding electrode conductors are not part of a circuit, and are intended to be excluded.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-34 Log #2230 NEC-P03 **Final Action: Reject**
(300.4(F))

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise as follows:

(F) Insulated Fittings. Where raceways <u>or metal fittings</u> containing ungrounded conductors 4 AWG or larger enter a cabinet, box enclosure, or raceway, the conductors shall be protected by a substantial fitting providing a smoothly rounded insulating surface, unless the conductors are separated from the fitting or raceway by substantial insulating material that is securely fastened in place.

Substantiation: Under the current code rule only RMC and IMC containing ungrounded conductors require protection for those conductors, they are the only raceways that enter the enclosure. In the case of cables, ETM, or other raceways only the connector enters the enclosure. Potential for conductor damage also exists where the connectors enter the raceway and protection should be provided.

Panel Meeting Action: Reject

Panel Statement: The present text "…the conductors shall be protected by a substantial fitting providing a smoothly rounded insulating surface,.." adequately addresses the submitter's concern. In addition the substantiation is incorrect that this subsection only covers rigid metal conduit and intermediate metal conduit. It covers all raceways where 4 AWG and larger conductors enter a cabinet, box, enclosure, or raceway.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-35 Log #633 NEC-P03 **Final Action: Reject**
(300.4(G))

Submitter: Carlo Compagnone, Compa Covers, Inc.

Recommendation: Add the following wording to 300.4(G):

"Protection of Outlet Boxes During Construction. The open front of both metal and nonmetallic electrical outlet boxes shall be temporarily covered to protect insulated electrical conductors from physical damage or deterioration due to power routers, plaster spray, spray foam insulation, and other potential damage during construction. The covers shall be constructed of a nonmetallic material and shall be clearly marked "Not for Permanent Installation"."

Substantiation: Leaving the front end of an electrical box open during the preliminary stages of construction results in exposed wires. This allows electrical wiring vulnerable to be cut or damaged during construction with power routers along with plaster filled boxes and overspray from paint guns and spray foam insulation guns, which in the end will leave a poor and unsafe working environment. Having a temporary cover on an electrical box is most of all a safety factor. The covers prevent build up of debris and puts a stop to unauthorized personnel tampering with wiring during the time of construction.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-32.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 10 Negative: 3

Explanation of Negative:

CASPARRO, P.: See my explanation of negative vote on Proposal 3-32.

KEDEN, R.: I disagree with the panel meeting action (reject) and the panel statement

Even though Section 110-12(C) covers the subject, reality is that the people who cause physical damage and contamination (drywall installers, plaster workers, and painters) do not read the NEC and the electrician ends up replacing wires and cleaning out boxes. Without endorsing specific products and materials, the code needs to give some specific guidance. I would have preferred an accept in principle.

OWEN, R.: While I agree with the Panel statement that 110.12(C) does cover damage to some extent, it does not go far enough. As an AHJ, over the years I have inspected many installations where sheetrockers and other trades damage conductors while trying to do their own work as quickly as possible. I am sure that not all this damage has been found by inspectors or electricians, and, thus, are still in operation in a possibly unsafe condition.

I believe it is time for the Code to require a specific method of protection, rather than just a concept that equipment and conductors should be protected. This is not new to the NEC: Article 300 already requires a very specific method of protecting cables, etc. that are subject to screw and nail penetration by requiring a nail plate be installed under 300.4(D). Article 300 also requires a minimum burial depth for underground installations, plus recognizes mechanical protection reducing that depth by using concrete. I urge the panel to reconsider this decision, and while not endorsing any particular product, I think it is time to become more specific in the protection methods for conductors in electrical boxes during construction.

3-36 Log #3370 NEC-P03 **Final Action: Reject**
(300.4(G))

Submitter: Jody Cook, Plugs & Switches, Inc.
Recommendation: Add new text to read:
Conductors inside junction boxes shall be protected by an acceptable means.
Substantiation: Eliminates routered wires too short to pigtail, damage to circuit integrity, exposure to live parts, and junction boxes being filled with mud making it harder to dentify cut and nicked wires.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-32.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CASPARRO, P.: See my explanation of negative vote on Proposal 3-32.

3-37 Log #415 NEC-P03 **Final Action: Reject**
(Table 300.5)

Submitter: Ronald Deering, City of Portage
Recommendation: Revise as follows:
Under a building: Col 1 Col 2 Col 3 Col 4 Col 5
mm in. mm in. mm in. mm in. mm in.
300 12 300 12 300 12 300 12 300 12
(in raceway only) (in raceway only) (in raceway only)
Substantiation: By adding a depth requirement to the table, for raceways under a building slab, in the saw cuts would have no affect on the raceways below. Money could be saved throughout the construction industry, when cuts need to be made, for plumbing installations, etc.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide any technical substantiation documenting the number of incidents where raceways were damaged by saw cutting a slab with a conduit installed at or near the top of the sub-base under the concrete. In many cases, the electrician installs the conduit in the sub-base to prevent the concrete from cracking anyway. Requiring a specific depth for these raceways to be imbedded below the sub-base would be difficult on many construction sites since final depth of the sub-base is often established after the inspection and right before the concrete is poured.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-38 Log #678 NEC-P03 **Final Action: Reject**
(300.5)

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
300.5 Underground Installations. ……..
(D) Protection from Damage. Direct-buried conductors and cables shall be protected from damage in accordance with 300.5 (D)(1) through(D) (3) ~~(4)~~ .
(1)…..
~~(3) Service Conductors. Underground service conductors that are not encased in concrete and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.~~
(3) ~~(4)~~ Enclosure or Raceway Damage. …….. (E) …….
(G) Service Conductors. Underground service conductors that are not encased in concrete or in metal conduit and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.
Substantiation: To require direct-buried conductors and nonmetallic conduits (PVC) containing service conductors to have identification ribbon. When excavating around nonmetallic conduits buried 450 mm or deeper, the conduits and the conductors inside are often damaged and striped, exposing the excavator to hazards, before being recognized as conduit and conductors.
Panel Meeting Action: Reject
Panel Statement: Direct buried service conductors are much more easily damaged, even when the operator is scratching the surface of the trench to locate the conductors, than when the conductors are installed in a raceway. A backhoe operator can damage any raceway system if the operator is not paying attention and has no idea that anything is buried below.
All utility companies have a service that will mark the ground directly above the service conductors, whether the conductors are directly buried or not, so anyone digging in that area will be less likely to damage their conductors. Cable locators should be used before any trenching or backhoe work is started in an area where service conductors may be buried. The primary concern for service conductors is providing an indicator, such as a warning ribbon, for direct burial cables, especially where those cables have no other form of protection.
Schedule 80 PVC could certainly be used as a protection method for underground service conductors or cables. Restricting the protection to metal conduit would not recognize this alternative protection method. A backhoe operator could damage cables or conductors in any wiring method installed but a raceway will provide some level of protection for these service conductors. Direct burial cables are not protected, so a warning ribbon is a method to help identify the location for these conductors and provide some warning that service cables are located below.
In addition, the result of this proposal would be to delete the present 300.5(D)(2) because it has not been shown as retained, and the reason for doing so has not been provided.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CASPARRO, P.: As the panel statement indicated, a backhoe operator can damage any raceway system if the operator is not paying attention and has no idea that anything is buried below, therefore, a warning ribbon placed 12 in. above the underground installation would alleviate this problem, thus saving unnecessary damage and possible bodily harm.

3-39 Log #2014 NEC-P03 **Final Action: Reject**
(Table 300.5)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for information.
Submitter: Dennis Baker, Springs & Sons Electrical Contractors, Inc. / Rep. IEC
Recommendation: I propose adding another row so that PVC could be used on residential construction at a depth of 6 in.
One and Two Column 1 Column 2 Column 3 Column 4 Column 5
Family Dwellings 450 18 150 6 150 6 300 12 150 6
Substantiation: If PVC is buried 6 in. deep on residential construction, it should be deep enough. If you dig with a shovel and hit PVC, chances are you will do no damage. If you use a machine such as a Ditch Witch or power trencher, you will tear up the PVC but you would also tear up rigid or intermediate metal conduit. We wire lots of swimming pools and spas and I believe that PVC is a better conduit system due to chemicals and all but where I live (Arizona) the ground prohibits burying PVC 18 in. deep. Please consider this change.
Panel Meeting Action: Reject
Panel Statement: The minimum depth requirement for PVC has been consistently 18 inches for most applications, unless some specific condition exists where heavy vehicular traffic may cause flexing and breakage of the raceway system. Circuits that are damaged during trenching, either by hand or machine, are just as dangerous in a residential installation, as those in a commercial and an industrial installation. Maintaining an 18-inch depth requirement for PVC, with some exceptions, seems to have stood the test of time as being a reasonable depth to keep most PVC raceway damage to a minimum.
The submitter has proposed changing the depth of other wiring methods without any substantiation.
Refer this action to CMP 17 for their information. The substantiation indicates the problem is with swimming pool wiring methods. The submitter is encouraged to review Table 680.10 and its notes.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-40 Log #2185 NEC-P03 **Final Action: Reject**
(Table 300.5)

Submitter: Dann Strube, Strube Consulting
Recommendation: On Column 2 last line change ~~450~~ 150 mm (~~18~~) (6) in .
Substantiation: Table 300.5 allows underground cable to rise from 24 in. to 18 in. on the air port at 600 volts. Table 300.50 allows underground cable to rise from 30 in. to 18 in. at 40 KV. However, rigid metal conduit is pushed down from 6 in. to 18 in. on Table 300.5 at 600 volts while the same product remains at 6 in. at 40 KV. It does not make sense to require 600 volt conduit to be deeper than 40 KV conduit. You have had proposals on this for at least four code cycles and it should not be that hard to figure out that there is something wrong here. I don't care if you make everything 3 in. or 18 in. or 10 ft. Just fix it.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided technical substantiation for this change in Table 300.5. While the panel understands that there is a difference between Table 300.5 and Table 300.50, the submitter has not provided a technical basis for making this change.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
GUIDA, T.: This proposal should have been accepted since the submitter is correct in his statement that requiring rigid metal conduit and intermediate metal conduit to be installed at a depth of 18 inches in or under airport runways for 600 volt and less circuits but permitting these same raceways to be buried at 6 inches in or under an airport runway for installations over 600 volts does not make sense. Prior to the 1990 NEC, both the under 600 volt installations and the over 600-volt installations had the same requirement of 6 inches of burial depth for rigid metal and intermediate metal conduit. Cables in runways

or in adjacent areas of airports were required to be not less than 18 inches for under 600 volt circuits and for those circuits over 600 volts, and it wasn't until the rewrite of Table 300.5 in the 1990 NEC that all wiring methods for wiring in or under airport runways were required to be at a depth of 18 inches or more for circuits at 600 volts or less. There was no technical reason given by Panel 3 during the 1990 rewrite of Table 300.5 to increase the burial depth of GRC and IMC to 18 inches for those circuits of 600 volts or less and there is no technical reason not to change the depth back to 6 inches or less.

3-41 Log #2874 NEC-P03 **Final Action: Reject**
(Table 300.5)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for information.
Submitter: Dennis Baker, Springs & Sons Electrical Contractors, Inc. / Rep. IEC
Recommendation: Revise text to read as follows:
I would like to change the heading of column 5 in Table 300.5, which now reads:
"Circuits for Control of Irrigation and Landscape Lighting Limited to Not More than 30 Volts and Installed with Type UF or in Other Identified Cable or Raceway ~~to one of the following:~~
1. Circuits for Control of Irrigation, Landscape Lighting and Pool/Spa Control Panels Limited to Not More than 30 Volts and Installed with Type UF or in Other Identified Cables or Raceway.
2. Control Circuits Limited to Not More than 30 Volts and Installed with Type UF or in Other Identified Cable or Raceway.
Substantiation: We now have Pool/Spa Control Panels that are controlled by a 9 volt DC circuit and when they are installed in PVC conduit, they should be permitted to be at a depth of 6 in. Currently, this type of circuit is not addressed under Article 680, nor is it defined properly in Article 725. This would be the best place to address this type of circuit for burial depth.
Panel Meeting Action: Reject
Panel Statement: Section 90.3 states that Chapters 1 through 4 apply generally and Chapters 5, 6, and 7 can supplement or modify the requirements in Chapters 1 through 4. Section 680.10 provides minimum burial depths for under the pool or within 5 feet horizontally of the inside wall of the pool, unless this wiring is required to supply equipment permitted by Article 680. The recommended text in this proposal would be more appropriate for 680.10; otherwise, this proposed change in Table 300.5 would still be modified by the requirements in 680.10.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-42 Log #1206 NEC-P03 **Final Action: Reject**
(300.5(B))

Submitter: Dennis Downer, Morrisville, VT
Recommendation: Change the wording of 300.5(B) to the language following:
300.5 Underground Installations.
(B) Listing Cables <u>.</u> ~~and~~ insulated conductors <u>and any splices or terminations</u> installed in enclosures or raceways in underground installations shall be listed for use in wet locations.
Substantiation: 300.5(B) should include the wording splices or terminations to be consistent with 314.30(C). In any underground installation all splices and terminations shall be listed as suitable for wet locations, not just in handhole enclosures without bottoms. There are numerous other applications such as PVC boxes installed underground where flooding of the box could happen.
314.30 Handhole Enclosures.
(C) Handhole Enclosures Without Bottoms. Where handhole enclosures without bottoms are installed, all enclosed conductors and any splices or terminations, if present, shall be listed as suitable for wet locations.
Panel Meeting Action: Reject
Panel Statement: Cables and insulated conductors installed in enclosures or raceways in underground locations are required to be listed for use in a wet location. If the cable or conductor has that insulation stripped for a splice or a connection, Section 110.14(B) requires "all splices and joints, and the free ends of conductors" to be covered with an insulation equivalent to that of the conductors or with an insulating device identified for the purpose. There is no reason to have this text in this section when Section 110.14(B) already covers it.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-43 Log #2231 NEC-P03 **Final Action: Reject**
(300.5(B))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Delete the following text:
~~(B) Listing, Cables, and insulated conductors installed in enclosures or raceways in underground installations shall be listed for use in wet locations.~~
Delete this part and re-letter remaining parts of this section.
Substantiation: I have submitted a proposal to add similar wording in a new Section 300.9.
Panel Meeting Action: Reject
Panel Statement: In the past, there has been a misconception with certain installers and designers that conductors in raceways installed in an underground location were not subject to wet conditions. This subsection was inserted into this section to ensure compliance with wet location installations, including compliance with Section 310.8(C) requirements for wet location conductors and to clarify that an underground installation is a wet location.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-44 Log #2992 NEC-P03 **Final Action: Reject**
(300.5(B), FPN (New))

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add a fine print note to clarify the requirement for wet rated conductors in 300.5(B).
<u>FPN: Underground installations include installations below grade and in tunnels.</u>
Substantiation: This clarifies the requirements for wet rated conductors in these installations.
Panel Meeting Action: Reject
Panel Statement: The text very clearly states that underground installations are a wet location so a fine print note explaining that point is not necessary. There may be applications in tunnels where raceways are not in a wet location. Certainly, raceways buried in the ground anywhere surrounding a tunnel are in a wet location, but there are many tunnel installations where the tunnel itself is not considered a wet location.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-45 Log #3333 NEC-P03 **Final Action: Reject**
(300.5(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add "or structures" after "building".
Substantiation: Edit. Structures which are not deemed buildings should be included.
Panel Meeting Action: Reject
Panel Statement: This section deals specifically with buildings, not structures. A structure could be two 4 X 4 posts installed in the ground with plywood fastened between the poles to provide a mounting structure for a service or panelboards. There would be no reason to require direct burial conductors to be installed in a raceway under that structure.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-46 Log #2710 NEC-P03 **Final Action: Accept**
(300.5(D)(1))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
300.5 Underground Installations.
[No change to (A), (B), or (C)]
(D) Protection from Damage. Direct-buried conductors and cables shall be protected from damage in accordance with 300.5(D)(1) through (D)(4)
(1) Emerging from Grade. Direct-buried conductors and <u>cables</u> ~~enclosures~~ emerging from grade <u>and specified in columns 1 and 4 of Table 300.5</u> shall be protected by enclosures or raceways extending from the minimum cover distance below grade required by 300.5(A) to a point at least 2.5 m (8 ft) above finished grade. In no case shall the protection be required to exceed 450 mm (18 in.) below finished grade.
[Remainder of 300.5 not changed]
Substantiation: Problem/Substantiation 1 - The term "enclosures" is incorrect - The submitter proposes that the first occurrence of the term "enclosures" in the first sentence of 300.5(D)(1) should be, instead, the term "cables". As it is now written, 300.5(D)(1) requires an enclosure emerging from grade to be protected by an additional enclosure or raceway. This does not make sense. The submitter proposes that it is "Direct Buried conductors and cables" that is the subject of 300.5(D)(1), matching the subject of 300.5(D).
Problem 2 - Irrigation and Landscape Lighting Circuits - 300.5(D)(1) requires conductors and cables of circuits rated maximum 30 volts and for the control or irrigation or landscape lighting to be protected by enclosures or raceways extending from the minimum cover distance below grade to a point at least 2.5 m (8 ft) above finished grade. This is not done to the knowledge of the submitter. Requiring 8 ft tall raceways at every sprinkler valve, low voltage landscape luminaire, and other places where these conductors emerge from below grade is not necessary, is defeated by the conductors extending back down from the top to the valve or luminaire, presents an undesired expense, and is not usually esthetically pleasing.
Substantiation for Changes to Problem 2 - The 30 volt or less circuits for irrigation control and landscape lighting exhibit limited risk of electric shock in the event the conductors or cables are damaged. The low voltage also subjects the insulation of the conductors and cable to less voltage stress than branch

circuit voltage conductors and cables. These risks are limited enough for the column 5 conductors and cables to not require the extent of a 2.5 m (8 ft) raceway rising above finished grade to protect these conductors or cables from damage.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-47 Log #1339 NEC-P03 **Final Action: Reject**
(300.5(D)(3))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
(D) Protection from Damage. Direct-buried conductors and cables shall be protected from damage in accordance with 300.5(D)(1) through (D)(4).
(1) Remain unchanged
(2) Remain unchanged
(3) Service Conductors. Underground <u>direct buried</u> service conductors <u>or cables</u> that are not encased in concrete <u>or in a raceway</u> and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.
(4) Remain unchanged.
Substantiation: Although many would argue that this change is not necessary due to the fact that subsection (D) applies only to direct buried conductors, it is interpreted differently by many, including expert users of the Code. I believe the reason for this is due to the fact that parenthetical 4 contains provisions for raceways, making the user think that parenthetical 3 also applies to raceways. Because cables are permitted to be installed in raceways (in accordance with the respective cable/raceway Articles), this should be made more clear. This change also adds the term “cables” to the subsection, in an effort to provide consistency between the changing language of subsection (D) and (D)(3).
Panel Meeting Action: Reject
Panel Statement: There are many applications where sleeves or raceways are installed as additional protection for direct burial cable and conductors. Section 300.5(D)(1) and (D)(4) both provide information on direct buried conductors enclosed in conduits as a means of providing protection from physical damage. In spite of this additional protection, these conductors or cables are still listed for direct burial. The introductory text in 300.5(D) makes this very clear.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 2
Explanation of Negative:
AYER, L.: I would have to agree with the submitter’s substantiation. Numerous proposals have been submitted for recent code cycles which misinterpret this section. 300.5(D)(3) is clearly found under the heading for direct-buried cables, but still creates confusion among users of the code. The proposed wording would add clarity.
CASPARRO, P.: See my explanation of negative vote on Proposal 3-38.

3-48 Log #2193 NEC-P03 **Final Action: Reject**
(300.5(D)(3))

Submitter: David Williams, Lansing, MI
Recommendation: Revise as follows:
(3) Service Conductors. Underground service conductors <u>and raceways</u> that are not encased in concrete and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.
Substantiation: The wording of the code section did not include raceways and I feel some could interpret this to only require this requirement when the conductors are direct burial.
Panel Meeting Action: Reject
Panel Statement: The introductory text in 300.5(D) requires direct buried conductors and cables to be protected from physical damage in (1) through (4). An installation may warrant more than one of these requirements be used. For example, direct buried service conductors may require protection where emerging from grade as provided in 300.5(D)(1) or where there is a potential for damage as provided in 300.5(D)(4). Where service conductors are not direct buried and are instead installed entirely in a raceway, this warning ribbon is not required. The warning ribbon is only required where direct buried conductors or cables are installed, even where a raceway or sleeve may be installed as extra protection.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CASPARRO, P.: See my explanation of negative vote on Proposal 3-38.

3-49 Log #2232 NEC-P03 **Final Action: Reject**
(300.5(D)(3))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
(3) Service Conductors. Underground service conductors that are not encased in concrete and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed ~~in the trench~~ at least 300 mm (12 in.) above the underground installation.
Substantiation: The potential hazard from a “dig-in” accident is not changed by the method used to install the conductors. If service conductors installed in a trench present a hazard, then so do service conductors installed by directional boring or other “trenchless” methods. The warning ribbon requirement should apply to all underground service conductors or to none of the underground service conductors. The panel should not consider the additional costs required to install the warning ribbon when “trenchless” installation methods are used. The only consideration should be the safety of the system, and if trenched in service conductors require a warning ribbon for safety reasons, then so do service conductors installed using other methods of installation.
Panel Meeting Action: Reject
Panel Statement: The only way to install a warning ribbon 12-inches above a bored hole containing service conductors would be to drill an additional hole with the ribbon inserted in the hole and pulled through from one location to another or to dig a trench to a depth 12-inches above the cable. In addition, since the ribbon would be installed in a drilled hole, the inspector would not be able to verify the depth of the ribbon as being 12-inches above the service conductors.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CASPARRO, P.: See my explanation of negative vote on Proposal 3-38.

3-50 Log #3161 NEC-P03 **Final Action: Reject**
(300.5(D)(3))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Add text as indicated in underline type:
(3) Service <u>, Branch Circuit and Feeder Conductors</u> . Underground <u>branch circuit, feeder and</u> service conductors that are not encased in concrete and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.
Substantiation: The commentary presented by the NEC Handbook in the 2002 Edition states the following, “Providing a warning ribbon reduces the risk of an accident or electrocution during excavation near underground service conductors that are not encased in concrete. This provision requiring a warning ribbon does not extend to feeders and branch circuits because these circuits contain short-circuit and overload protection.”
Although feeders and branch circuits do contain short-circuit and overload protection, there would still seem to be the possibility of bodily injury or worse if an underground conductor was accidentally contacted by a person digging by hand with a metal digging bar or other metal implement.
As stated in 90.1(A) of this Code; “Practical Safeguarding. The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity.”
This would seem to be an additional “practical safeguard” of persons that should be added to the Code.
Panel Meeting Action: Reject
Panel Statement: Service conductors are not protected by overcurrent protection devices and constitute a much greater hazard where these service conductors are damaged during excavation. Anyone digging in a location where directly buried service conductors have a ribbon installed 12-inches above the cable should be warned that there is a cable below that location. Expanding this warning ribbon requirement to all service, feeder, and branch circuit underground direct burial applications would tend to desensitize the effect of the warning ribbon. Human nature tends to disregard safety items where that person is constantly exposed too often to that safety item.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CASPARRO, P.: The panel is correct in saying that service conductors are not protected by overcurrent protection and therefore constitute a much greater hazard when these conductors are damaged during excavation. But, I disagree with the panel statement that says “Expanding this warning ribbon requirement to all applications would tend to desensitize the effect of the warning ribbon.” Any type of warning device that eliminates a hazard, extra work, and the expense of a repair would be valid in its use. Can we really ever be TOO safe?

3-51 Log #270 NEC-P03 **Final Action: Reject**
(300.5(D)(4))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Enclosure or Raceway Damage. Where the enclosure or raceway is subject to ~~physical~~ damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, Schedule 80 rigid nonmetallic conduit, or equivalent.
Substantiation: Use of the word “physical” is superfluous. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.) Let’s take care of that for good: for our purposes, “damage” means “physical damage.”
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-52 Log #1912 NEC-P03 **Final Action: Reject**
(300.5(D)(4))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action taken on Proposal 8-53. This action will be considered by the Panel as a Public Comment.
See the Technical Correlating Committee action on Proposal 8-53.
It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise 300.5(D)(4) as follows:
300.5(D)(4) Enclosure or Raceway Damage. Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, Schedule 80 rigid ~~nonmetallic~~ <u>PVC</u> conduit, or equivalent.
Substantiation: This is a companion proposal for the definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC Conduit. It clarifies that rigid polyvinyl chloride conduit is designed as Type PVC, rather than the broader designation of rigid nonmetallic conduit (Type RNC) which includes PVC, HDPE and RTRC.
Panel Meeting Action: Reject
Panel Statement: Since Panel 8 has jurisdiction over Article 352, this change must first occur with Panel 8 in Article 352. Article 352 covers rigid nonmetallic conduit, which includes Schedule 80 PVC conduit. The use of “Schedule 80 nonmetallic conduit” in 300.5(D)(4) provides the user of the NEC with the ability to find the raceway requirements in Article 352. PVC is not in the index but rigid nonmetallic conduit is in the index.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-53 Log #272 NEC-P03 **Final Action: Reject**
(300.5(F))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Where necessary to prevent ~~physical~~ damage to the raceway or cable, protection shall be provided in the form of granular or selected material, suitable running boards, suitable sleeves, or other approved means.
Substantiation: Use of the word “physical” is superfluous. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.) Let’s take care of that for good: for our purposes, “damage” means “physical damage.”
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-54 Log #3160 NEC-P03 **Final Action: Reject**
(300.5(F))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Reformat Section as follows adding text as indicated in underline type, and deleting text as indicated in strikethrough type, as shown:
(F) Backfill. Backfill that contains large rocks, paving materials, cinders, large or sharply angular substances, or corrosive material shall not be placed in an excavation where materials may damage raceways, cables, or other substructures or prevent adequate compaction of fill or contribute to corrosion of raceways, cables, or other substructures.
(1) ~~Where necessary to~~ <u>Where the authority having jurisdiction deems it</u> necessary to prevent physical damage to the raceway or cable, protection shall be provided in the form of granular or selected material, suitable running boards, suitable sleeves, or other approved means.
Substantiation: By deleting and adding the text as proposed, this proposal would give the Authority Having Jurisdiction more clear power to assure that the intent of this section is followed. The present use of the phrase “Where necessary to...” leaves only the imagination to judge just as to just who would, or would not find it necessary to install the intended protection.
Panel Meeting Action: Reject
Panel Statement: Section 110.2 states that “conductors and equipment required or permitted by this Code shall be acceptable only if approved” and “approved” is defined in Article 100 as being acceptable to the authority having jurisdiction. Inserting this text into 300.5(F) is not necessary, since 110.2 already provides the AHJ’s with that power.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-55 Log #537 NEC-P03 **Final Action: Reject**
(300.5(G))

Submitter: Joel A. Rencsok, Electrical Designs Inc.
Recommendation: Revise text to read:
Where a raceway enters from an underground system, the end within the building shall be sealed so as to prevent the entrance of moisture or gases. The sealing device shall be identified and listed for the purpose.
Substantiation: I have submitted three photos where the underground feeder generated enough Hydrogen gas to blow apart the control building. Fortunate no one was killed. See also 300.50(E).
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Seal-off devices can minimize the migration of gases or vapors but not prevent this migration based on the laws of physics. Since seal-off devices cannot prevent the migration of gases, the first sentence of the proposal is not possible and would be totally unenforceable. The submitter did not provide all of the pertinent information involved in this incident, so the panel could analyze the cause and effects of the incident. Making a change and a requirement of this magnitude in the Code requires more technical substantiation than was provided in the proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-56 Log #2233 NEC-P03 **Final Action: Reject**
(300.5(I))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
(I) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be installed in the same raceway or cable <u>or where individual conductors are used, they</u> shall be installed in close proximity in the same trench.
Substantiation: It appears that the current wording would permit the use of a three conductor cable containing the three phase conductors and individual conductors for the grounded and grounding conductors installed in close proximity in the same trench. This proposal would require that all circuit conductors be in the same raceway, or if individual conductors are used that these individual conductors be installed in close proximity in the trench.
Panel Meeting Action: Reject
Panel Statement: The requirement is already provided in the existing text in 300.5(I) for underground raceways or cables. This section works in conjunction with the requirements in 300.3(B)(2), where permission is given for a cable assembly installed in accordance with Section 250.134(B), Exception No. 2, for

dc circuits. Making this proposed change would make this dc application a code violation in this section and a conflict with the permission in 250.134(B), Exception No. 2.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-57 Log #1234 NEC-P03 **Final Action: Reject**
(300.5(I) Exception No. 2)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "nonmetallic raceways" to "nonmagnetic raceways".
Substantiation: Edit. Isolated conductors are permitted for cables with a nonmagnetic sheath: nonmagnetic raceways such as aluminum, brass, or copper should be included.
Panel Meeting Action: Reject
Panel Statement: This Exception No. 2 is targeting parallel conductor installations in PVC or other nonmetallic conduit.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-58 Log #1641 NEC-P03 **Final Action: Reject**
(300.6(A))

Submitter: Gregory J. Steinman, Thomas & Betts Corporation
Recommendation: Add the word "listed" and delete the word "approved" to describe electrically conductive corrosion resistant compound.
Where corrosion protection is necessary and the conduit is threaded in the field, the threads shall be coated with a listed ~~approved~~ electrically conductive corrosion resistant compound.
Substantiation: There are numerous compounds on the market that may not be appropriate for this use. An AHJ has no tools to use to confirm whether a compound may or may not be suitable for long-term corrosion protection. Underwriters Laboratories Inc. created a product category for this specific application, (FOIZ) Electrically Conductive Corrosion Resistant Compounds. There have been corrosion issues with field-threaded conduit, which was the reason for this requirement being introduced in 2002. Don't rely on an AHJ taking an educated guess on the long-term performance of corrosion protection. This electrical connection is the safety path for effective grounding. Any corrosion at these connections depreciates the safety level.
Panel Meeting Action: Reject
Panel Statement: No substantiation has been provided by the submitter to show there is a problem with using non-listed products. "Listed" products may be approved, but there is no justification to require "listed" only.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 10 Negative: 3
Explanation of Negative:
CASPARRO, P.: Although I agree that no substantiation has been provided by the submitter to prove the need for a listed product, I do believe that the submitter has valid concerns that need to be addressed. Listing would remove the guesswork for the Authority Having Jurisdiction when trying to determine if a compound is adequate for the task.
The panel also had discussion about whether these compounds are listed for use in hazardous locations. This is a very valid concern since the grounding path in a hazardous location is an even greater concern. But, the fact that a product is not listed for a particular application is no reason to reject a proposal, Arc Fault devices didn't exist at the time they were introduced into the NEC.
EGESDAL, S.: Considering that electrically conductive corrosion resistant compound applied in the field will be expected to function for decades, it is reasonable to require a listed product, where independent evaluation and listing will provide long-term confidence in the product.
GUIDA, T.: This proposal should have been accepted requiring listed corrosion protection for field threaded rigid and IMC conduit. Listed corrosion resistant compounds have been tested for both their corrosion resistivity and an electrical conductivity test. Electrical inspectors should not be required to determine in the field whether a material installed on the threads of a raceway are electrically conductive when there is a listed material that is available that will ensure conductivity of the conduit path. If a material is applied to the field threads of a metal raceway and conductivity is impaired, the grounding and bonding path of the metal raceway may no longer be an assured path and a ground fault in a circuit may not have a path back to the source to facilitate the operation of the overcurrent protective, as required by 250.4(A)(5).
Comment on Affirmative:
PACE, D.: The ACC supports the panel statement that no substantiation was provided to indicate that "non-listed" compounds are a problem. "Listed" products may be approved for use, but there is no justification to require "listed" products only.

3-59 Log #3396 NEC-P03 **Final Action: Accept**
(300.6(B))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: In both the title and text, change "non-ferrous" to "aluminum".
Substantiation: This proposal corrects a serious error in the 2005 NEC that was based on faulty substantiation when the proposal that created this rule was presented. Not all non-ferrous metal raceways are aluminum, but the proposal substantiation presented UL Guide Card restrictions that only apply to aluminum. These requirements do not apply to brass conduit, and complicate swimming pool wiring projects that use metallic raceways. Brass conduit has been recognized for these uses for forty years.
Panel Meeting Action: Accept
Panel Statement: The panel does not agree with the submitter's claim in the substantiation that there is a "serious" error in the 2005 edition of the Code.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-60 Log #639 NEC-P03 **Final Action: Accept in Principle**
(300.6(B) Exception (New))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Add a new exception as follows:
Exception: Red Brass shall not be required to have protective coatings.
Substantiation: This change is necessary to correct a problem which has developed since this section was rewritten for the 2002 edition. The text in 300.6(B) "Non-Ferrous Metal equipment" is applicable to non-ferrous products, including aluminum and red brass. Aluminum and red brass rigid conduit are listed to UL 6A. The UL Electrical Construction Equipment Directory includes limitations and special conditions of use for listed products. Under the product category "Conduit, Rigid Nonferrous Metallic (DYWV), aluminum conduit is required to have supplementary corrosion protection when installed in concrete or in soil. UL does not require supplementary protection for Red Brass conduit. Red Brass conduit has been used for many years as the preferred method for wiring swimming pool lighting and has held up in these harsh corrosive environments without problems.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action and statement for Proposal 3-59. The submitter is correct. One type of nonferrous raceway, brass conduit, does not require extra corrosion protection. This requirement only applies to aluminum raceways, enclosures, etc, that are in direct contact with the earth or embedded or encased in concrete. By changing "nonferrous" in both the title and the text to "aluminum," this subsection will now only apply to aluminum equipment. The proposed exception would no longer apply.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-61 Log #640 NEC-P03 **Final Action: Accept in Principle**
(300.7(B), FPN)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise Fine Print Note to read as follows:
FPN: Table 352.44(A) provides the expansion information for polyvinyl chloride (PVC). A nominal number for steel conduit can be determined by multiplying the expansion length in this table by 0.20. The coefficient of expansion for steel electrical metallic tubing, intermediate metal conduit, and rigid conduit is ~~11.70 x 10-6~~ 1.170 x 10 -5 (0.0000117 mm per mm-of conduit for each °C in temperature change) [~~6.50 x 10-6~~ (0.650 x 10 -5) (0.00000 65 in. per inch of conduit for each °F in temperature change)].
A nominal number for aluminum conduit can be determined by multiplying the expansion length in Table 352.44(A) by 0.40. The coefficient of expansion for aluminum electrical metallic tubing and rigid metal conduit is 2.34 x 10 -5 (0.0000234 mm per mm of conduit for each °C in temperature change) [1.30 x 10 -5 (0.000013 in. per inch of conduit for each °F in temperature change)].
Substantiation: This is a change in the exponential value of the coefficient of expansion associated with steel raceways. It does not change the resultant calculations associated with determining the length of expansion or contraction change per unit of temperature change. It is being changed to reflect the same exponential value as shown in Table 352.44(A) for Rigid Nonmetallic Conduit (RNC) which this FPN references. It allows for a direct, general comparison of the linear expansion characteristics of these commonly used raceways. Aluminum was added to complete the family of metals commonly used.
Panel Meeting Action: Accept in Principle
Revise the existing FPN to read as follows:
FPN: Table 352.44(A) provides the expansion information for polyvinyl chloride (PVC). A nominal number for steel conduit can be determined by multiplying the expansion length in this table by 0.20. The coefficient of

expansion for steel electrical metallic tubing, intermediate metal conduit, and rigid conduit is ~~11.70 x 10-6~~ 1.170 x 10 -5 (0.0000117 mm per mm of conduit for each °C in temperature change) [~~6.50 x 10-6~~ 0.650 x 10 -5 (0.00000 65 in. per inch of conduit for each °F in temperature change)].

In the proposed second paragraph, add "and aluminum electrical metallic tubing" after "aluminum conduit" in the first sentence. Add "aluminum" before "rigid metal conduit" in the second sentence. The changes to read as follows:

A nominal number for aluminum conduit and aluminum electrical metallic tubing can be determined by multiplying the expansion length in Table 352.44(A) by 0.40. The coefficient of expansion for aluminum electrical metallic tubing and aluminum rigid metal conduit is 2.34 x 10 - 5 (0.0000234 mm per mm of conduit for each o C in temperature change) [1.30 x 10 -5 (0.000013) in. per inch of conduit for each o F in temperature change].

Panel Statement: The text was added to the recommended text to clarify the types of raceways included in the expansion calculation.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

CASPARRO, P.: I understand that PVC, HDPE, and RTRC conduits all have coefficient of expansion tables in their respective articles. The FPN in 300.7(B) contains a multiplier for steel. The multiplier is to be used with the table in 352 (for PVC conduit) to find expansion charactristics for steel conduit. There is currently no multiplier for aluminum in the NEC. Consequently nonmetallic conduit products and steel products are covered, but aluminum is not. This change to the FPN corrects the oversight.

3-62 Log #1914 NEC-P03 **Final Action: Reject**
(300.7(B), FPN)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-53. See Technical Correlating Committee action on Proposal 8-53. This action will be considered by the Panel as a Public Comment.

It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for comment.

Submitter: William Wagner, Certification Solutions

Recommendation: Revise the first sentence of the FPN to 300.7(B) as follows:

FPN: Table 352.44 ~~(A~~) provides the expansion information for polyvinyl chloride (PVC).

Substantiation: This is a companion proposal for the revised Article 352 for Type PVC Conduit. Article 352 will now apply only to rigid polyvinyl chloride conduit (Type PVC), rather than for rigid nonmetallic conduit (Type RNC) which includes PVC, HDPE and RTRC. Therefore, there will only be one Table 352.44 and the reference should be revised accordingly.

Panel Meeting Action: Reject

Panel Statement: Since Panel 8 has jurisdiction over Article 352, this change must first occur with Panel 8 in Article 352.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-63 Log #2234 NEC-P03 **Final Action: Reject**
(300.9 (New))

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Add new text to read as follows:

300.9 Raceways in Wet Locations. Cables and conductors installed in underground raceways or raceways that are located in wet locations shall be listed for use in wet locations.

Substantiation: The interior of raceways installed in wet locations is a wet location and the cables and conductors installed in such raceways should be listed for that purpose. I have submitted a proposal to delete the similar requirement for underground installations that is in 300.5(B). This new requirement will cover all raceways installed in wet locations.

Panel Meeting Action: Reject

Panel Statement: The requirement for cables to be suitable for the location in which they are to be installed is presently addressed in Section 310.8, and Table 310.13 applicable locations. Article 310 covers the general requirements for conductors such as insulation types, designations, and uses. To add the proposed text to Article 300 would be inappropriate since 300 deals with wiring methods in general. Repeating this requirement in Article 300 does not add clarity to The Code. See panel action and statement for Proposal 3-43.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-64 Log #158 NEC-P03 **Final Action: Reject**
(300.10)

Submitter: Steven Stelly, Louisiana Dept. of Transportation and Development

Recommendation: My proposal is to require an equipment grounding conductor of appropriate size preventing the use of conduit as an equipment grounding conductor.

Substantiation: Because of some uncontrollable situations due to changing environmental conditions such as air pollution, resulting in rusted out or broken threads, couplings or connectors pulled apart that are not apparent because of hidden locations, the integrity of the conduit being used as an equipment grounding conductor is lost. Because of a short circuit or ground fault occurring in equipment down stream of the break, an unsuspecting person could receive a severe shock or be electrocuted.

The added cost of installing an equipment grounding conductor in the conduit instead of using the conduit is minimal in comparison to saving a life.

Panel Meeting Action: Reject

Panel Statement: This proposal does not comply with Section 4.3.3 of the NFPA Rules and Regulations to provide specific text in the recommendation for change. A suggested change of this magnitude requiring a separate equipment grounding conductor, rather than permitting the raceway to act as the equipment grounding conductor, must be submitted to Panel 5 for grounding and bonding and to Panel 8 covering raceways for their action.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-65 Log #2228 NEC-P03 **Final Action: Accept in Principle**
(300.10 Exception No. 3 (New))

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Add an exception to read as follows:

Exception No. 3: Where conduits are installed into the bottom of open bottom equipment, the conduits shall not be required to be mechanically secured to the equipment.

Substantiation: Large equipment such as switchboards, MCCs and pad mount transformers are often supplied with open bottoms for the conduit to be stubbed into. There is no way to secure these conduits to the equipment. The rule in this section says that the conduits must be mechanically secured to the enclosure, "unless specifically permitted elsewhere in this Code." There is no specific provision in this code to permit this, yet this type of installation is very common.

Panel Meeting Action: Accept in Principle

Reword the recommended text to read as follows:

Exception No. 3: Conduit installed into the bottom of open bottom equipment, such as switchboards, motor control centers, and transformers, shall not be required to be mechanically secured to the equipment.

Panel Statement: The text was changed to provide clarity and some examples of open bottom type equipment where this exception could apply.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-66 Log #2942 NEC-P03 **Final Action: Reject**
(300.11)

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Revise existing 300.11 as follows and renumber the following subsections:

300.11 Securing and Supporting.

(A) Secured in Place. Raceways, cable assemblies, boxes, cabinets, and fittings shall be securely fastened in place.

(B) Support wires. Support wires that do not provide secure support shall not be permitted as the sole support. Support wires and associated fittings that provide secure support and that are installed in addition to the ceiling grid support wires shall be permitted as the sole support. Where independent support wires are used, they shall be secured at both ends. Cables and raceways shall not be supported by ceiling grids.

Substantiation: The existing section needs to be broken up with appropriate titles to add clarity to the NEC. Adding an additional section with a title for the sentences on support wires will improve the organization of the Code. Presently, the requirements for using support wires, which are specific, are included in the section that provides a general requirement for raceways, cable assemblies, boxes, cabinets, and fittings.

Panel Meeting Action: Reject

Panel Statement: There are some organizational problems with the submitter's recommendation. The existing (A) applies to both securely fastening and supporting the various raceways, cable assemblies, etc., and must remain as a single subsection.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

9-7d Log #3519a NEC-P09 **Final Action: Reject**
(300.11(A))

TCC Action: The Technical Correlating Committee directs that the panel reconsider this Proposal since boxes for power-limited fire alarms are not excluded from Article 314 by any rules from Article 760. This action will be considered by the panel as a public comment.

The Technical Correlating Committee further directs that this proposal be forwarded to Code-Making Panel 3 for information.

Submitter: Thomas F. Norton, Norel Service Co. Inc.

Recommendation: Add a new sentence at the end of 300.11(A) as follows:

Boxes installed for smoke detectors, heat detectors or a combination of both in suspended ceilings using "T" bar supports shall not be required to install additional support to the building structure.

Substantiation: This sentence should be added for clarity. It is not the intention to require each smoke/heat detector box to be tied to the building structure.

Panel Meeting Action: Reject

Panel Statement: Section 314.23 adequately covers surface mounted, structurally mounted, finished surface, suspended ceiling mounted and similar box support. The rules in 314.23(D) are appropriate for non-power-limited applications. The proposal is unclear as to the intended application. Modifications of 314.23(D) for power-limited applications in Article 760 are under the jurisdiction of CMP-3

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

3-67 Log #3519 NEC-P03 **Final Action: Reject**
(300.11(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 9 for action in Article 314. This action will be considered by Code-Making Panel 9 as a public comment.

Submitter: Thomas F. Norton, Norel Service Co. Inc.

Recommendation: Add a new sentence at the end of 300.11(A) as follows:

Boxes installed for smoke detectors, heat detectors or a combination of both in suspended ceilings using "T" bar supports shall not be required to install additional support to the building structure.

Substantiation: This sentence should be added for clarity. It is not the intention to require each smoke/heat detector box to be tied to the building structure.

Panel Meeting Action: Reject

Panel Statement: Section 314.23 adequately covers surface-mounted, structurally mounted, finished surface, suspended ceiling mounted and similar box support and is under the jurisdiction of Panel 9, not Panel 3. Very specifically, 314.23(D) applies to box support from a framing member in (1) and to support wires in (2). Any suggested changes for support of boxes in a suspended ceiling should be submitted to 314.23(D) rather than 300.11.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-67a Log #CP300 NEC-P03 **Final Action: Accept**
(300.11(A)(2))

Submitter: Code-Making Panel 3,

Recommendation: Revise the last sentence of 300.11(A)(2) to read as follows:

An independent means of secure support shall be provided <u>and shall be permitted to be attached to the assembly</u> .

Substantiation: Adding this text in the last sentence in (2) provides clarity and direction to the installer and the inspector that connecting the lower end of the independent support for the raceway to the ceiling assembly is acceptable in a non-fire-rated assembly.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-68 Log #3299 NEC-P03 **Final Action: Reject**
(300.11(A)(2))

Submitter: Jerry Feagans, City of St. Louis

Recommendation: Revise text to read as follows:

Wiring located within the cavity of a non-fire rated floor-ceiling or roof-ceiling assembly shall ~~not~~ <u>be permitted to</u> be secured to, or supported by the ceiling assembly support wires. <u>This wiring shall be for equipment located within or supported by the ceiling assembly.</u>

Substantiation: The problem is the confusion about which wires can or cannot be used. Your ceiling support wires are already carrying the weight of your lay-in fixtures. Adding the weight of the whips for these fixtures does not appear to add that much additional weight to the ceiling system. I have tried to get the manufacturers instructions to see how they recommend how to install and I have not been successful in doing so. It appears that the manufacturers are reluctant in issuing those instructions. With this change the contractors and the AHJ will still be able to insure a safe and secure wiring system without all the unnecessary confusion.

Panel Meeting Action: Reject

Panel Statement: Many non-fire rated ceiling assemblies are not even rated to carry the weight load of lay-in luminaires and certainly are not rated to carry the load of the branch circuit wiring system. Where the ceiling assembly is designed to carry the load of the luminaires, the manufacturer has absolutely no idea of the type of wiring method that will be used to connect to these luminaires and the approximate weight of that wiring method. One of the major problems in the past in permitting wiring methods to be supported by the ceiling grid assembly was the number of raceways supported by one ceiling wire. Many installations had three or more ½ or ¾ inch EMTs attached to each grid wire. The attachment means had a tendency to shorten the support wire a small amount and thus make the finished ceiling not level. To fix the problem, the ceiling grid installer would just pop the EMT support devices off the support wire, leaving the EMT unsupported above the ceiling.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-69 Log #3298 NEC-P03 **Final Action: Reject**
(300.11(A)(2) Exception)

Submitter: John Stacey, City of St. Louis, Elect. Insp. Dept.

Recommendation: Revise text to read as follows:

The ceiling support system shall be permitted to support new ceiling branch - circuit wiring and associated ceiling equipment where installed in accordance with ~~Ceiling System Manufacturer's Instructions~~ the AHJ.

Substantiation: After calling several ceiling manufacturers, they had no instructions and did not want anything on their support wires. The weight of the luminaire exits are on the ceiling already. Some of the slabs above may be 20+ ft. A 1/2 - pound whip should not overload these ceilings. Please reconsider.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement for Proposal 3-68.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-70 Log #3189 NEC-P03 **Final Action: Reject**
(300.11(B))

Submitter: Donald Cook, Shelby County Development Services

Recommendation: Revise text to read:

300.11(B) Raceways used as Means of Support. Raceways shall be used only as a means of support for other raceways, cables, ~~or~~ <u>electric or</u> nonelectric equipment under any of the following conditions:

Substantiation: Current text permits the support of raceways, cables, or nonelectric equipment by other raceways. The items included in 300.11(B)(3) which are permitted to be supportted by raceways (boxes, conduit bodies, and luminaires) are neither raceways, cables nor nonelectric equipment.

Adding "electric or" will cover those items. Electric equipment is defined in Article 100 and includes the items listed in 300.11(B)(3).

Panel Meeting Action: Reject

Panel Statement: Section 300.11(B) clearly lays out the conditions whereby raceway can be used to support other items and delineate them in 300.11(B)(1),(2), and (3). Raceways are neither tested nor listed for external mechanical load carrying capabilities.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

AYER, L.: I would agree with the submitter's substantiation. Other than raceways and cables, 300.11(B) allows only nonelectric equipment to be supported by raceways under certain conditions. 300.11(B)(3) under this section allows for boxes, conduit bodies, and luminaries to be supported by raceways. These items are clearly electric items and the wording of the present text needs to be revised for clarity.

3-71 Log #638 NEC-P03 **Final Action: Reject**
(300.11(B)(4) (New))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Add a new (4) to 300.11(B) to read as follows:

<u>(4) Support for cable installed in raceway shall be provided by the raceway, installed in accordance with the applicable raceway article.</u>

Substantiation: To many it may be obvious that the conduit is the support for cables inside the conduit, just as it is for conductors. 300.11(B) does not permit cable to be supported by raceway. Therefore, questions often arise in the field regarding support whenever cable is installed in conduit. The proposed text is a clarification of what is required, including the fact that it is the conduit support requirements that apply. This new text would only be applicable where the cable is not prohibited from being installed in conduit. Chapter 3 is the appropriate place for this rule as it could apply to several articles, dependent upon what Panel 7 permits or prohibits relevant to cables in raceway, both currently and in the future. Panel 3 may recall that Panel 8 revised raceway

articles in the 2005 NEC to permit cables in raceways unless the individual cable articles prohibit it, thus those decisions have been passed from Panel 8 to Panel 7. At the current time the cables most likely to be installed in conduit are not prohibited.
Panel Meeting Action: Reject
Panel Statement: The support of conductors and cables by the raceway when the cables and conductors are pulled into the raceway would seem to be very obvious, but this is certainly covered by 300.11(B)(1) since raceways are listed to contain conductors and permission is granted in a number of the raceway articles to also contain cables. Certainly if the raceway is identified for the internal support of conductors and permission is given in the cable article to install the cable in a raceway, then it follows that the cable is also supported. This would be contrary to the extra support requirements that are provided in 300.19 for vertical raceways.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-72 Log #1109 NEC-P03 **Final Action: Reject**
(300.11(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Cable wiring methods shall not be used as a means of support for other cables, raceways, or ~~nonelectrical~~ equipment.
Substantiation: Edit. The word "nonelectrical" implies that this section does not prohibit of electrical equpment such as a receptacle or switch box.
Panel Meeting Action: Reject
Panel Statement: The word "equipment," as defined in Article 100, is a very general definition and includes electrical materials, fittings, devices, appliances, luminaires, apparatus, and anything similar used in connection with or as a part of an electrical installation. The intent of this section was to limit cable wiring methods from supporting other cables, raceways, and non-electrical equipment. There may be listed cable assemblies and fittings that are adequately supporting electrical sensing equipment in certain installations, so this application should still be permitted.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-73 Log #1009 NEC-P03 **Final Action: Reject**
(300.11(C) Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
Exception: A single listed Class 2 or Class 3 cable that is soley for the connection to the control circuit(s) of a single utilization equipment shall be permitted to be supported from Type AC, Type MC, or Type MI cable used as the power supply for the equipment.
Substantiation: A limit of a single Class 2 or 3 cable and a single utilization equipment would make such support reasonable, since flexible metal and nonmetallic raceways are permitted for support in 300.11(B). This type of installation is commonly installed and accepted.
Panel Meeting Action: Reject
Panel Statement: There was no restriction provided in the recommended text as to the size of Class 2 or Class 3 cable that could be installed, the number of conductors within the Class 2 or Class 3 cables attached to AC, MC or MI cable, or any restriction for the length of the Class 2 or 3 cable. Finally there was no size provided for the Type AC, MC, or MI cable that could be used for supporting other cables. All of these items mentioned must be quantified to ensure that the control cable does not overburden the power cable. This is consistent with 300.11(B)(2).
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-74 Log #1011 NEC-P03 **Final Action: Reject**
(300.11(C) Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
Exception: A single listed Class 2 or Class 3 cable that is solely for the connection to the control circuit(s) of a single utilization equipment shall be permitted to be supported from Type AC, Type MC, or Type MI cable used s the power supply to the equipment.
Substantiation: Specifying a single listed cable and a single equipment will exclude multiple cables and other type cables. Raceways, including flexible metal and nonmetallic types are permitted in 300.11(B). This type installation is not uncommonly installed and accepted.
Panel Meeting Action: Reject
Panel Statement: See the panel Statement in Proposal 3-73.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-75 Log #273 NEC-P03 **Final Action: Reject**
(300.12 Exception No. 1)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Exception No. 1: Short sections of raceway used to provide support or protection of cable assemblies from ~~physical~~ damage shall not be required to be made electrically continuous.
Substantiation: Use of the word "physical" is superfluous. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-76 Log #1340 NEC-P03 **Final Action: Reject**
(300.14)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add the word "unspliced"
300.14 Length of Free Conductors at Outlets, Junctions, and Switch Points. At least 150 mm (6 in.) of free <u>, unspliced,</u> conductor, measured from the point in the box where it emerges from its raceway or cable sheath, shall be left at each outlet, junction, and switch point for splices or the connection of luminaires (fixtures) or devices. Where the opening to an outlet, junction, or switch point is less than 200 mm (8 in.) in any dimension, each conductor shall be long enough to extend at least 75 mm (3 in.) outside the opening.
Substantiation: This change is to clarify that the free length of conductor is required to be unspliced. As written, the code is vague as to whether or not the conductor is permitted to contain a splice in the free length aforementioned.
Panel Meeting Action: Reject
Panel Statement: The purpose of Section 300.14 is to permit access to the end of the conductor. Whether this conductor is spliced or un-spliced does not affect the length of this free end of the conductor. Many conductors originate inside the box and are spliced to other conductors within the box but extend out of the box for connection to a device of some kind. Making this change would not permit this very common application. Even the exception to this section states that unspliced or unterminated conductors do not have to comply with 300.14.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-77 Log #262 NEC-P03 **Final Action: Reject**
(300.15(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Protection. A box or conduit body shall not be required where cables enter or exit from conduit or tubing that is used to provide cable support or protection against ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in

1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-78 Log #1406 NEC-P03 **Final Action: Reject**
(300.15(C), Exceptions No. 1 and 2 (New))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Add the following Exceptions to 300.15(C):
Exception No. 1: A fitting shall not be required for type LFNC used for protection between a box and entrance into concealed spaces where the conduit is secured within 1 ft of the penetration into the concealed space.
Exception No. 2: A fitting shall not be required where short lengths of LFNC are used for separation of cables from masonry.
Substantiation: For Exception No. 1: It is highly difficult to abrade cable assemblies with type LFNC conduit. This would ease installations from outdoor boxes to interior spaces. An instance where this exception would be utilized is retrofitting existing structures for air conditioning.
For Exception No. 2: Anything unrecognized by the NEC that safely separates the cable from masonry can be used for this purpose, where as of now if LFNC is used a fitting must be installed, despite the fact that it is not really serving as conduit so much as a nonabrasive seperative device.
Panel Meeting Action: Reject
Panel Statement: Where cable is installed as a wiring method, and then conversion to conduit or tubing occurs, protection of the cable is imperative to prevent abrasion from sharp edges. Since this is a general section that deals with cables being converted to conduit or tubing, a specific change can be inserted into any article dealing with cables, conduit, or tubing. Depending on the robustness of the cable, such as three conductor UF cable installed in place of NM cable, abrasion of the cable may not be an issue but it would be better dealt with in either the specific cable article or the raceway article.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-79 Log #3397 NEC-P03 **Final Action: Reject**
(300.15(L))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
(L) Manholes and Handhole Enclosures. ~~Where accessible only to qualified persons,~~ A box or conduit body shall not be required for conductors in manholes or handhole enclosures, except where connecting to electrical equipment. The installation shall comply with Part V of Article 100 for manholes, and 314.30 for handhole enclosures.
Substantiation: The deleted wording is apparently intended to apply to the inside of these enclosures. However, the literal text applies to the outside of the enclosure, and inadvertently prohibits their use in public areas where they have been routinely used since they were first developed. The access rule can be simply deleted, because access to the inside is limited by the requirements to attach the cover with a method that requires a tool to open (or with a cover that weighs over 100 lb). See 314.30(D) and 110.75(D). In addition, jurisdiction over access to the interior of these enclosures should rest with CMP 1 and CMP 9 respectively.
Panel Meeting Action: Reject
Panel Statement: A manhole or a handhole enclosure may still be accessed by someone who is not a qualified person and that person may not understand the safety issue of these conductors being spliced inside the manhole or enclosure without a box or fitting. If the manhole is accessed by other than qualified people, installing a box or an enclosure for splices or terminations may still be necessary, so deleting this phrase would decrease safety in these applications.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-80 Log #1144 NEC-P03 **Final Action: Reject**
(300.16(A) and FPN (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add "conduit body" after "box."
Add FPN:
FPN: See 300.20(B) where metal boxes or conduit bodies are used.
Substantiation: Edit. Conduit bodies with three or more hubs should be suitable. (see 590.4(G). The FPN clarifies that this section does not conflict with 300.20(B) due to lack of reference to metal.
Panel Meeting Action: Reject
Panel Statement: This applies only where open wiring or concealed knob and tube wiring is converted to conduit, tubing, NM cable, AC cable, MC cable, MI cable, or surface raceways. Where this conversion occurs, a box or fitting is required. While there can be no splices or taps in a fitting, taps or splices could occur within a box. It would take permission from 314.16(C)(2) for those splices or taps within a conduit body. There was no technical substantiation provided to add conduit bodies to this section. In addition, Section 300.20 would apply to these applications where single conductors enter into a ferrous metal enclosure, so a fine print note added to 300.16(A) is unnecessary.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-81 Log #3341 NEC-P03 **Final Action: Reject**
(300.17)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Add a second paragraph as follows:
Where different raceway wiring methods are joined together without a pull point at the transition, there shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.
Substantiation: Although the 360° rule is adequately covered in the various tubular raceway articles, none of those limitations apply beyond the scope of their article. There are a variety of listed fittings that enable seamless transitions between wiring methods, and nothing in 300.15 requires enclosures at such points unless the conductors actually terminate or splice. The result is no literal NEC requirement to observe the 360° bend rule on a continuous pull if the run crosses wiring methods, provided no particular wiring method exceeds the bend limit. A fish tape does not know that it has crossed a wiring method transition. This proposal provides an important tool for the inspection community to control abuses of what CMP 8 clearly intends as the upper limit elsewhere in Chapter 3.
Panel Meeting Action: Reject
Panel Statement: There are raceways in Chapter 3 that do not have the 360-degree bend requirements. For example, this added sentence would make it a requirement that strut-type channel raceways in Article 384, surface metal raceways in Article 386, and surface nonmetallic raceways in Article 388 would all have to comply with the 360-degree rule even though all have removable covers.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-82 Log #1467 NEC-P03 **Final Action: Reject**
(300.17, FPN)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in 300.17 FPN.
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: While the term "fixture," as relating to "lighting fixtures" has been changed to "luminaires", the term "fixture wires" applies to conductors that serve appliances or other devices and not just "luminaires." The change in terminology does not provide greater clarity or usability.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-83 Log #1915 NEC-P03 **Final Action: Accept in Part**
(300.17, FPN)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 8-53 and 8-78. This action will be considered by the Panel as a Public Comment.
See Technical Correlating Committee action on Proposals 8-53 and 8-78.
It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise the FPN to 300.17 as follows:
FPN: See the following sections of this Code: intermediate metal conduit, 342.22; rigid metal conduit, 344.22; flexible metal conduit, 348.22; liquidtight flexible metal conduit, 350.22; rigid ~~nonmetallic~~ PVC conduit, 352.22; HDPE conduit, 353.22; RTRC, 355.22 ; liquidtight nonmetallic flexible conduit, 356.22; electrical metallic tubing, 358.22; flexible metallic tubing, 360.22; electrical nonmetallic tubing, 362.22; cellular concrete floor raceways, 372.11; cellular metal floor raceways, 374.5; metal wireways, 376.22; nonmetallic wireways, 378.22; surface metal raceways, 386.22; surface nonmetallic raceways, 388.22; underfloor raceways, 390.5; fixture wire, 402.7; theaters, 520.6; signs, 600.31(C); elevators, 620.33; audio signal processing, amplification and reproduction equipment, 640.23(A) and 640.24; Class 1, Class 2, and Class 3 circuits, Article 725; fire alarm circuits, Article 760; and optical fiber cables and raceways, Article 770.

Substantiation: This is a companion proposal for the definition of Rigid Nonmetallic Conduit in Article 100, the revised Article 352 for Type PVC Conduit and the proposed new Article 355 for RTRC. The products formerly designated collectively as rigid nonmetallic conduit (Type RNC) will be expanded to include separate Articles for PVC, HDPE and RTRC.
Panel Meeting Action: Accept in Part
Accept the addition of HDPE conduit, 353.22, and reject the remainder of the proposal.
Panel Statement: HDPE conduit was accepted since Article 353 was a new article in the 2005 NEC. The remainder of the proposal was not accepted, since Panel 8 has jurisdiction over raceway articles and the NEC TCC has jurisdiction over the acceptance of new articles in the NEC.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-84 Log #3272 NEC-P03 **Final Action: Reject**
(300.18(C) (New))

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review
Recommendation: Add text to read as follows:
300.18(C) Raceway Diameter. Raceways shall be of the same diameter from one end of a run to the other end unless the diameter of the raceway is changed at a junction/pull box, or when the raceway diameter is changed anywhere in the run, it is visible where the change is made.
Substantiation: The problem is that all to often, especially in remodel work a designer will go to a site to be remodeled and observe a larger raceway than may have been required thinking that there will be available space for them to increase the wire size, especially when schedule 80 PVC is involved because many times a larger raceway was installed above grade for physical protection. Even if the conductors can be installed in a raceway smaller than would be allowed because the designer cannot determine the size. Many times the conductors are damaged and there are no indications of this until they become a problem sometime in the future.
Panel Meeting Action: Reject
Panel Statement: The reason Table 4 and Annex C were changed in the 1990s was that different types of raceways and tubing have a slightly different inside diameter, even for the same trade size. These different diameters would make this proposed rule unenforceable. There are even different internal diameters for the same type of raceway within a product group, as was mentioned in the substantiation, such as Schedule 80 versus Schedule 40 PVC conduits.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-85 Log #3016 NEC-P03 **Final Action: Reject**
(300.19 Exception (New))

Submitter: James Conrad, Tyco Thermal Control
Recommendation: Add exception to 300.19 as follows:
<u>Exception: Conductors in vertical racewarys that are part of an Electrical Circuit Protective System shall be supported in accordance with the distances given in the system write-up but not to exceed the values in Table 300.19(A).</u>
Substantiation: Testing has shown that conductors in a vertical raceway weakened when exposed to fire conditions. This is currently being addressed by the STP for UL 2196 and each manufacturer will be required to test their systems to determine the maximum distance for their cable support distance.
Panel Meeting Action: Reject
Panel Statement: This is already covered in Section 110.3(B), where listed and labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling, so inserting this text into 300.19 as an exception is unnecessary.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-85a Log #CP301 NEC-P03 **Final Action: Accept**
(300.20(A))

Submitter: Code-Making Panel 3,
Recommendation: Add the word "ferrous" in the title in two places and in (A) in three places to read as follows:
300.20 Induced Currents in Ferrous Metal Enclosures or Ferrous Metal Raceways.
(A) Conductors Grouped Together. Where conductors carrying alternating current are installed in ferrous metal enclosures or ferrous metal raceways, they shall be arranged so as to avoid heating the surrounding ferrous metal by induction. To accomplish this, all phase conductors and, where used, the grounded conductor and all equipment grounding conductors shall be grouped together.
[The exceptions are not changed.]
Substantiation: Section 300.20 is addressing induction from the ac conductors into ferrous (magnetic) metal enclosures and ferrous raceways. The word "ferrous" was added to more accurately describe the type of metal enclosures and raceways where induction would be an issue. This change will provide correlation for terminology with Section 300.3(B) and 300.5(I),
Exception No. 2.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-86 Log #1235 NEC-P03 **Final Action: Accept in Principle**
(300.20(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Insert "with magnetic properties" after "metal raceways".
Substantiation: Edit. Literal wording does not permit single conductor Type MI or Type MC cable for ac circuits. Subsection (B) qualifies metal as "with magnetic properties".
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Log CP301, which would seem to satisfy the submitter's intent.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-87 Log #2747 NEC-P03 **Final Action: Reject**
(300.20(A) Exception No. 3 (New))

Submitter: Daniel Baker, URS Corporation, Inc.
Recommendation: Revise text to read:
<u>Exception No. 3: Conductors of series circuits powered by regulators which limit current to 20 amperes, may be run without being grouped.</u>
Substantiation: Existing article reads:
300.20(A) Conductors Grouped Together. Where conductors carrying alternating current are installed in metal enclosures or metal raceways, they shall be arranged so as to avoid heating the surrounding metal by induction. To accomplish this, all phase conductors and, where used, the grounded conductor and all equipment grounding conductors shall be grouped together.
It is common practice in airfield lighting series circuits which are powered by regulators to separate the conductors and run single conductors along the edge of a taxiway or runway. This saves on wiring costs which can be significant because of the long runs involved, runways are usually over 5,000 feet long. As a result of this, conductors often enter enclosures singly. The practices and methods used in airfield lighting are based on Federal Aviation Administration (FAA) Advisory Circulars (ACs). An example of ungrouped entering a metal enclosure is shown on the left in **Figure 23** of Appendix 1 of Advisory Circular AC 150/5340-30A "Design and Installation Details for Airport Visual Aids", issued April 11, 2005. The ACs stipulate that the series circuits be connected to "Constant Current Regulators" (CCRs). There are two classes of CCRs, one with a maximum rating of 6.6 amperes and the other with a rating of 20 ampleres, maximum. Considering the limitation to 20 amperes, maximum there will be negligible heating caused by this separation.
Although many airfield installations are not inspected by local inspectors, there are times where this occurs and these installations are cited for lack of compliance with this provision of the NEC. This proposal adds a third exception to the list at the end of the above NEC provision.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-9.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-88 Log #2746 NEC-P03 **Final Action: Reject**
(300.20(B) Exception No. 2 (New))

Submitter: Daniel Baker, URS Corporation, Inc.
Recommendation: Revise text to read:
<u>Exception No. 2: In the case of series circuits powered by regulators which limit current to 20 amperes or less the inductive heating effect can be ignored where these conductors are placed in metal enclosures or pass through metal.</u>
Substantiation: Existing article reads:
(B) Individual Conductors. Where a single conductor carrying alternating current passes through metal with magnetic properties, the inductive effect shall be minimized by (1) cutting slots in the metal between the individual holes through which the individual conductors pass or (2) passing all conductors in the circuit through an insulating wall sufficiently large for all of the conductors of the circuit.
It is common practice in airfield lighting series circuits which are powered by regulators to separate the conductors and run single conductors along the edge of a taxiway or runway. This saves on wiring costs which can be significant because of the long runs involved, runways are usually over 5,000 feet long. As a result of this, conductors often enter enclosures singly. The practices and methods used in airfield lighting are based on Federal Aviation Administration (FAA) Advisory Circulars (ACs). An example of an individual conductor passing through a metal enclosure is shown on the left in **Figure 23** of Appendix 1 of Advisory Circular AC 150/5340-30A "Design and Installation Details for Airport Visual Aids", issued April 11, 2005. The ACs stipulate that the series circuits be connected to "Constant Current Regulators" (CCRs). There are two classes of CCRs, one with a maximum rating of 6.6 amperes and the other with a rating of 20 amperes, maximum. Considering the limitation to 20 amperes, maximum there will be negligible heating caused by this separation.

Cutting slots in the underground enclosure to minimize the inductive effects is not practical because this would destroy the watertightness of the enclosure.

Although many airfield installations are not inspected by local inspectors, there are times where this occurs and these installations are cited for lack of compliance with this provision of the NEC. This proposal adds a second exception to the list at the end of the above NEC provision.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-9.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-89 Log #2773 NEC-P03 **Final Action: Reject**
(300.21)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Revise as follows:

300.21 Spread of Fire or Products of Combustion.

Electrical installations in hollow spaces, concealed spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN No.1 : Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 300.21 can be found in building codes, fire resistance directories, and product listings.

FPN No.2: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The addition of "concealed spaces" helps the NEC correlate with other NFPA Standards and building codes. Most NFPA standards use the term "hollow" to describe the void in a metal door, concrete blocks, and masonry. Most other NFPA standards do not consider "concealed" to mean the space is inaccessible, as defined by the NEC [See definition of "Concealed" below.]

Article 100 Definition

"Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them."

If wiring installed in a building is concealed, the definition of "concealed" is descriptive. However, when the term "concealed" is used in the term "concealed space," as in 604.4, the space is accessible.

NFPA 70-2005

"604.4 Uses Permitted.

Manufactured wiring systems shall be permitted in accessible and dry locations and in ducts, plenums, and other air-handling spaces where listed for this application and installed in accordance with 300.22.

Exception No. 1: In concealed spaces, one end of tapped cable shall be permitted to extend into hollow walls for direct termination at switch and outlet points.

Exception No. 2: Manufactured wiring system assemblies installed outdoors shall be listed for use in outdoor locations."

The proposed fine print note will alert NEC users to review NFPA 13 should there be a concern about possible combustible loading in a concealed space. The proposed fine print note is identical to the one in 800.154(A).

There is a separate proposal to add the definition of "concealed space" to Article 100 Definitions, which reads as follows:

"Concealed Space. That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and in whose size might normally range from 44.45mm (1 3/4 in.) stud spaces to 2.44 m (8ft) interstital truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting. [NFPA 96:3.3.42.1]"

Panel Meeting Action: Reject

Panel Statement: The definition for "concealed" in Article 100 in the 2005 NEC does not apply to the proposed text or to the proposed fine print note. There was no technical substantiation provided to add concealed spaces to 300.21. The reference to NFPA 13 does not seem appropriate in 300.21 at this time, since putting a sprinkler head in an inaccessible location inside the wall or above a drywall ceiling would not permit access for servicing. The area above a suspended ceiling is not considered by the NEC to be a concealed space.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: The Panel Statement points out a conflict between the NEC and NFPA 13. The use of the term "concealed" in the NEC and NFPA 13 covers different sets of spaces. Also, the Panel Statement is in error, as NFPA 13 does require sprinklers in inaccessible spaces. See below:

The following is from NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

8.14 Special Situations.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

8.14.1.2* Concealed Spaces Not Requiring Sprinkler Protection.

8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

8.14.1.2.2 Noncombustible and limited combustible concealed spaces with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

8.14.1.2.3 Concealed spaces formed by studs or joists with less than 6 in. (152 mm) between the inside or near edges of the studs or joists shall not require sprinkler protection. (See Figure 8.6.4.1.5.1.)

8.14.1.2.4 Concealed spaces formed by bar joists with less than 6 in. (152 mm) between the roof or floor deck and ceiling shall not require sprinkler protection.

8.14.1.2.5 Concealed spaces formed by ceilings attached directly to or within 6 in. (152 mm) of wood joist construction shall not require sprinkler protection.

Additionally, Mr. Koffel in his substantiation on Proposal 3-91 points out that "hollow spaces" in other NFPA standards and building codes typically refers to the void in metal doors, concrete blocks, and masonry.

The users of the NEC would benefit if the term "concealed" space in buildings had a consistent meaning across all NFPA standards.

3-90 Log #2827 NEC-P03 **Final Action: Reject**
(300.21)

Submitter: John Kacpenski, Western Telecommunications Consutling (WTC)

Recommendation: Revise text to read as follows:

300.21 Spread of Fire or Products of Combustion.

Electrical installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance-rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 300.21 can be found in building codes, fire resistance directories, and product listings.

(A) Fire Resistance Rating of Through-Penetration:

Through-Penetration Firestop assemblies shall meet all criteria set forth in ANSI/UL 1479 (ASTM E 814-02). The following ratings shall apply:

(1) "F" Rating - "F" rating criteria prohibits the passage through a firestop assembly.

(2) "T" Rating - "T" rating criteria restricts the maximum temperature rise on the unexposed surface of the wall or deck caused by the firestop assembly.

(3) "L" Rating - "L" rating determines the amount of air leakage through a firestop assembly.

(4) "F & T" Ratings - Also are required to achieve acceptable hose stream performance.

(B) Firestop Assemblies.

(1) Hourly Rating. The hourly rating given to a firestop assembly is for the complete assembly and not the individual components that make up the assemblies.

(2) Specifications listing the assembly for an application by a registered testing lab shall be provided to the AHJ along with proof of successful completion of training from the assembly manufacturer.

(C) Firestop Inspection. At a minimum the proposed firestop assembly contractor shall be prepared for all criteria referenced in ASTM E2174 and E2393.

(D) Long-Term Maintenance. Firestop assemblies shall be included on the facility passive fire protection maintenance schedule approved by the AHJ for the type of building.

Substantiation: The additional text will assist the AHJ in interpreting the code that is defined in the NEC Handbook. This additional information will also set parameters as to what is required of firestop installers, specifiers, and other responsible parties. This will also inform them of the potential criteria the AHJ will use to inspect firestop assembly installations.

Panel Meeting Action: Reject

Panel Statement: Enough information has been provided in the fine print note to 300.21 to permit the user of the NEC to access the information necessary for compliance with 300.21. Adding this recommended text does not clarify the

issue of fire resistance or fire penetration requirements. Without accessing the UL Fire Resistance Directories and studying the general and specific requirements for though-penetration fire stop systems, someone may actually misapply a fire stop application. This information is best left in its entirety in the UL Fire Resistance Directory.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-91 Log #3311 NEC-P03 **Final Action: Reject**
(300.21)

Submitter: William E. Koffel, Koffel Assoc., Inc. / Rep. Society of the Plastics Industry
Recommendation: 300.21 Spread of Fire or Products of Combustion.
Electrical installations in hollow spaces, concealed spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
FPN No.1 : Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 300.21 can be found in building codes, fire resistance directories, and product listings.
FPN No.2: See 8.14.1 of NFPA 13, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation: The addition of “concealed spaces” helps the NEC correlate with other NFPA Standards and building codes. Most NFPA standards use the term “hollow” to describe the void in a metal door, concrete blocks, and masonry. Most other NFPA standards do not consider “concealed” to mean the space is inaccessible, as defined by the NEC [See definition of “Concealed” below.]
Article 100 Definition
“Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.”
If wiring installed in a building is concealed, the definition of “concealed” is descriptive. However, when the term “concealed” is used in the term “concealed space,” as in 604.4, the space is accessible.
NFPA 70-2005
“604.4 Uses Permitted. Manufactured wiring systems shall be permitted in accessible and dry locations and in ducts, plenums, and other air-handling spaces where listed for this application and installed in accordance with 300.22.
Exception No. 1: In concealed spaces, one end of tapped cable shall be permitted to extend into hollow walls for direct termination at switch and outlet points.
Exception No. 2: Manufactured wiring system assemblies installed outdoors shall be listed for use in outdoor locations.”
The proposed fine print note will alert NEC users to review NFPA 13 should there be a concern about possible combustible loading in a concealed space. The proposed fine print note is identical to the one in 800.154(A). It should be noted that the section number may need to be changed once the 2006 Edition of NFPA 13 is published.
There is a separate proposal to add the definition of “concealed space” to Article 100 Definitions, which reads as follows:
“ **Concealed Space.** That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and in whose size might normally range from 44.45 mm (1 3/4 in.) stud spaces to 2.44 m (8 ft) interstitial truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting. [NFPA 96:3.3.42.1]”
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-89.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
EGESDAL, S.: See my Explanation of Negative for Proposal 3-89.

3-92 Log #1916 NEC-P03 **Final Action: Reject**
(300.22)

Submitter: William Wagner, Certification Solutions
Recommendation: Revise 300.22 as follows:
300.22 Wiring in Ducts, Plenums, and Other Air-Handling Spaces. The provisions of this section apply to the installation and uses of electric wiring and equipment in ducts, plenums, and other air-handling spaces.
FPN: See Article 424, Part VI, for duct heaters.
(A) Ducts for Dust, Loose Stock, or Vapor Removal. No wiring systems of any type shall be installed in ducts used to transport dust, loose stock, or flammable vapors. No wiring system of any type shall be installed in any duct, or shaft, containing only such ducts, used for vapor removal or for ventilation of commercial-type coking equipment.
(B) Ducts or Plenums Used for Environmental Air. Only wiring methods consisting of Type MI cable, Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering, electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, ~~or~~ rigid metal conduit without an overall nonmetallic covering , or Type RTRC rigid nonmetallic conduit listed as having adequate fire-resistant and low smoke-producing characteristics, shall be installed in ducts or plenums specifically fabricated to transport environmental air. Flexible metal conduit shall be permitted, in lengths not to exceed 1.2 m (4 ft), to connect physically adjustable equipment and devices permitted to be in these ducts and plenums chambers. The connectors used with flexible metal conduit shall effectively close any openings in the connection. Equipment and device shall be permitted within such ducts or plenum chambers only if necessary for their direct action upon, or sensing of the contained air. Where equipment or devices are installed and illumination is necessary to facilitate maintenance and repair, enclosed gasketed-type luminaires (fixtures) shall be permitted.
FPN: One method of defining that a Type RTRC rigid nonmetallic conduit is a fire-resistant and low smoke-producing raceway is that it exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with the plenum test in UL 2024, Standard for Optical Fiber Cable Raceway.
(C) Other Space Used for Environmental Air. This section applies to space used for environmental air-handing purposes other than ducts and plenums as specified in 300.22(A) and (B). It does not include habitable rooms or areas of buildings, the prime purpose of which is not air handling.
FPN: The space over a hung ceiling used for environmental air-handling purposes is an example of the type of other space to which this section applies.
Exception: This section shall not apply to the joist or stud spaces of dwelling units where the wiring passes through such spaces perpendicular to the long dimension of such spaces.
(1) Wiring Methods. The wiring methods for such other space shall be limited to totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections, Type MI cable, Type MC cable without an overall nonmetallic covering, Type AC cable, or other factory-assembled multiconductor control or power cable that is specifically listed for the use, or listed prefabricated cable assemblies of metallic manufactured wring systems without nonmetallic sheath. Other Types of cables and conductors shall be installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, Type RTRC rigid nonmetallic conduit listed as having adequate fire-resistant and low smoke-producing characteristics , flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers.
FPN: One method of defining that a Type RTRC rigid nonmetallic conduit is a fire-resistant and low smoke-producing raceway is that it exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with the plenum test in UL 2024, Standard for Optical Fiber Cable Raceway.
(2) Equipment. Electrical equipment with a metal enclosure, or with a nonmetallic enclosure listed for the use and having adequate fire-resistant and low-smoke-producing characteristics, and associated wiring material suitable for the ambient temperature shall be permitted to be installed in such other space unless prohibited elsewhere in this Code.
Exception: Integral fan systems shall be permitted where specifically identified for such use.
(D) Information Technology Equipment. Electric wiring in air-handling areas beneath raised floors for information technology equipment shall be permitted in accordance with Article 645.
Substantiation: Manufacturers have developed Type RTRC rigid nonmetallic conduit products that they believe are suitable for use as wiring methods in plenum and riser applications. However, in order to have these products evaluated accordingly, certification agencies require that there be at least one potential application for their use in accordance with the National Electrical Code. This proposal would permit these products to be employed in these applications providing that they have been specifically evaluated and listed for such use. Additionally, the Fine Print Notes provide a suggested methodology for evaluating the fire and smoke producing aspects of these products, which is based upon other nonmetallic raceways that have perviously been listed for use in these environments.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
“[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to

plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-93 Log #3101 NEC-P03 **Final Action: Reject**
(300.22)

Submitter: Donald Hall, Corning Cable Systems
Recommendation: This proposal may be considered as an alternate to my proposal to revise 392.4 or it may be considered in addition to acceptance of my proposal to revise 392.4.
Add new text under 300.22(C):
<u>(3) Cable Trays. Metallic cable tray systems with or without solid bottoms and solid metal covers may be used within other air-handling spaces to support wiring methods permitted in 300.22(C)(1) and other raceways or cables permitted for such use elsewhere in this Code.</u>
Substantiation: 392.4 references 300.22 as the only permitted uses of trays within other air-handling spaces. If 300.22 is to exist as the sole source of information regarding pemitted use of trays as support structures in other air-handling spaces, then it is inadequate in its treatment of the subject.
The existing languate of 300.22 and the reference of 392.4 is confusing some users of the Code. Some users are concluding that metallic tray systems can only be used in ducts, plenum, and other air handling spaces if they have solid bottoms and solid metal covers. This is not the intent of 392.4 or 300.22. The commentary to 392.4 in the NEC handbook correctly identifies the intent of 300.22 by stating,
"Section 300.22 specifically limits the types for wiring methods that may be used within other spaces used for environmental air. Metallic cable trays may be used within these spaces to support only the recognized wiring methods permitted in these spaces. The cable tray types may be ladder, ventilated trough, ventilated channel, or solid bottom. Metal cable trays are not the limiting factor; rather the cable or wiring method is the limiting factor."
300.22(C)(1) refers to <u>wiring methods</u>. It allows "other types of cables and conductors", meaning those which 300.22 does not specifically mention by name, to be placed in various types of raceway, in metal wireway with metal covers, or in metallic trays having solid bottoms and solid metal covers. It does not require metal trays to have solid bottoms or solid metal covers unless the trays contain "other types of cables or conductors" which are not expressly permitted for use in that space by 300.22. Furthermore, although "other cables and conductors" is inclusive of the various types of low voltage cable described in Articles 725, 760, 800, 820, and 830, these articles all contain sufficiently clear language explaining that plenum rated cables may be installed within other air-handling spaces without compliance to 300.22. Therefore, if a metal tray used in "other air-handling spaces" is used to support only wiring methods permitted in that space, there is no requirement or reason for them to have solid bottoms or solid metal covers.
Other proposals may be submitted which would propose to address this issue by adding text to Articles 725, 760, 800, 820, and 830 explicitly permitting the use of metal trays without solid bottom and solid metal covers. Since these other articles are not the source of the confusion and since these trays are already permitted to be used, it is more desirable to change 300.22 and/or 392.4 which are the source of confusion.
Panel Meeting Action: Reject
Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-94 Log #879 NEC-P03 **Final Action: Reject**
(300.22(B))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise the 4th sentence as follows:
"...Equipment, <u>including wiring</u> and devices, shall be permitted within such ducts or plenum chambers only if necessary for their direct action upon, or sensing of, the contained air."
Substantiation: "Equipment" is a defined term in Article 100 that includes wiring (because wiring, through undefined, is "material"). Presently, 300.22(B) seems to refer to equipment other than wiring, ignoring the definition. The intent of this rule should be clear and not unnecessarily clouded by imprecise language.
Panel Meeting Action: Reject
Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal."
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-95 Log #2610 NEC-P03 **Final Action: Reject**
(300.22(C)(1))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
300.22(C) Other Spaces Used for Environmental Air.
(1) Wiring Methods. The wiring methods for such other space shall be limited to totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections, Type MI cable, Type MC cable without an overall nonmetallic covering, Type AC cable, or other factory-assembled multiconductor control or power cable that is specifically listed for the use, or listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath. Other types of cables <u>,</u> ~~and~~ conductors <u>and raceways</u> shall be <u>permitted to be</u> installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers.
Substantiation: Raceways such as ENT, Article 352, and Optical Fiber/ Communications raceways found in Articles 725, 770, 800 and 820 are pulled into metal conduits in areas for environmental air. This common practice allows cable to be removed and replaced without interrupting other services.
Panel Meeting Action: Reject
Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal."
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-96 Log #3036 NEC-P03 **Final Action: Reject**
(300.22(C)(1))

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Revise text to read as follows:
300.22 Wiring in Ducts, Plenums, and Other Air-Handling Spaces.
The provisions of this section apply to the installation and uses of electric wiring and equipment in ducts, plenums, and other air-handling spaces.
FPN: See Article 424, Part VI, for duct heaters.
(C) Other Space Used for Environmental Air. This section applies to space used for environmental air-handling purposes other than ducts and plenums as specified in 300.22(A) and (B). It does not include habitable rooms or areas of buildings, the prime purpose of which is not air handling.
FPN: The space over a hung ceiling used for environmental air-handling purposes is an example of the type of other space to which this section applies.
Exception: This section shall not apply to the joist or stud spaces of dwelling units where the wiring passes through such spaces perpendicular to the long dimension of such spaces.
(1) Wiring Methods. The wiring methods for such other space shall be limited to <u>the following:</u>

(a) Totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections
(b) Type MI cable
(c) Type MC cable without an overall nonmetallic covering
(d) Type AC cable
(e) Factory-assembled multiconductor control or power cable that is specifically listed for the use
(f) Listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath
(g) Cables and conductors installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers
(h) Cables listed as low smoke-producing cable and fire-resistant cable, because the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
FPN: This covers the following types of cables: CL2P, CL3P, NPLFP, FPLP, OFNP, OFCP, CMP, CATVP, BLP.
~~totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections, Type MI cable, Type MC cable without an overall nonmetallic covering, Type AC cable, or other factory-assembled multiconductor control or power cable that is specifically listed for the use, or listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath. Other types of cables and conductors shall be installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers~~ .

(2) Equipment. Electrical equipment with a metal enclosure, or with a nonmetallic enclosure listed for the use and having adequate fire-resistant and low-smoke-producing characteristics, and associated wiring material suitable for the ambient temperature shall be permitted to be installed in such other space unless prohibited elsewhere in this Code.

Exception: Integral fan systems shall be permitted where specifically identified for such use.

(D) Information Technology Equipment. Electric wiring in air-handling areas beneath raised floors for information technology equipment shall be permitted in accordance with Article 645.

Substantiation: This proposal does not alter any of the requirements presently found in the NEC for wiring methods. However, this proposal does help the NEC user by explicitly placing all the appropriate wiring methods into article 300.22, instead of having them appear spread out throughout the code, in articles 725, 760, 770, 800, 820 and 830, where they appear somewhat haphazardly. This refers to the wiring methods in (h) which are now permitted by the following sections of the NEC, in articles 725, 760, 770, 800, 820 and 830. The wording in each section is different but the end result is that cables "listed as being suitable for use in ducts, plenums, and other space used for environmental air" and also "listed as having adequate fire resistant and low smoke producing characteristics" by exhibiting "a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262" are permitted for use as wiring methods in "other spaces used for environmental air". The present NEC wording follows:

725.3 Other Articles.
Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through 725.3(G). Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits.
(A) Number and Size of Conductors in Raceway. Section 300.17.
(B) Spread of Fire or Products of Combustion. Section 300.21. The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.
(C) Ducts, Plenums, and Other Air-Handling Spaces. Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22. Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air.
760.3 Other Articles.
Circuits and equipment shall comply with 760.3(A) through 760.3(F). Only those sections of Article 300 referenced in this article shall apply to fire alarm systems.
(A) Spread of Fire or Products of Combustion. Section 300.21. The accessible portion of abandoned fire alarm cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts or plenums or other spaces used for environmental air.
Exception: As permitted in 760.30(B)(1) and (B)(2) and 760.61(A).
760.30 Multiconductor NPLFA Cables.
Multiconductor non–power-limited fire alarm cables that meet the requirements of 760.81 shall be permitted to be used on fire alarm circuits operating at 150 volts or less and shall be installed in accordance with 760.30(A) and 760.30(B).
(B) Applications of Listed NPLFA Cables. The use of non–power-limited fire alarm circuit cables shall comply with 760.30(B)(1) through (B)(4).
(1) Ducts and Plenums. Multiconductor non–power-limited fire alarm circuit cables, Types NPLFP, NPLFR, and NPLF, shall not be installed exposed in ducts or plenums.
FPN: See 300.22(B).
(2) Other Spaces Used for Environmental Air. Cables installed in other spaces used for environmental air shall be Type NPLFP.
Exception No. 1: Types NPLFR and NPLF cables installed in compliance with 300.22(C).
Exception No. 2: Other wiring methods in accordance with 300.22(C) and conductors in compliance with 760.27(C).
Exception No. 3: Type NPLFP-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.
760.61 Applications of Listed PLFA Cables.
PLFA cables shall comply with the requirements described in either 760.61(A), (B), or (C) or where cable substitutions are made as shown in 760.61(D).
(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type FPLP. Types FPLP, FPLR, and FPL cables installed in compliance with 300.22 shall be permitted. Type FPLP-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.
770.3 Other Articles.
Circuits and equipment shall comply with 770.3(A) and 770.3(B). Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.
(A) Spread of Fire or Products of Combustion. The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. The accessible portion of abandoned optical fiber cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. The requirements of 300.22 for electric wiring shall also apply to installations of optical fiber cables and raceways where they are installed in ducts or plenums or other space used for environmental air.
Exception: As permitted in 770.154(A).
770.154 Applications of Listed Optical Fiber Cables and Raceways.
Nonconductive and conductive optical fiber cables shall comply with any of the requirements given in 770.154(A) through 770.154(E) or where cable substitutions are made as shown in 770.154(F).
(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.
FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
800.3 Other Articles.
(A) Hybrid Power and Communications Cables. The provisions of 780.6 shall apply for listed hybrid power and communications cables in closed-loop and programmed power distribution.
FPN: See 800.179(J) for hybrid power and communications cable in other applications.
(B) Hazardous (Classified) Locations. Communications circuits and equipment installed in a location that is classified in accordance with Article 500 shall comply with the applicable requirements of Chapter 5.
(C) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned communications cables shall not be permitted to remain.
(D) Equipment in Other Space Used for Environmental Air. Section 300.22(C) shall apply.
800.154 Applications of Listed Communications Wires and Cables and Communications Raceways.
Communications wires and cables shall comply with the requirements of 800.154(A) through 800.154(F) or where cable substitutions are made in accordance with 800.154(G)
(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned cables shall not be permitted to remain. Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.
820.3 Other Articles.
Circuits and equipment shall comply with 820.3(A) through 820.3(G).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned coaxial cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts, plenums, or other spaces used for environmental air, shall apply.
Exception: As permitted in 820.154(A).

820.154 Applications of Listed CATV Cables and CATV Raceways.
CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154.
(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.
FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
830.3 Other Articles.
Circuits and equipment shall comply with 830.3(A) through 830.3(E).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned network-powered broadband communications cables shall be removed.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22 shall apply where installed in ducts, plenums, or other spaces used for environmental air.
Exception: As permitted in 830.154(B).
830.154 Low-Power Network-Powered Broadband Communications System Wiring Methods.
Low-power network-powered broadband communications systems shall comply with any of the requirements of 830.154(A) through 830.154(D).
(A) In Buildings. Low-power network-powered broadband communications systems shall be installed within buildings using listed Type BLX, Type BL, Type BLR, or Type BLP network-powered broadband communications low-power cables.
(B) Ducts, Plenums, and Other Air-Handling Spaces. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type BLP. Type BLX cable installed in compliance with 300.22 shall be permitted.

In fact, this is also consistent with a proposal to make a change to 90.3 so that chapter 8 is no longer independent of Chapters 1 through 7, which is no longer reasonable, in view of the similarity between wiring for communications systems and for other systems, since there are communications systems that are not always low voltage wiring.

This proposal does not change any requirements; it simply makes the code more user friendly.

Panel Meeting Action: Reject
Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal."
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-97 Log #480 NEC-P03 **Final Action: Reject**
(300.22(C)(2))

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise text to read:
(2) Equipment. Electrical equipment with a metal enclosure <u>without any openings, or where listed equipment is specifically identified for such use,</u> or with a nonmetallic enclosure listed for the use and having adequate fire-resistant and low smoke producing characteristics, and associated wiring material suitable for the ambient temperature shall be permitted to be installed in such other space unless prohibited elsewhere in this Code.
Substantiation: This will clarify that electrical equipment that has ventilation openings such as motors, transformers, dimmer banks, sign power supplies, etc. that have plastics and other components that may produce smoke and toxic vapors that could escape through the openings and contaminate this space used for environmental air shall not be installed in this space unless listed for such installation.

See the Exception to 300.22(C)(2) that will only allow an integral fan "where specifically identified for such use."

This will also mirror the requirements in 300.22(C)(1) "...for totally enclosed, nonventilated, insulated busway..., surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers."

Note: Supporting material is available for review at NFPA headquarters.

Panel Meeting Action: Reject
Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal."
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-98 Log #571 NEC-P03 **Final Action: Reject**
(300.22(C)(2))

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise as follows:
(2) Equipment. Electrical equipment with a metal enclosure <u>without any openings, or where listed equipment is specifically identified for such use</u> , or with a nonmetallic enclosure listed for the use and having adequate fire-resistant and low smoke producing characteristics, and associated wiring material suitable for the ambient temperature shall be permitted to be installed in such other space unless prohibited elsewhere in this code.
Substantiation: This will clarify that electrical equipment that has ventilation openings such as motors, transformers, dimmer banks, sign power supplies, etc. that have plastics and other components that may produce smoke and toxic vapors that would escape through the openings and contaminate this space used for Environmental Air shall not be installed in this space unless listed for such installation.

See the Exception to 300.22(C)(2) will only allow an integral fan "where specifically identified for such use."

This will also mirror the requirements in 300.22(C)(1) "...for totally enclosed, nonventilated, insulated busway..., surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid bottom covers.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal."
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-99 Log #844 NEC-P03 **Final Action: Reject**
(300.22(C)(2))

Submitter: Dwayne E. Sloan, Tom Guida, Underwriters Laboratories Inc.
Recommendation: Add the following Fine Print Note after 300.22(C)(2):
<u>FPN: One method of defining adequate fire-resistant and low-smoke producing characteristics for electrical equipment with a nonmetallic enclosure is that the equipment meets the requirements of UL 2043-1996, Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.</u>
Substantiation: The purpose of this FPN is to provide guidance towards an appropriate test method and the requirements used to determine adequate fire-resistant and low-smoke producing characteristics for discrete electrical equipment with nonmetallic enclosures. UL2043 has been used to establish listing for such equipment. Furthermore, testing to UL2043 has been accepted by Authorities Having Jurisdiction since the standard was published in 1992.
Panel Meeting Action: Reject
Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo

in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal."

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

GUIDA, T.: This proposal should have been accepted. With reference to the Panel Statement, this proposal is not about a plenum cable issue and does not change the "status quo" with regard to cables or equipment. The proposed FPN directs the user of the Code to an appropriate test standard for "equipment with a nonmetallic enclosure listed for use and having adequate fire-resistant and low-smoke producing characteristics" [300.22(C)(2)].

3-100 Log #805 NEC-P03 **Final Action: Reject**
(300.24)

Submitter: Joe Tedesco, Boston, MA

Recommendation: 300.24 Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of low energy wires and cables that prevents removal of panels, including suspended ceiling panels.

Substantiation: Added words: "low energy" to existing text already found in Chapters 6, 7, and 8. This is an important rule and will be easier to find in Article 300.

Panel Meeting Action: Reject

Panel Statement: As stated in the submitter's substantiation, similar text is already located in various articles in Chapters 6, 7, and 8. Inserting this text into a new section within Article 300 would then necessitate inserting this additional reference section number into other Articles, such as 725 and 760. For example, Section 725.3 states that only those sections of Article 300 referenced in article 725 shall apply to Class 1, Class 2, or Class 3 circuits. Section 725.7 already provides this same information on access to equipment behind these panels for Article 725. Other articles have similar provisions.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

CASPARRO, P.: I disagree with the panel statement that this doesn't belong in Article 300. We continue to support keeping wires and cables of any energy level off of ceiling tiles.

3-101 Log #271 NEC-P03 **Final Action: Reject**
(300.31)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

Covers Required. Suitable covers shall be installed on all boxes, fittings, and similar enclosures to prevent accidental contact with energized parts or ~~physical~~ damage to parts or insulation.

Substantiation: Use of the word "physical" is superfluous. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-177.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-102 Log #3342 NEC-P03 **Final Action: Reject**
(300.37)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Insert the following sentence following the first sentence:

Where rigid nonmetallic conduit is used, it shall be Schedule 80 or it shall be suitably encased in not less than 50 mm (2 in.) of concrete.

Substantiation: If rigid nonmetallic conduit is used for above grade use above 600V, the Code should require a small safety margin beyond what it requires for similar use for 600V and below. This proposal allows rigid nonmetallic conduit for this purpose, but asks for Schedule 80 (or concrete encasement otherwise) when so employed.

Medium voltage applications warrant an increased level of protection as compared with circuits running at 600V and below. Remember, this part of the section applies to installations that are accessible to the general public. Only the last sentence of the section carries with it restrictions on public accessibility. Generally speaking, an increased magnitude of potential hazard warrants enhanced protection methods to mitigate the hazard.

Panel Meeting Action: Reject

Panel Statement: Where the rigid nonmetallic conduit is not exposed to physical damage, there is no technical reason for requiring this raceway to be Schedule 80 PVC. There are many different installations where Schedule 40 PVC is an acceptable wiring method. There are other wiring methods in Section 300.37, where installed in a location subject to physical damage, would also be a concern but are as acceptable as Schedule 40 PVC in a location not subject to physical damage.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-103 Log #274 NEC-P03 **Final Action: Reject**
(300.42)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

Where cable conductors emerge from a metal sheath and where protection against moisture or ~~physical~~ damage is necessary, the insulation of the conductors shall be protected by a cable sheath terminating device.

Substantiation: Use of the word "physical" is superfluous. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-177.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-104 Log #3343 NEC-P03 **Final Action: Accept in Principle**
(Table 300.50)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: In Table 300.50, add a superscript "4" to the first and second column titles, and a fourth footnote as follows:

4 Depth reduction of 150 mm (6 in.) permitted for each 50 mm (2 in.) of concrete or equivalent protection placed in the trench over the underground installation.

Substantiation: The 2005 NEC deleted the long-standing permission to use a 2-in. thick concrete cover for each 6 in. of depth reduction from Table 300.50 initial burial depths for direct-burial cables and for rigid nonmetallic conduit. The panel substantiated its action by pointing to the discrepancy between this allowance and the fact that Table 300.5 only allows a single 2-in. reduction. Burial depths for medium voltage applications are greater for these wiring methods than for utilization voltages, so it makes common sense that with more robust physical protection the burial depth might be further decreased. Further, the NEC now contains a greater discrepancy because medium voltage wiring has no in-the-trench concrete allowance, whereas Table 300.5 will allow a 6-in. cover reduction within its scope.

It is inappropriate to use text no longer necessary for 600V or less wiring methods as a reason for removing similar language from over 600 volt wiring methods, when the only effect is to make them (Tables 300.5 and 300.50) look similar. This allowance has been relied on by Code users for decades, and should remain available. CMP 3 should review the elaborate negative comment in the voting on this issue during the ROC stage in the 2005 NEC.

Panel Meeting Action: Accept in Principle

Panel Statement: During Panel discussions in the last Code cycle, there was a consensus that reducing the burial depth by 6 inches for each 2 inches of concrete poured in a trench for all wiring methods, except rigid metal conduit and intermediate metal conduit for over 600 volt installations was a possible hazard for anyone with a pick and shovel. For many years, it was permissible to reduce the depth 6 inches for each two inches of concrete for any voltage system over 600 volts but one could only reduce the depth of the raceway or direct burial cable by one 6 inch depth for two inches or more of concrete for cables 600 volts and under. In the 2002 and previous Codes, if a trench was dug just wide enough for a 22kV cable and 6 inches of concrete was poured on top, the 22 kV cable only had to be 12 inches deep. The concrete did not have to encase the cable so anyone digging a hole for a tree, for example, could very easily drive a pick from the side of the hole into the 22 kV cable. This is directly buried and unprotected cable at 22 kV.

By permitting this depth reduction only under controlled locations in industrial facilities with trained personnel who should first provide an underground locator for locating high voltage lines, the general public should be assured of greater safety. The industrial facilities can still use this depth reduction where obstacles or permafrost to do not permit greater depths. See the Panel Action and Statement in 3-105 which seems to satisfy the submitter's intent.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-105 Log #3038 NEC-P03 **Final Action: Accept in Principle**
(300.50 Note 3 (New))

Submitter: Melvin K. Sanders, TECo Inc.

Recommendation: Add text to read as follows:

Note 3. In industrial establishments, where conditions of maintenance and supervision ensure that written procedures have been adopted and qualified persons who are authorized will service the installation, the minimum cover requirements for other than rigid metal conduit and intermediate metal conduit shall be permitted to be reduced 6-inches (150 mm) for each 2-inches (50 mm) of concrete or equivalent placed entirely within the trench over the underground installation.

Substantiation: During the re-write of Table 300.50 for the 2005 cycle for the ROP and ROC stages, Table 300.50 Exception No. 2 of the 2002 Edition of the NEC was deleted during the Comment stage, based upon comments that lack of restrictions would expose general construction unqualified personnel to electrical shock or electrocution hazards during "dig-ins." No technical documentation was provided to substantiate the supposed degree of hazard. Due to time constraints, the research necessary to track the text in question was not possible, and in order to err on the side of caution, the wording was stricken even though it was acknowledged at that time there had been no proposals made this had been experienced as a problem.

The proposed Note 3 is adapted from 2002 NEC Table 300.50 Exception No. 2 and revised to address the concerns expressed at the ROC stage of the 2005 cycle. The dreaded phase " In industrial establishments, where conditions of maintenance and supervision ensure that written procedures have been adopted and qualified persons who are authorized will service the installation, …" was added to preclude its use in general locations and to stipulate that those knowledgeable in the hazards associated with voltages over 600 volts would be assigned.

The added text "… entirely …" will emphasize earlier CMP statements that it was expected the previous wording gave the directive the concrete pad would end up below finished grade and there would be back-fill material between the top of the concrete pad and the final grade for a trenched-in installation. Since there still seems to be some confusion on this point, the word "entirely" was added to clarify this issue.

The SI units were modified to follow the directive from the TCC from the 2002 cycle, to indicate they are not measured dimensions.

This proposed Note 3 is necessary within industrial plants because it is impossible to go under some piping that may be several layers deep with the uppermost layer not permitting the 2005 minimum burial depth from the surface and the lowermost layer several tens of feet deep. Also, since the NEC is supposed to be National in coverage, another problem with the 2005 edition wording, it would not permit installations subject to permafrost as found in the north slope oil fields of Alaska.

Panel Meeting Action: Accept in Principle

In the recommended text, delete the phrase "written procedures have been adopted and", and the phrase "who are authorized" in the sentence. Move the metrication from within the parenthesis to outside and replace with the inch measurement to read as follows:

Table 300.50 Note 3. In industrial establishments, where conditions of maintenance and supervision ensure that qualified persons will service the installation, the minimum cover requirements, for other than rigid metal conduit and intermediate metal conduit, shall be permitted to be reduced 150 mm (6 inches) for each 50 mm (2 inches) of concrete or equivalent placed entirely within the trench over the underground installation.

Panel Statement: The two phrases dealing with written procedures and authorization were removed since these two issues would be almost impossible to enforce. The metrication was fixed to be consistent with 90.9(B).

The panel clarifies that the added note is an addition to the general notes, not the footnotes shown in superscript. The Panel would encourage NFPA Staff to use letters for footnotes instead of numbers to distinguish the difference between "notes" and "footnote."

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

CASPARRO, P.: In the last sentence of the panel action, this part should be deleted - "or Equivalent placed entirely within the trench over the underground installation." What is equivalent to concrete?

3-106 Log #1917 NEC-P03 **Final Action: Reject**
(300.50(B))

Submitter: William Wagner, Certification Solutions

Recommendation: Revise the second sentence of 300.50(B) as follows:

300.50(B) Protection from Damage. Raceways installed on poles shall be of rigid metal conduit, intermediate metal conduit, ~~PVC~~ Schedule 80 rigid PVC conduit , or equivalent, extending from the minimum cover depth specified in Table 300.50 to a point 2.5 m (8 ft) above finished grade.

Substantiation: This is a companion proposal for the definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for type PVC Conduit and results in the use of consistent terminology for this product throughout the Code.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-52.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-107 Log #263 NEC-P03 **Final Action: Reject**
(300.50(D))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"Protection in the form of granular or selected material or suitable sleeves shall be provided to prevent ~~physical~~ damage to the raceway or cable."

Substantiation: Use of the word "physical" is superfluous. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-177.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-108 Log #679 NEC-P03 **Final Action: Accept in Principle**
(300.50(F) (New))

Submitter: Jamie McNamara, Hastings, MN

Recommendation: Revise as follows:

300.50 Underground Installations.

New (F) I underlined added text.

(F) Underground Conductors. Underground conductors that are not encased in concrete or in metal conduit and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.

Substantiation: To require conductor over 600 volts to have an identification ribbon would enhance safety to people. When excavating conductors can be damaged exposing the excavator to an electrocution hazard. This warning ribbon will help identify the hazard before the damage is done.

Panel Meeting Action: Accept in Principle

Add a superscript 4 to the first column after "Direct-Buried Cables" in Table 300.50 and a fourth superscript footnote below the table to read as follows:

4 Underground direct-buried cables that are not encased or protected by concrete and are buried 750 mm (30 inches) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 inches) above the cables.

Panel Statement: Direct-buried cables at over 600 volts are the most likely to be damaged where excavation is being done to existing installations and where people are most subject to injury, not those high voltage cables in rigid nonmetallic conduit or raceways installed under concrete slabs at least 4 inches thick. Placing a warning ribbon over direct buried cables does make sense but the proposed text was too restrictive.

Refer to the panel statement on Proposal 3-105 regarding the recommendation to NFPA Staff on the numbering of notes versus footnotes.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 310 — CONDUCTORS FOR GENERAL WIRING

6-4 Log #1535 NEC-P06 **Final Action: Accept in Part**
(310, 400, and 402)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to the Technical Correlating Committee Task Group on Grounding & Bonding for Comment.
Submitter: Technical Correlating Committee on National Electrical Code,
Recommendation: Revise Articles 310, 400, and 402 as described in the following, relative to the terms bonding and grounding.
310.6 Revise 310.6 as follows:
Solid dielectric insulated conductors operated above 2000 volts in permanent installations shall have ozone-resistant insulation and shall be shielded. All metallic insulation shields shall be connected to an equipment grounding conductor ~~be grounded~~ t ~~hrough an effective grounding path meeting the requirements of 250.4(A)(5) or 250.4(B)(4)~~ . Shielding shall be for the purpose of confining the voltage stresses to the insulation.
310.7 Exception Revise 310.7 Exception as follows:
The metallic shield, sheath, or armor shall be connected to an equipment grounding conducto r ~~grounded through an effective grounding path meeting the requirements of 250.4(A)(5) or (B)(4)~~ .
400.4, Table 400.4, Note 6, Revise Note 6 to Table 400.4 as follows:
6. The third conductor in these cables shall be used ~~for~~ as an equipment grounding ~~purpose~~ conductor only. The insulation of the equipment grounding conductor for Types SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, NISPT-1, NISPT-2, NISPE-1, and NISPE-2 shall be permitted to be thermoset polymer.
Revise 400.23 as follows:
400.23 Equipment Grounding Conductor Identification . A conductor intended to be used as an equipment grounding conductor shall have a continuous identifying marker readily distinguishing it from the other conductor or conductors. Conductors having a continuous green color or a continuous green color with one or more yellow stripes shall not be used for other than equipment grounding conductors ~~purposes.~~ The identifying marker shall consist of one of the methods in 400.23(A) or 400.23(B).
400.32 Revise 400.32 as follows:
All shields shall be connected to an equipment grounding conductor ~~grounded~~ .
400.33 Revise 400.33 as follows:
400.33 Equipment Grounding Conductors. Equipment grounding conductors shall be connected in accordance with Part V I and VII of Article 250.
Substantiation: 310.6: The language of 250.4(A)(5) and 250.4(B)(4) is referring to an equipment grounding conductor. Thus, a more direct language is proposed.
310.7 Exception: The language of 250.4(A)(5) and 250.4(B)(4) is referring to an equipment grounding conductor. Thus, a more direct language is proposed.
400.4 Table 4004., Note 6: The term "Equipment Grounding Conductor" instead of "Equipment Grounding" is proposed in order to use defined terms.
400.23: The term "Equipment Grounding Conductor" instead of "Equipment Grounding" is proposed in order to use defined terms.
400.32: The proposed text is more prescriptive. The existing rule requires a connection to an equipment grounding conductor.
400.33: The term "Equipment Grounding Conductor" instead of "Grounding Conductor" is proposed since this text applies specifically to the equipment grounding conductor.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Part
Accept the following parts of the proposal and reject the balance of the proposal:
Revise 400.4 Note 6 to Table 400.4 as follows:
6. The third conductor in these cables shall be used ~~for~~ as an equipment grounding ~~purpose~~ conductor only. The insulation of the equipment grounding conductor for Types SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, NISPT-1, NISPT-2, NISPE-1, and NISPE-2 shall be permitted to be thermoset polymer.
Revise 400.23 as follows:
400.23 Equipment Grounding Conductor Identification . A conductor intended to be used as an equipment grounding conductor shall have a continuous identifying marker readily distinguishing it from the other conductor or conductors. Conductors having a continuous green color or a continuous green color with one or more yellow stripes shall not be used for other than equipment grounding conductors ~~purposes.~~ The identifying marker shall consist of one of the methods in 400.23(A) or 400.23(B).
400.32 Revise 400.32 as follows:
All shields shall be connected to an equipment grounding conductor ~~grounded~~ .
400.33 Revise 400.33 as follows:
400.33 Equipment Grounding Conductors. Equipment grounding conductors shall be connected in accordance with Parts V I and VII of Article 250.
Panel Statement: The present language requires the metallic insulation shields to be grounded through an effective grounding path, thus meeting the requirements of 250.4(A)(5) or (B)(4). This requirement takes into consideration the different purposes for which these conductors may be used rather than limiting their use as the proposed language may do. The primary grounding point may not be to the equipment grounding conductor. The panel also considered the concerns expressed in the TCC voting regarding the changes in Article 310.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Abstain: 1
Explanation of Abstention:
MCCLUNG, L.: Fails to address 5000V non shielded cable restoration issue.

6-5 Log #1468 NEC-P06 **Final Action: Reject**
(310.1, FPN)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in 310.1 FPN.
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: The use of fixture wire is not limited to luminaires or lighting fixtures; they are also used within equipment. The action on this proposal should also be forwarded for information to CMPs 2, 3, 5, 8, 9, 10, 12, and 15.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 2
Explanation of Negative:
CLINE, S.: If "fixture" was the word which gave rise to "fixture wires" in the past, then it seems that the term should now be "luminaire wires." It is possible that a different word more inclusive of current applications for these conductors could be better than "luminaire," but "luminaire" is the defined word the Code now uses in place of "fixture." A new word could be done as a Comment should someone have one to suggest. I believe in struggling for uniformity and simplicity in the Code as much as is practically possible.
KENT, G.: To be consistent, this proposal should have been accepted. The term 'fixture' was changed to 'luminaire' wire.

6-6 Log #420a NEC-P06 **Final Action: Reject**
(310.2(B), 310.14, & Tables 310.16 and 310.21)

Submitter: John Brouzakis, John's Electric
Recommendation: Discontinue use of all aluminum and copper clad wire in homes, business, and industry. Discontinue using aluminum bus bars in breaker panels and MCC panels. Aluminum and copper clad wire and bus bars are still being used in homes, business and industry.
Substantiation: I've seen aluminum or copper clad wire connections to 240 volt a.c. circuits such as on ranges, dryers and other circuits become loose or corroded and start arcing and burn the wire.
Some breaker panels in basements with aluminum bus bars corrode and start arcing where the breaker plugs into the bus bar. On one job, I had to remove all the breakers, clean the bus bar and replace some of the breakers.
These are just a couple of problems that I experienced with people using AL or copper clad wire and panels with AL bus bars. These situations could have turned into electrical fires with loss of life and property. I believe only copper wire and bus bars should be used in homes, buildings and industry.
When I see AL or copper clad wiring inside a home, I tell the owner it should be replaced with copper. I would appreciate it if you discontinue the usage of aluminum and copper clad wire inside homes, business and industry in your next code.
Panel Meeting Action: Reject
Panel Statement: No technical substantiation has been provided to discontinue the use of all aluminum or copper-clad aluminum conductors or aluminum bus bars. Also, the proposal does not comply with 4-3.3(c) of the NFPA Regulations Governing Committee Projects, which states that the proposal shall include "Proposed text of the Proposal, including the wording to be added, revised (and how revised), or deleted."
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-7 Log #1674 NEC-P06 **Final Action: Accept in Principle in Part**
(310.4)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for Comment.

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.

Recommendation: Add text to read as follows:

310.4, Exception No. 5: Equipment grounding conductors in sizes smaller than 1/0 AWG shall be permitted to be run in parallel to supply motor loads from variable frequency drives where listed multiconductor cable is utilized.

Substantiation: It is a common practice and a common VFD manufacturer's recommendation to parallel three equipment grounding conductors where multiconductor power supply cables are utilized with a variable frequency drive. Many times these equipment grounding conductors are of sizes less than 1/0 AWG. Even though 110.3(A)(1) and 110.3(B) allows listed cable such as this to be used in this manner, there seems to be a conflict with NEC 310.4. Adding the exception above would clarify that this practice is acceptable.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

Insert as a new paragraph to 310.13 after the fine print note and change the proposed text to read as follows:

Equipment grounding conductors shall be permitted to be sectioned within a listed multi-conductor cable provided the combined circular mil area complies with 250.122.

Panel Statement: The panel agrees that the equipment grounding conductor in listed multi-conductor cable shall be permitted to be sectioned. The use of a sectioned EGC is not limited to variable frequency drives and therefore this has been moved to conductor construction.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-7a Log #CP601 NEC-P06 **Final Action: Accept**
(310.4)

Submitter: Code-Making Panel 6

Recommendation: Delete section 310.4 in its entirety and replace with the following:

310.4 Conductors in Parallel.

Aluminum, copper-clad aluminum, or copper conductors of size 1/0 AWG and larger, comprising each phase, polarity, neutral, grounded circuit conductor, or equipment grounding conductor shall be permitted to be connected in parallel (electrically joined at both ends). Where parallel equipment grounding conductors are used they shall be sized in accordance with 250.122.

Exception No. 1: Conductors, other than equipment grounding conductors, in sizes smaller than 1/0 AWG shall be permitted to be run in parallel to supply control power to indicating instruments, contactors, relays, solenoids, and similar control devices, provided all of the following apply:

(a) They are contained within the same raceway or cable.

(b) The ampacity of each individual conductor is sufficient to carry the entire load current shared by the parallel conductors.

(c) The overcurrent protection is such that the ampacity of each individual conductor will not be exceeded if one or more of the parallel conductors become inadvertently disconnected.

Exception No. 2: Conductors, other than equipment grounding conductors, in sizes smaller than 1/0 AWG shall be permitted to be run in parallel for frequencies of 360 Hz and higher where conditions (a), (b), and (c) of Exception No. 1 are met.

Exception No. 3: Under engineering supervision, grounded neutral conductors in sizes 2 AWG and larger shall be permitted to be run in parallel for existing installations.

FPN: Section 310.4 Exception No. 3 can be used to alleviate overheating of neutral conductors in existing installations due to high content of triplen harmonic currents.

Exception No. 4: As permitted in 620.12(A)(1).

The paralleled conductors in each phase, polarity, neutral, grounded circuit conductor, or equipment grounding conductor shall comply with all of the following:

(1) Be the same length
(2) Have the same conductor material
(3) Be the same size in circular mil area
(4) Have the same insulation type
(5) Be terminated in the same manner

Where run in separate cables or raceways, the cables or raceways with conductors shall have the same number of conductors, and shall have the same electrical characteristics. Conductors of one phase, polarity, neutral, grounded circuit conductor, or equipment grounding conductor shall not be required to have the same physical characteristics as those of another phase, polarity, neutral, grounded circuit conductor, or equipment grounding conductor to achieve balance.

Conductors installed in parallel shall comply with the provisions of 310.15(B)(2)(a).

FPN: For sectioned equipment grounding conductors in listed multi-conductor cables, see 310.13

Substantiation: The panel has reorganized this section in response to a number of public proposals indicating the need to reorganize the section to make it more usable without changing the intent of the section. A FPN was added to identify the use of sectioned Equipment grounding conductors and the existing 2nd FPN was removed.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-8 Log #2235 NEC-P06 **Final Action: Reject**
(310.4)

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise as follows:

310.4 Conductors in Parallel. Aluminum, coper-clad aluminum, or copper conductors of ~~size 1/0 AWG and larger~~ size #1 AWG and smaller , comprising each phase, polarity, neutral, or grounded circuit conductor, shall ~~be permitted to~~ not be connected in parallel (electrically joined at both ends).

Substantiation: There is no code rule that prevents the installation of conductors smaller than 1/0 AWG in parallel in the current code. The existing rule just specifically permits the use of conductors 1/0 and larger in parallel, but does not prohibit smaller conductors from being paralleled.

Panel Meeting Action: Reject

Panel Statement: The present language meets the requirements of Section 3.1.3 of the NEC Style Manual. Article 310.4 permits conductors 1/0 or larger to be installed in parallel. The general rule is that conductors sized smaller than 1/0 are not permitted to be run in parallel.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-9 Log #3174 NEC-P06 **Final Action: Accept in Principle**
(310.4)

Submitter: Brian P. Johnson, Minnesota State Community & Technical College

Recommendation: I propose that 310.4 be reorganized. Paragraph one and its five subdivisions after FPN of Exception No. 4 should be placed after the first paragraph of 310.4 instead of after the list of exceptions. The reason why it should be placed there instead of after the exceptions is because both paragraphs talk about the same things. They both talk about the phase, polarity, neutral, or grounded circuit conductors of conductors in parallel and how they should be used.

Substantiation: One solution that you will get by excepting my proposal is that 310.4 will be more organized. Another solution that you will get by excepting my proposal is that it will be understood better because those two paragraphs will be next to each other. As written. it is difficult to understand for a new student of electricity, as I am.

Panel Meeting Action: Accept in Principle

The panel has addressed the submitter's issues in its action on Committee Proposal 6-7a.

Panel Statement: See Committee Proposal 6-7a.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-10 Log #1172 NEC-P06 **Final Action: Reject**
(310.4 Exception No. 1)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete.

Substantiation: Edit. 90.3 indicates Chapter 6 may modify Chapter 3. This exception is already covered.

Panel Meeting Action: Reject

Panel Statement: While it may be redundant, removing this section will not enhance the usability of the Code.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-11 Log #1117 NEC-P06 **Final Action: Accept in Principle in Part**
(310.4 Exception No. 4)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

Exception No. 4: Under engineering supervision, grounded ~~neutral~~ conductors in sizes 2 AWG and 1 AWG ~~larger~~ shall be permitted to be run in parallel for existing installations.

Substantiation: I believe this exception was established to allow increases in neutral capacities where conditions in the FPN occurred. However, the panel statement for Proposal 6-7 Log 731 in the 2004 ROP, stated this is not the purpose. Therefore, the exception should not be limited to neutrals, which excludes the grounded conductor of a 4-wire delta-connected system. The phrase "and larger' includes conductors 1/0 AWG which should not require engineering supervision as the first paragraph permits paralleling of 1/0 conductors without regard to engineering supervision or existing installations.

Panel Meeting Action: Accept in Principle in Part
Revise as follows:
Exception No. 4: Under engineering supervision, grounded ~~neutral~~ conductors in sizes 2 AWG ~~and~~ or 1 AWG ~~larger~~ shall be permitted to be run in parallel for existing installations.
Panel Statement: The panel accepts the deletion of the word "neutral" and changes the wording of "and larger" to read "or 1 AWG". The word "grounded" already exists in the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-12 Log #1137 NEC-P06 **Final Action: Accept in Principle**
(310.4 Exception No. 4)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Under engineering supervision grounded neutrals in sizes 2 AWG and 1 AWG ~~and larger~~ shall be permitted to be run in parallel for existing installations.
Substantiation: I believe this rule was established for neutrals for conditions noted in the FPN. The phrase "and larger" includes conductors 1/0 and larger which should not require engineering supervision, as the first paragraph permits paralleling of 1/0 and larger conductors without engineering supervision or regard to new or existing installations.
Panel Meeting Action: Accept in Principle
The panel has addressed the submitter's issues in its action on Proposal 6-11
Panel Statement: See panel action and statement on Proposal 6-11.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-13 Log #2556 NEC-P06 **Final Action: Reject**
(310.6)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
Submitter: Bruce McClung, McSquared Electrical Consulting LLC
Recommendation: Revise text as follows:
Renumber present Exception as Exception No. 1: and add Exception No. 2: Nonshielded multiconductor cables rated 2001-5000 volts listed by a qualified testing laboratory shall be permitted for use up to 5000 volts if the cable has an overall metallic sheath or armor:
The metallic, sheath, or armor shall be grounded through an effective grounding path meeting the requirements of 250.4(A)(5) or 250.4(B)(4).
FPN: See 300.3(C)(2) for installation requirements for conductors rated over 600 volts.
Substantiation: The use of nonshielded multiconductor cables rated 2001-5000 volts having an overall metallic sheath or armor is just as reliable and safe when installed and grounded properly above ground as it is when installed as direct burial. See continued use of this construction permitted in 310.7 Direct Burial Conductors.
Panel Meeting Action: Reject
Panel Statement: The submitter has provided no technical substantiation to prove that nonshielded multiconductor cables with an overall metallic sheath or armor used on systems rated up to 5000 volts for aboveground installations would be safe.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 7 Negative: 4
Explanation of Negative:
HUDDLESTON, JR., R.: This proposal should have been accepted. Insufficient evidence exists to ban the use of nonshielded cable for 4160 volt applications, especially when installed as armored cable as this proposal specified. The panel refuses to acknowledge that nonshielded cable has been used for many years safely for 4160 volt applications, as long as it is installed properly and maintained correctly. The panel alluded to safety concerns, and when it was pointed out that armored cable, with the metal armor grounded, is virtually a shield in terms of corona, the panel absolutely ignored the lack of evidence for safety problems.
KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.
MCCLUNG, L.: Starting with 310.6 Exception make modification as follows:
1. Revise to read: Exception: Nonshielded insulated conductors listed by a qualified testing laboratory shall be permitted for use up to 2400V dry "locations" and 5000V "dry or wet locations" under the following conditions.
a. Conductors shall have insulation resistant to electric discharge and surface tracking, or the insulated conductor(s) shall be covered with a material resistant to ozone, electric discharge, and surface tracking.
b. Where used at 5000V, the insulated conductor(s) shall be enclosed in an armor of interlocking metal tape or a smooth or corrugated metallic sheath.
c. Insulation and jacket thicknesses shall be in accordance with Table 310.63.
5000V nonshielded multi-conductor cable rated 2001-5000V having an overall metallic sheath or armor is reliable and safe when installed and properly grounded above ground or installed as direct burial.

WETHERELL, A.: I agree with the submitter that no evidence, anecdotal or otherwise, has been provided that indicates that 5 kV rated, nonshielded cable has presented a safety problem when it is enclosed in metal conduit or metallic armor.
Comment on Affirmative:
CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.
As currently worded , I believe that 310.7 applies to the construction requirements for cables, not applications of voltage operation. It says "rated above," not "operated above" as 310.6 does. It appears that 310.6 still limits the operational voltage of non-shielded cables to below 2000 in the general rule, and 2400 volts under the exception's allowances.
Evidentiary Substantiation of the equivalent safety performance of an overall metallic sheath or armor compared to shielded construction needs to be presented for me to agree to this expansion of applied use.

LAIDLER, W.: I'm voting to reject this proposal because unshielded cables operating at voltages above 2400 volts present a safety hazard whether or not they are enclosed in a raceway or a metallic sheath. This is due to the fact that the discharging problems mainly occur at the point where the cables terminate. The only way to ensure safety when cables are operating above 2400 volts is to shield them.
ZIMNOCH, J.: This proposal addresses a serious safety issue that exists in the field. When non-shielded cables are operated at 4160 volts, a standing voltage potential exists on the surface of the cable regardless of how much insulation or what non-metallic material covers that surface; this is the reason for applying a shield to a cable. The shield contains the potential and drains any leakage to ground. The NEC initially did not allow this type of cable construction to operate at 4160 volts; it was added as an exception, which means originally it was thought to be unsafe.
Current ICEA standards includes the following, "Cables without insulation shields have electric fields that extend partially within the insulation and whatever exists between the insulation and ground. If the field is sufficiently intense, it will cause the air near the insulation to ionize and form corona which can damage the cable insulation or cause the insulation itself to breakdown". This same corona also creates a serious safety issue for personnel.

6-14 Log #1736 NEC-P06 **Final Action: Reject**
(310.6 Exception)

Submitter: Thomas F. Mueller, Southern Company Services
Recommendation: Change "2400" to "5000" in the exception.
The exception will then read, "Non-shielded insulated conductors listed by a qualified testing laboratory shall be permitted for use up to 5000 volts under the following conditions." The conditions folowing (a, b, and c) will remain the same.
Substantiation: In the previous code cycle, the panel was duped by copper salesmen. The panel was fed a disingenuous argument that 5 kV shielded cables would correct perceived safety problems associated with 5 kV non-shielded cable installations.
No one disputes the fact that voltages in the 5 kV range produce corona - a phenomenon damaging to cable insulation - in moist and/or dirty conditions. The 5 kV shielding proponents produced evidence - also not in dispute - of corona damage at 5 kV terminations. What the proponents did not divulge is that corona at terminations can be present and just as damaging for both shielded and non-shielded designs.
To intimate that 5 kV non-shielded cable cannot be installed safely is patently false. Even the anecdotal examples of non-shield problems focused on terminations, not cable installation. It was pointed out to panel members that some cable vendors did not manufacture non-shielded cables in the 5 kV range and they were then at a competitive disadvantage. Let's all shed a tear for cable companies that don't make non-shielded 5 kV cable. Perhaps those same companies don't make other types of cable either.
Shielded cable is more expensive and more expensive to install, has less ampacity, takes more room at terminations, and requires a greater degree of precision by electricians installing it than non-shielded cable.
To shield or not shield at 5 kV is just as much a design decision as whether to use THHN or THWN conductors. The elimination of 5 kV non-shielded cable from the ingredient list of a designer's cook book serves no purpose but to sell more copper. The panel should be suspicious of those code changes that tend to economically benefit the submitter and proponents. Changes that increase cost without improving safety hurt us all.
Note: When this proposal is adopted, a corresponding change must be made in Table 310.63.
Panel Meeting Action: Reject
Panel Statement: The panel agreed with the substantiation submitted for the 2005 Code that the use of nonshielded conductors and cables above 2400 volts provides an increased safety hazard for personnel in close proximity to energized nonshielded conductors or cables and should be eliminated.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 8 Negative: 3
Explanation of Negative:
HUDDLESTON, JR., R.: This proposal should have been accepted. The substantiation by the submitter, unfortunately, appears to be correct. There are literally hundreds of documented examples of safe nonshielded cable installations that have been in place for many years, with no problems whatsoever. The panel refused to acknowledge the hardships that banning nonshielded cable for 4160 volt applications imposed on users, such as retrofitting larger junction boxes on motors and switchgear in order to allow adequate room to install stress cones (and voiding UL listing by modifying the equipment).
KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.
MCCLUNG, L.: 5000V nonshielded conductors or cables are just as safe and reliable at terminations as is shielded 5000V.
Comment on Affirmative:
CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.
As currently worded , I believe that 310.7 applies to the construction requirements for cables, not applications of voltage operation. It says "rated above," not "operated above" as 310.6 does. It appears that 310.6 still limits the operational voltage of non-shielded cables to below 2000 in the general rule, and 2400 volts under the exception's allowances.
Evidentiary Substantiation of the equivalent safety performance of an overall metallic sheath or armor compared to shielded construction needs to be presented for me to agree to this expansion of applied use.
LAIDLER, W.: The physical laws that are imposed on conductors carrying voltages higher than 2000 volts make those conductors inherently dangerous. The NEC has always recognized this potential safety issue and requires that the conductors be shielded. It is only by exception that unshielded conductors are permitted to be used with voltages exceeding 2000 volts. During the last cycle, the panel chose to reduce the voltage limit from 8000 to 2400 volts based on the substantiation provided by the submitter of the proposal. Several panel members also related instances where people were seriously injured or killed as the result of working around unshielded cables operating at 4160 volts. No substantiation has been provided to warrant the panel to reverse the action taken during the last Code cycle.
ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-15 Log #1989 NEC-P06 **Final Action: Reject**
(310.6 Exception)

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group
Recommendation: In the Exception, change '2400' to '5000'. The exception will now read as follows:
Exception: Non shielded insulated conductors listed by a qualified testing laboratory shall be permitted for use up to ~~2000~~ 5000 volts under the following conditions:
Exception clauses a, b & c to remain the same.
Substantiation: The purpose of this change is to allow unshielded cable to be used for typical 5 kV type circuits that are commonly installed in the industry. For almost a century, 4160 volt circuits have been run safety & effectively on non shielded 5 kV cables. Over that time frame, cable insulation materials and constructions have seen vast improvements. Thus the design life of such cables even though continuously energized has been extended so that it does not routinely require replacement.
The 2005 NEC disallowed this practice with a few advocates saying it was unsafe. Those advocates were unable to document a single injury that would have been prevented had shielded 5 kV cable been used instead of properly installed unshielded 5 kV cable. The panel was convinced by these arguments and now the code requires a cable that is more expensive & has its own set of safety problems.
To suggest that an unshielded 5 kV cable, installed in a grounded cable tray is unsafe, without technical documentation is incorrect. In fact, the installation of shielded 5 kV cable in an area where it would otherwise be appropriate to install a non-shielded cable is not as safe. The shielded cable has less current carrying capacity and its installation is more complicated and exacting and therefore susceptible to improper installation practice.
The original proposal to establish the new rule stated that installations "…have experienced arcing problems…where the cable conductors are separated outside of the outer sheath." What the submitter failed to state was that such problems exist for shielded and non shielded constructions. Indeed, evidence would suggest that these problems would exist to a greater degree with shielded 5 kV cables. Non shielded cables can be terminated without the use of special tools, or termination devices, by skilled electricians. Shielded cables must be precisely prepared and terminated using stress relieving attachments by electricians who have received specialized training. Poorly prepared shielded cable and improperly grounded shielding can present more hazards than unshielded cable.
4160 volts is a potential high enough to cause corona, an electrostatic discharge that is damaging to electrical insulating materials. There is no industry evidence of deteriorating cable insulation for properly designed and installed 5 kV non shielded cables. It can be deduced then that corona is not a problem with the cables and therefore not a safety issue.
If the intent of the rule change was to protect employees from improperly designed and/or installed cables, the argument is untenable. Such cables would quickly deteriorate, while the rule change increases the likelihood of improper installation and subsequent additional hazard.
4160 volts is a dangerous voltage. Corona and arcing are a concern at the terminations, not along properly designed and installed cable. Since both shielded and non shielded cables terminate, nothing is gained by requiring 5 kV shields under all circumstances. This proposed code change is economically sound while in addition it enhances safety.
Panel Meeting Action: Reject
Panel Statement: The panel agreed with the substantiation submitted for the 2005 Code that the use of nonshielded conductors and cables above 2400 volts provides an increased safety hazard for personnel in close proximity to energized nonshielded conductors or cables and should be eliminated.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 8 Negative: 3
Explanation of Negative:
HUDDLESTON, JR., R.: This proposal should have been accepted. See comment for Proposal 6-14.
KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.
MCCLUNG, L.: 5000V nonshielded conductors or cables when properly installed are just as safe and reliable as is shielded 5000V cables.
Comment on Affirmative:
CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.
Mr. LaBrake's arguments in his Substantiation seem to be well thought out and presented. One of the biggest difficulties I heard regarding taking this point of view had to do with the "properly designed and installed cable" requirement for safety he mentions, and with ongoing maintenance requirements. Anecdotal statements regarding safety issues were presented; the Panel seemed to need a higher level of evidence. The point of the relative mechanical difficulty of making up the termination might be a good point, if this is a non-self-clearing (by failure) operational danger. One of the concerns appeared to be that the non-shielded cable could experience modes of insulation failure which did not self-clear by failure, but instead laid traps of future personal risk. Evidentiary Substantiation needs to be presented for me to agree to this expansion of applied use.
LAIDLER, W.: See my affirmative comment on Proposal 6-13.
ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-16 Log #2991 NEC-P06 **Final Action: Reject**
(310.6 Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 11 for Information.
Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Revise text to read as follows:
Add allowance for 5 kv nonshielded cables used as motor leads or parts of assemblies in 301.6 exception as shown below:
Exception: Nonshield insulated conductors listed by a qualified testing laboratory shall be permitted for use up to 2400 volts <u>or up to 5000 volts for motor leads or as part of an assembly</u> under the following conditions:
Substantiation: It is not always practical to use a 5 kv shielded cable, with stress cone type terminations for motor leads or assemblies. These cables are of limited length and have been used in even greater voltages for many years.
Panel Meeting Action: Reject
Panel Statement: The proposed modification to the exception should not be included in Chapter 3 since Article 310 addresses conductors for general wiring, not wiring within assemblies. Use of nonshielded cable within an assembly should be addressed in the product standard or Listing. This proposal should be referred to CMP 11 for information.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 2
Explanation of Negative:
KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.
MCCLUNG, L.: 5000V nonshielded conductors or cables installed since 1960 exceed 400 circuits with more than 2400 termination in safe and reliable installations.
Comment on Affirmative:
ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-17 Log #3516 NEC-P06 **Final Action: Reject**
(310.6 Exception)

Submitter: Mark Goodman, Jacobs Engineering Group / Rep. American Petroleum Institute
Recommendation: Revise wording to delete 2400 volts and replace with 5000 volts.

Section to read:...shall be permitted for use up to ~~2400~~ 5000 volts under the following conditions.

Substantiation: Non-shielded cable at 5000 volts has been utilized in the petrochemical industry since the 1940's. In some refineries, the number of circuits at 5 kV, without shielding exceeds 500 and our survey shows that there have not been any failures attributed to the lack of shielding at this voltage level.

The non shielded cables provide more insulation than the shielded cables. The thicker insulation makes the use of non-shielded cables more reliable especially where subjected to more corrosive environments. The 2002 change had no technical merit and the non-shielded cables should be allowed in installations up to 5 kV.

Panel Meeting Action: Reject

Panel Statement: The panel agreed with the substantiation submitted for the 2005 Code that the use of nonshielded conductors and cables above 2400 volts provides an increased safety hazard for personnel in close proximity to energized nonshielded conductors or cables and should be eliminated.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 8 Negative: 3

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been accepted. See comment for Proposal 6-14.

KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.

MCCLUNG, L.: 5000V nonshielded conductors or cables in one company since mid 1940's exceeding 500 circuits with more than 3000 terminations have provided safe and reliable service.

Comment on Affirmative:

CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.

Anecdotal statements regarding safety issues were presented; the Panel seemed to need a higher level of evidence. Where is the survey? Who did it and what were its parameters?

One of the Panel's concerns appeared to be that the non-shielded cable could experience modes of insulation failure which did not self-clear by failure, but instead laid traps of future personal risk. Evidentiary Substantiation needs to be presented for me to agree to this expansion of applied use.

LAIDLER, W.: See my affirmative comment on Proposal 6-13.

ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-18 Log #2292 NEC-P06 **Final Action: Reject**

(310.6 Exception No. 2 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Bruce McClung, McSquared Electrical Consulting LLC

Recommendation: Revise text as follows:

Renumber present Exception as Exception No.1: and add Exception No. 2: Nonshielded multiconductor cables rated 2001-5000 volts shall be permitted if the cable has an overall metallic sheath or armor:

The metallic shield, sheath, or armor shall be grounded through an effective grounding path meeting the requirements of 250.4(A)(5) or (B)(4).

FPN: See 300.50 for installation requirements for conductors rated over 600 volts.

Substantiation: The use of nonshielded multiconductor cables rated 2001-5000 volts having an overall metallic sheath or armor is just as reliable and safe when installed and grounded properly above ground as it is when installed as direct burial. See continued use of this construction permitted in 310.7 Direct Burial Conductors.

Panel Meeting Action: Reject

Panel Statement: The panel agreed with the substantiation submitted for the 2005 Code that the use of nonshielded conductors and cables above 2400 volts provides an increased safety hazard for personnel in close proximity to energized nonshielded conductors or cables and should be eliminated.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 7 Negative: 4

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been accepted. See comment for Proposal 6-13.

KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.

MCCLUNG, L.: 5000V nonshielded multi-conductor cable rated 2001-5000V having an overall metallic sheath or armor is reliable and safe when installed and properly grounded above ground or installed as direct burial.

WETHERELL, A.: See my explanation of negative vote on Proposal 6-13.

Comment on Affirmative:

CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.

As currently worded , I believe that 310.7 applies to the construction requirements for cables, not applications of voltage operation. It says "rated above," not "operated above" as 310.6 does. It appears that 310.6 still limits the operational voltage of non-shielded cables to below 2000 in the general rule, and 2400 volts under the exception's allowances.

Evidentiary Substantiation of the equivalent safety performance of an overall metallic sheath or armor compared to shielded construction needs to be presented for me to agree to this expansion of applied use.

LAIDLER, W.: See my affirmative comment on Proposal 6-14.

ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-19 Log #2700 NEC-P06 **Final Action: Reject**

(310.6 Exception No. 2 (New))

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Make existing exception "Exception No. 1".

Add new exception:

Exception No. 2: In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, nonshielded insulated conductors shall be permitted for use up to 8000 volts when installed in a metal raceway such as rigid metal conduit.

Substantiation: For many years, large industrial installations have used nonshielded insulated conductors for medium voltage distribution systems within their facilities. Virtually all problems that have occurred have been due to improper installation techniques, such as allowing conductors to cross at skew angles in junction boxes where corona between cables becomes an issue. If nonshielded cables are installed and maintained properly in metal raceways, there is no reason to disallow their use up to 8KV.

Often, older electrical gear and equipment does not allow enough room for terminations requiring stress cones, and modifications would need to be made in order to terminate shielded cable in these cabinets and terminal boxes. Listed equipment should not be modified or the listing may become voided, which could necessitate replacing the equipment at greater cost.

The National Electrical Code is written to provide for "the practical safeguarding of person and property from hazards arising from the use of electricity." (90.1(A)). Nonshielded medium voltage cable, when properly installed and maintained in supervised industrial installations, does not violate this purpose.

Panel Meeting Action: Reject

Panel Statement: The panel agreed with the substantiation submitted for the 2005 Code that the use of nonshielded conductors and cables above 2400 volts provides an increased safety hazard for personnel in close proximity to energized nonshielded conductors or cables and should be eliminated.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 8 Negative: 3

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been accepted. The proposal was amended so that the wording was changed from 8000 volts to 5000 volts, which would have been to "accept in principle". This would have been fine; however, to reject this proposal on a safety basis ignores the fact that conduit installations are undoubtedly a safe way to install nonshielded cable. The panel did not submit any reasons why this would not be a safe installation, but remained adamant about rejecting any inclusion of the use of nonshielded cable for 4160 volt use, period. It would appear that the panel members voting against this proposal in principle had made their minds up, and would not allow the facts to change their opinion.

KOMASSA, D.: This proposal should have been accepted in principle by changing the "8000 volts" to "5000 volts". By permitting the use of nonshielded cables up to 5000 volts where "conditions of maintenance and supervision ensure that only qualified persons" work on these cables addresses the concerns of adequately trained workers and supervised facilities which can keep an installation in good repair. The NECA representative at the meeting cited the New York Times as a location which has a well maintained facility. We should not penalize those facilities which keep in good repair from continuing to use nonshielded cable up to 5000 volts.

MCCLUNG, L.: 5000V nonshielded conductors or cables utilized in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation should be permitted since such facilities have thousands of circuits with 6 times as many terminations in safe and reliable operation.

Comment on Affirmative:

CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.

This sort of installation requirement seems to be a suggestion close to an alternative to shielding which might be acceptable. The part of the substantiation related to existing installations seems to have an even higher probability of acceptance. What installation instructions or safety reports can be presented as real evidence of the operational safety of such applications?

Evidentiary Substantiation of the equivalent safety performance of an in-conduit installation compared to shielded construction needs to be presented for me to agree to this expansion of applied use. Alternatively, risk management having to do with existing installations might be acceptable.

LAIDLER, W.: I am voting to reject this proposal because the inherent danger of using unshielded cables on voltages exceeding 2400 volts is the same in all locations. To permit the use of unshielded cables in any location is a step backward in regards to safety of personnel and equipment.

ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-20 Log #3072 NEC-P06 **Final Action: Reject**
(310.6 Exception No. 2)

Submitter: Michael Martin, Lyondell Chemical Company
Recommendation: Add text to read as follows:

Exception No. 2: In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installations, nonshielded insulated conductors listed by a qualified testing laboratory shall be permitted for use up to 5000 volts under the following conditions:

(a) Conductors shall have insulation resistant to electric discharge and surface tracking, or the insulated conductor(s) shall be covered with a material resistant to ozone, electric discharge, and surface tracking.

(b) Where used in wet locations, the insulated conductor(s) shall have an overall nonmetallic jacket or a continuous metallic sheath.

(c) Insulation and jacket thicknesses shall be in accordance with Table 310.63.

Substantiation: The use of non shielded cable up to 5000V has a long history of safe and effective use in industrial establishments.
Panel Meeting Action: Reject
Panel Statement: The panel agreed with the substantiation submitted for the 2005 Code that the use of nonshielded conductors and cables above 2400 volts provides an increased safety hazard for personnel in close proximity to energized nonshielded conductors or cables and should be eliminated.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 2
Explanation of Negative:

KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.

MCCLUNG, L.: 5000V nonshielded conductors or cables utilized in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation should be permitted since such facilities have thousands of circuits with 6 times as many termnations in safe and reliable operation.

Comment on Affirmative:

CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.

This sort of installation requirement seems to be a suggestion close to an alternative to shielding which might be acceptable. What installation instructions or safety reports can be presented as real evidence of the operational safety of such applications?

Evidentiary Substantiation of the equivalent safety performance of an “industrial establishment” installation compared to shielded construction needs to be presented for me to agree to this expansion of applied use.

LAIDLER, W.: See my affirmative comment on Proposal 6-19.

ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-21 Log #2745 NEC-P06 **Final Action: Reject**
(310.6 Exception No. 3 (New))

TCC Action: The Technical Correlating Committee directs that the panel reconsider the proposal and act on its merits since the application discussed is not exempt under 90.2(B). This action will be considered by the panel as a public comment.
Submitter: Daniel Baker, URS Corporation, Inc.
Recommendation: Revise text to read:

Exception No. 3: Nonshielded insulated listed by the Federal Aviation Administration as certified to meet the requirements for L-824 5,000 volts, shall be permitted for use on series lighting circuits up to 5,000 volts under the conditions specified above under Exception No. 1.

Substantiation: This proposal returns an exception that permitted use of unshielded wiring to be used for underground airfield lighting circuits, due to the 2005 change to this item.

It is common practice in airfield lighting series circuits which are powered by regulators to run unshielded wiring underground for powering the lights. These circuits are ungrounded, and feature many connections, typically for runways every 50 feet, and for taxiways as close together as 20 feet. On a typical circuit, there are often over 100 lights, each of which is connected to the series circuit twice. Requiring use of shielded wire will greatly complicate the splicing, and thus increase the cost of the lighting installations. The practices and methods used in airfield lighting are based on Federal Aviation Administration (FAA) Advisory Circulars (ACs). An example of the connection at typical airfield lighting fixture is shown on the left in **Figure 23** of Appendix 1 of Advisory Circular AC 150/5340-30A “Design and Installation Details for Airport Visual Aids”, issued April 11, 2005. The ACs stipulate that the two “L-823” Connectors be provided for each light.

Because of the importance of these systems to the safe operations of aircraft, it provides higher levels of operability to have an ungrounded system. If a ground occurs on the circuit, no fault current flows so operations can continue.

These practices have been in use for many years with ungrounded, unshielded cable at almost all major airports throughout the United States.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: While airfield lighting circuits are not specifically exempted from the Code in 90.2(B), the cable and application is not within the scope of Article 310, which addresses conductors for general wiring.
The panel recommends that CMP 1 review the panel action and proposal for information.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:

MCCLUNG, L.: 5000V nonshielded conductors or cables whether used for series lighting circuits or 3-phase power circuits have proven to be safe and reliable when properly installed and maintained.

Comment on Affirmative:

CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.

This sort of installation requirement seems to be a form which might be acceptable. What installation instructions or safety reports can be presented as real evidence of the operational safety of such applications?

Evidentiary Substantiation of the equivalent safety performance compared to shielded construction needs to be presented for me to agree to this expansion of applied use.

LAIDLER, W.: I’m voting to reject this proposal because an exception in the NEC permitting the use of unshielded cable for runway lighting systems is not appropriate. The same inherent danger exists in all applications when using unshielded cable on systems operating above 2400 volts. The FAA may choose not to use the NEC if it deems it necessary to use unshielded cables for runway lighting systems.

ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-22 Log #2558 NEC-P06 **Final Action: Reject**
(310.7)

Submitter: Bruce McClung, McSquared Electrical Consulting LLC
Recommendation: Revise text as follows:

Add words “listed by a qualified testing laboratory” so it reads Exception: Nonshielded multiconductor cables rated 2001-5000 volts listed by a qualified testing laboratory shall be permitted for use up to 5000 volts if the cable has an overall metallic sheath or armor:

The metallic shield, sheath, or armor shall be grounded through an effective grounding path meeting the requirements of 250.4(A)(5) or 250.4(B)(4).

Delete FPN No. 1 and continue FPN No. 2 as FPN: See 300.50 for installation requirements for conductors rated over 600 volts.

Substantiation: The use of nonshielded multiconductor cables rated 2001-5000 volts having an overall metallic sheath or armor should be listed by a qualified testing laboratory, but does not have to comply with installation requirements for conductors rated 600 volts or less.
Panel Meeting Action: Reject
Panel Statement: The addition of the phrase “listed by a qualified testing laboratory” violates the NEC Style Manual and the addition of “for use up to 5000 volts” is not necessary since the existing wording implies that such cable is approved for such use.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 2
Explanation of Negative:

KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.

MCCLUNG, L.: 5000V nonshielded multi-conductor cable rated 2001-5000V having an overall metallic sheath or armor is reliable and safe when installed and properly grounded above ground or installed as direct burial.

Comment on Affirmative:

CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.

As currently worded , I believe that 310.7 applies to the construction requirements for cables, not applications of voltage operation. It says “rated above,“ not “operated above“ as 310.6 does. It appears that 310.6 still limits the operational voltage of non-shielded cables to below 2000 in the general rule, and 2400 volts under the exception’s allowances.

Evidentiary Substantiation of the equivalent safety performance of an overall metallic sheath or armor compared to shielded construction needs to be presented for me to agree to this expansion of applied use.

LAIDLER, W.: See my affirmative comment on Proposal 6-23.

ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-23 Log #2637 NEC-P06 **Final Action: Reject**
(310.7 Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative. It was the additional action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting concerning a conflict within Chapter 3. This action will be considered by the Panel as a public comment.
Submitter: James M. Daly, General Cable
Recommendation: Change 5000 to 2400.
Substantiation: Article 310 was revised in the 2005 NEC to limit nonshielded conductors and cables to 2400 volts. This reference was overlooked and needs to be corrected.
Panel Meeting Action: Accept
Panel Statement: Section 310.13 refers to Table 310.63, which no longer recognizes nonshielded cables rated above 2400 volts.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 7 Negative: 4
Explanation of Negative:
HUDDLESTON, JR., R.: This proposal should have been rejected, as there is no sound evidence that proper installations using nonshielded cable for 4160 volt applications are a concern.
KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.
MCCLUNG, L.: Fails to address 5000V nonshielded cable restoration issue.
WETHERELL, A.: See my explanation of negative vote on Proposal 6-13.
Comment on Affirmative:
CLINE, S.: These are detail corrections to Panel action(s) in a previous cycle. I think they are correct as they stand, and their acceptance does not interfere with the other arguments related to allowance of cable application at higher voltages. I think it should be a high priority for Panel members to assure that the Code is correct and clear.
LAIDLER, W.: I'm voting to accept this proposal because the submitter is correct. When the panel voted to limit the voltage of unshielded cables to 2400 volts during the 2005 cycle, the editing to this exception was overlooked.
ZIMNOCH, J.: Acceptance of the proposal will correct an oversight that occurred during the 2005 Code cycle. The Panel never discussed either leaving the direct burial Exception in 310.7 nor specifically modifying the Exception. All of the Panel discussion was directed towards limiting the use of non-shielded conductors or cables to 2400 V in all applications and installations. See the Panel Statement "It is the panel's decision that cables rated above 2400 volts be shielded." on Comments 6-9, 6-13, 6-14, and 6-17 through 6-22 to the 2005 Code.
Not accepting the proposal will continue to perpetuate a conflict within Chapter 3. Table 310.63 no longer authorizes 5 kV non-shielded conductors or cables but the Exception in 310.7 permits its use for direct burial applications if the cable has an overall metallic sheath or armor, a clear conflict of Code requirements.
The revisions to Table 310.63 in the 2005 Code cycle removed the insulation and jacket thicknesses for 5 kV non-shielded constructions so the Code no longer includes any construction requirements for non-shielded conductors or cables rated above 2400 V. Therefore, no conductors or cables rated over 2400 V can be provided in compliance with the Code. Failure to accept the proposal could result in non-shielded products rated 5 kV being direct buried with the onus being placed on the AHJ to accept the product and permit the installation even though that is contrary to the Panel action during the 2005 Code cycle.

6-24 Log #3448 NEC-P06 **Final Action: Accept**
(310.7 Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative. It was the additional action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting concerning a conflict within Chapter 3. This action will be considered by the Panel as a public comment.
Submitter: Joseph S. Zimnoch, The Okonite Company
Recommendation: Change the following exception:
Exception: Nonshielded multiconductor cables rated 2001 - ~~5000~~ 2400 volts shall be permitted if the cable has an overall metallic sheath or armor.
Substantiation: This is a housekeeping item in accordance with the 5 kV to 2.4 kV non-shielded cable change in the 2005 cycle.
Panel Meeting Action: Accept
Panel Statement: Section 310.13 refers to Table 310.63, which no longer recognizes nonshielded cables rated above 2400 volts.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 7 Negative: 4
Explanation of Negative:
HUDDLESTON, JR., R.: This proposal should have been rejected. See comment 6-23.
KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.
MCCLUNG, L.: Fails to address 5000V nonshielded cable restoration issue.
WETHERELL, A.: See my explanation of negative vote on Proposal 6-13.
Comment on Affirmative:
CLINE, S.: These are detail corrections to Panel action(s) in a previous cycle. I think they are correct as they stand, and their acceptance does not interfere with the other arguments related to allowance of cable application at higher voltages. I think it should be a high priority for Panel members to assure that the Code is correct and clear. LAIDLER, W.: See my affirmative comment on Proposal 6-23.
ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-23.

6-25 Log #2744 NEC-P06 **Final Action: Reject**
(310.7 Exception No. 2 (New))

TCC Action: The Technical Correlating Committee directs that the panel reconsider the proposal and act on its merits since the application discussed is not exempt under 90.2(B). This action will be considered by the panel as a public comment.
Submitter: Daniel Baker, URS Corporation, Inc.
Recommendation: Revise text to read:
Exception No 2: Ungrounded airfield lighting series circuits rated up to 5000 volts and powered by regulators may be unshielded.
Substantiation: The practices and methods used in airfield lighting are based on Federal Aviation Administration (FAA) Advisory Circulars (ACs). An example of direct burial cable installation at typical airfield lighting fixtures is shown on the right in **Figure 23** taken from Appendix 1 of Advisory Circular AC 150/5340-30A "Design and Installation Details for Airport Visual Aids", issued April 11, 2005. The figure clearly shows FAA Type L-824, 1/C, #8 AWG, 5 kV Cable. This type of cable is unshielded, and the circuits are not intentionally grounded. One of the advantages cited by the FAA in the above referenced AC in Section 2.1.4, "System Design" b. 4 reads "unintentional grounding will not shut the system down."
Requiring use of shielded wire will greatly complicate the splicing, and thus increase the cost of the lighting installations. These circuits are ungrounded, and feature many connections, typically for runways every 50 feet, and for taxiways as close together as 20 feet. On a typical circuit, there are often over 100 lights, each of which is connected to the series circuit twice.
The practice of using unshielded 5kV direct burial cable with ungrounded circuits has been implemented for many years at various airports in the United States.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: While airfield lighting circuits are not specifically exempted from the Code in 90.2(B), the cable and application is not within the scope of Article 310, which addresses conductors for general wiring.
The panel recommends that CMP 1 review the panel action and proposal for information.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
MCCLUNG, L.: 5000V nonshielded conductors or cables whether used for series lighting circuits or 3-phase power circuits have proven to be safe and reliable when properly installed and maintained.
Comment on Affirmative:
LAIDLER, W.: See my affirmative comment on Proposal 6-21.
ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-26 Log #812 NEC-P06 **Final Action: Accept**
(310.8(B) and 310.8(C)(2))

Submitter: Austin D. Wetherell, Underwriters Laboratories, Inc.
Recommendation: Delete "THHW-2" from the list of types in both sections.
Substantiation: Type THHW-2 does not exist in the Table 310.13. A 90° C wet or dry rated wire of this construction is covered by Type THW-2.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-27 Log #2236 NEC-P06 **Final Action: Reject**
(310.8(D))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
(D) Locations Exposed to Direct Sunlight. Insulated conductors or cables used where exposed to direct rays of the sun shall comply with one of the following:
(1) Cables listed ~~, or listed and marked,~~ as being sunlight resistant
(2) Conductors listed ~~, or listed and marked~~ , as being sunlight resistant
(3) Covered with insulting material, such as tape or sleeving, that is listed ~~, or listed and marked,~~ as being sunlight resistant.
Substantiation: The words "or listed and marked" add nothing to the understanding of the question. There is no requirement that the conductors be

"marked", only that they be listed. The fact, that they listed for the use is the rule, the "marking" is optional. The listing neither requires nor precludes the marking of the cable.

Panel Meeting Action: Reject

Panel Statement: The phrase "listed and marked" was added in the 2005 Code cycle to provide greater clarity for inspectors. Some standards require products to be marked "sunlight resistant" while others do not.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been accepted. The wording in the proposal does away with useless, redundant words, without negating the meaning intended. Any words that are currently in the NEC that can be removed without changing the meaning should be removed.

6-28 Log #3344 NEC-P06 **Final Action: Reject**
(310.8(D) Exception (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Add an exception as follows:

Exception: For drip loops installed to comply with 230.54(F), or for similar drip loops formed in branch-circuit or feeder conductors, conductors extending not more than 900 mm (3 ft) from a cable sheath or from a raceway shall not be required to be sunlight resistant.

Substantiation: The blanket prohibition against nonsunlight-resistant conductors is not appropriate for short lengths of conductors emerging from separate holes in a weatherhead. Although sunlight resistant wire is somewhat more available than when the rule first changed, it still is a special order item in many sizes. Although UL has revised its guide card restrictions on SE cable to give relief where that is the wiring method, they cannot provide relief for building wire generally. This is particularly true for small conductors that usually are not uniformly black with colored tape applied afterwards.

For example, a 60A service might well have a No. 6 grounded circuit conductor (neutral or otherwise), and that conductor would need to be entirely white. Although white wires can be made sunlight resistant, it is much more difficult and expensive than black wire, and therefore we are not likely to see much of it. Relief is needed for installers. The general rule is appropriate, however, for long lengths of conductors exposed to sunlight, such as outdoor installations of single conductors in cable tray or open wiring on insulators.

Panel Meeting Action: Reject

Panel Statement: All conductors and cables exposed to direct sunlight must be sunlight resistant. A failure could occur in a short length of a conductor or cable exposed to direct sunlight just as it could occur in a longer length.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been accepted. The submitter makes a good argument for allowing non-sunlight-resistant conductors for drip loops.

6-29 Log #927 NEC-P06 **Final Action: Accept**
(310.10, FPN 2)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete.

Substantiation: Edit. A reference to a study involving conduit without specifying whether it was metal, nonmetallic, or flexible types, has limited or no use.

Panel Meeting Action: Accept

Panel Statement: This is to corrolate with the action on Proposals 6-30 & 6-51. The panel disagrees with the submitters substantiation.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been rejected. A FPN referencing the possibility that conduits installed on rooftops may heat up the conductors is appropriate.

6-30 Log #3151 NEC-P06 **Final Action: Accept**
(310.10, FPN 2)

Submitter: Travis Lindsey, Travis Lindsey Consulting Services

Recommendation: Delete 310.10 FPN No. 2.

Substantiation: This is a companion Proposal to a Proposal to add section 310.15 (B)(2)(c) and should be accepted only if that proposal is accepted.

Panel Meeting Action: Accept

Panel Statement: This is to corrolate with the action on Proposal 6-51.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been rejected. A FPN is appropriate to alert designers that there is a possibility that conduits on rooftops may cause conductors to become warmer than ambient temperatures.

6-31 Log #2930 NEC-P06 **Final Action: Reject**
(310.11(A)(6), 310.11(B)(1) and 310.11(B)(4))

Submitter: Leif O. Pihl, IBEW LU 292

Recommendation: Revise as follows:

310.11 Marking

(A) Required Information *. All conductors and cables shall… (This text to remain unchanged)*

(1) thru (5) (This text to remain unchanged.)

<u>(6)Color of the insulation, as a full word or as an abbreviation. Tracer color(s) shall follow the primary color, separated by a slash ('/') or an equivalent separation.</u>

<u>Exception No. 1:The color is not required to be marked on the outer jacket of multiconductor cables.</u>

<u>Exception No. 2:A conductor's tracer's color label is not required if the primary color is green and the tracer color is yellow.</u>

<u>Exception No. 3:A conductor's tracer's color label is not required if the tracer color is only black or only white.</u>

<u>FPN: Below are some examples of possible color labels, including the full name, a possible abbreviation, and an example primary color with a tracer color.</u>

<u>BLACK, [BLK.], <BLK/ORG>,</u>
<u>WHITE, [WHT], <WHT/ORG>,</u>
<u>RED, [RED], <RED/ORG>,</u>
<u>BLUE, [BLU], <BLU/ORG>,</u>
<u>GREEN, [GRN], <GRN/ORG>,</u>
<u>YELLOW, [YEL], <YEL/ORG>,</u>
<u>ORANGE, [ORG], <ORG/PRP>,</u>
<u>BROWN, [BRN], <BRN/ORG>,</u>
<u>PURPLE, [PRP], <PRP/ORG>,</u>
<u>PINK, [PNK], <PNK/ORG>,</u>
<u>GRAY, [GRY], <GRY/ORG>,</u>
<u>TAN, [TAN], <TAN/ORG>.</u>

310.11 (B) Method of Marking

Surface Marking *The following conductors and calves shall be durably marked on the surface. The AWG size or circular mil area* <u>and color</u> *shall be repeated at intervals not exceeding 610mm (24 in.). All other markings shall be repeated at intervals not exceeding 1.0m (40 in.).*

310.11 (B)(4) Optional Marking of Wire Size **<u>and Color</u>** *The information required in 310.11(A)(4)* <u>and 310.11(A)(6)</u> *shall be permitted to be marked on the surface of the individual insulated conductors for the following multiconductor cables:*

(remainder unchanged)

Substantiation: This change is being recommended to cut down on the number of hazards that have been introduced in the field do to misidentification of the color imbedded into conductors' insulation.

It has been stated that as few as 8-10%, and as many as one-in-six men have some form of color blindness. (Because the condition is hereditary by way of the X-chromosome, only 0.4-1.0% of women have the condition.) Within these groups of people, total color blindness is very rare, partial color blindness is much more common. People with partial color blindness are in "all walks of life", including Electricians.

It does not take a color blindness condition in order to misidentify a conductor's insulation color. Numerous manufacturers have made colors that are not easy for even the most visually acute people to easily identify. Over time the colors in some conductor's insulation has been known to fade or discolor. Add into these situations problems with poor lighting, dust, and any other number of conditions, and one can see that color misidentification can cause serious safety problems. (Try identifying a green, gray and brown conductor, in a dusty, shady environment, when the manufacturer has not added sufficient pigment to the insulation.)

The ideal solution would be to dictate various ranges of color via existing RGB (red-green-blue), CMYK (Cyan-Magenta-Yellow-Black), frequency, or other identification methods. However, this is not an ideal world. Additional research would be needed in order to find out the exact colors that are less likely to be misidentified by the partially colorblind community. Further, manufacturers would object to additional manufacturing processes for cost and nuisance reasons.

There is a less expensive and arguably better alternative: Add to the already existing labeling requirements to include the color. This code change *does not dictate what the exact color must be* ; the manufacturer gets to decide what color they choose to sell it as. With this code change they must label the conductor so that the end user has a better chance to know *what the color is intended to be* .

Exception No. 1 is a response to criticism this proposal has received.

Exception No. 2's reason is to ease the financial burden upon manufacturers and businesses that specialize in adding tracer colors and/or re-spooling conductors onto spools with a smaller quantity that the OEM made. This exception does not significantly reduce safety, as it is relatively rare for colors other than yellow to be placed on a green conductor.

Exception No. 3's reason is similar to Exception No. 2 as described above. So long as there is only one tracer color, and that color is either white or black, the chances of misidentification are very minimal.

The reason for the Fine Print Note is to give manufacturers and users an example of what to expect the color labels *could* look like. The selection of example color choices are already in the market place, derived from several manufacturers catalogs. Showing an example of what users should look for would improve proper identification, and thus safety.

Panel Meeting Action: Reject

Panel Statement: As indicated in the 2004 ROP, there are times that conductors cannot be marked and, if marked, cannot easily be read. This may occur when the conductors are small or not round. The Code does not prohibit the conductors from being marked, so if desired, the customer may request such marking. There are recognized color standards. One such standard is Munsell, which is often referenced in wire and cable standards.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-32 Log #2150 NEC-P06 **Final Action: Reject**
(310.12)

Submitter: Roger Hewitt, Puget Sound Electrical Apprenticeship / Rep. IBEW LU #46

Recommendation: Delete existing text from 310.12 and replace with:

310.12(A) Deleted text of 200.6 (ALL).
310.12(B) Deleted text of 250.119 (ALL).
310.12(C) Deleted text of 210.5 (C).
310.12(D) Deleted text of 215.12 (C).

Substantiation: Multiple sections of the NEC must now be consulted to ensure proper conductor identification. Combining all conductor identification requirements in one section in Article 310 is logical.

Panel Meeting Action: Reject

Panel Statement: There are very specific requirements in 200.6 for grounded conductors and in 250.119 for equipment grounding conductors. Section 200.7 also applies to the marking of grounded conductors. 310.12 applies to conductors for general wiring, whereas 200.7 also applies to conductors used in applications other than general wiring. Combining all the marking requirements into 310.12 would not improve clarity over the present text, which directs the user to the appropriate sections that provide the marking requirements applicable to the particular use of the conductors -- grounded conductors, equipment grounding conductors, branch circuits, and feeders.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-33 Log #676 NEC-P06 **Final Action: Reject**
(310.12, FPN (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for Action. This action will be considered by Code-Making Panel 2 as a public comment.

Submitter: Jamie McNamara, Hastings, MN

Recommendation: Add a FPN to the end of current 310.12 Conductor Identification to read

<u>FPN: Were two nominal voltage systems exist in a building the systems are often identified by colors as follows, for the lower voltage, A phase is Black, B is Red, C is Blue and the grounded conductor is White. The system with the higher voltage is A phase is Brown, B is Orange or Purple, C is Yellow and the grounded conductor is Gray.</u>

Substantiation: This fine print note would help users of the NEC identify a long time industry practice of a common way the conductors are identified. It helps people recognize the deferent systems and identify the hazards.

Panel Meeting Action: Reject

Panel Statement: The panel believes that this proposal is properly within the purview of CMP 2 for consideration in Chapter 2.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

LAIDLER, W.: I agree with the panel that this proposal would be more appropriate under the purview of Panel 2. I also agree with the submitter that a FPN recommending that where different nominal voltage systems are present in a building, a color coding identifying each system is needed. This recommendation would provide an additional means to identify different systems from each other as well as providing an additional safety factor.

6-34 Log #2943 NEC-P06 **Final Action: Reject**
(310.12 Exception)

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Move the existing exception that follows 310.12(C) to follow (A).

Substantiation: The existing exception modifies the rule on identification of grounded conductors and should follow (A). The NEC Style Manual requires an exception to directly follow the rule it modifies.

Panel Meeting Action: Reject

Panel Statement: The exception correctly applies only to (C).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-35 Log #193 NEC-P06 **Final Action: Reject**
(310.12(C))

NOTE: The following proposal consists of Comment 6-29 on Proposal 6-20 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-20 was:

Revise text as follows:

(C) Ungrounded Conductors. Conductors that are intended for use as ungrounded conductors, whether used as a single conductor or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors. Distinguishing markings shall not conflict in any manner with the surface markings required by 310.11(B)(1). <u>Branch-circuit ungrounded conductors shall be in accordance with 210.5(C). Feeders shall be in accordance with 215.12.</u>

Exception: Conductor identification shall be permitted in accordance with 200.7.

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Delete " ~~in any manner~~ " and add <u>"Exception: Where all conductors in an enclosure are the same size and insulation type, a white conductor shall be permitted to be reidentified as a non-grounded conductor without regard to 310.11(B)(1)."</u>

Substantiation: In this circumstance, loss of the markings will produce no hazard. Contrariwise, if the section of wire that happens to be available in the enclosure happens to be the portion containing the markings, it could be unnecessarily burdensome on installers to have to re-pull in order to avoid an apparent conflict between the two NEC sections (presuming small-gage conductors).

Panel Meeting Action: Reject

Panel Statement: The rules for re-identification are covered in Chapter 2.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-36 Log #813 NEC-P06 **Final Action: Accept**
(Table 310.13)

Submitter: Austin D. Wetherell, Underwriters Laboratories, Inc.

Recommendation: For Type THHW, extend the size range by adding the following entries at the bottom of the 6th, 7th, and 8th columns: 1001-2000 3.18 125

Substantiation: The size ranges for Type TW (rated 60°C wet or dry), THW (75°C wet or dry), THW-2 (90°C wet or dry) go up to 2000 kcmil. Type THHW has the same construction as the three previously named conductors and is rated 90°C dry, 75°C wet. There is no technical reason to restrict the size of Type THHW to 1000 kcmil. UL 83, the ANSI approved Standard for Thermoplastic-Insulated Wires, covers Type THHW in sizes up to and including 2000 kcmil.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-37 Log #814 NEC-P06 **Final Action: Accept in Principle**
(Table 310.13)

Submitter: Austin D. Wetherell, Underwriters Laboratories, Inc.

Recommendation: Delete Types RHW-2 and XHHW-2 from Table 310.13, and revise footnote 4 to Table 310.13 to read "-2" instead of "2".

Substantiation: Types RHW-2 and XHHW-2 are covered by footnote 4 which applies to Types RHW and XHHW. Regarding the footnote, the suffix always has a "-2". If the Panel believes that all the types should appear in the table, an alternative proposal (for consistency), would be to delete footnote 4 from Types THW, THWN, USE, and ZW, and add Types THW-2, THWN-2, USE-2, and ZW-2. Footnote 4 would then need to be removed from the end of the table. Doing so would involve renumbering of the footnotes.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel has satisfied the submitter's intent to have consistency by including the "-2" types within the table.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

[Proposal 6-37 (Log #814)]

Table 310.13 Conductor Applications and Insulations

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation AWG or kcmil	mm		mils		Outer Covering[1]
Fluorinated ethylene propylene	FEP or FEPB	90°C 194°F	Dry and damp locations	Fluorinated ethylene propylene	14–10	0.51		20		None
					8–2	0.76		30		
		200°C 392°F	Dry locations — special applications[2]	Fluorinated ethylene propylene	14–8	0.36		14		Glass braid
					6–2	0.36		14		Glass or other suitable braid material
Mineral insulation (metal sheathed)	MI	90°C 194°F	Dry and wet locations	Magnesium oxide	18–16[3]	0.58		23		Copper or alloy steel
					16–10	0.91		36		
		250°C 482°F	For special applications[2]		9–4	1.27		50		
					3–500	1.40		55		
Moisture-, heat-, and oil-resistant thermoplastic	MTW	60°C 140°F	Machine tool wiring in wet locations	Flame-retardant moisture-, heat-, and oil-resistant thermoplastic		(A)	(B)	(A)	(B)	(A) None (B) Nylon jacket or equivalent
					22–12	0.76	0.38	30	15	
					10	0.76	0.51	30	20	
					8	1.14	0.76	45	30	
		90°C 194°F	Machine tool wiring in dry locations. FPN: See NFPA 79.		6	1.52	0.76	60	30	
					4–2	1.52	1.02	60	40	
					1–4/0	2.03	1.27	80	50	
					213–500	2.41	1.52	95	60	
					501–1000	2.79	1.78	110	70	
Paper		85°C 185°F	For underground service conductors, or by special permission	Paper						Lead sheath
Perfluoro-alkoxy	PFA	90°C 194°F	Dry and damp locations	Perfluoro-alkoxy	14–10	0.51		20		None
					8–2	0.76		30		
		200°C 392°F	Dry locations — special applications[2]		1–4/0	1.14		45		
Perfluoro-alkoxy	PFAH	250°C 482°F	Dry locations only. Only for leads within apparatus or within raceways connected to apparatus (nickel or nickel-coated copper only)	Perfluoro-alkoxy	14–10	0.51		20		None
					8–2	0.76		30		
					1–4/0	1.14		45		
Thermoset	RHH	90°C 194°F	Dry and damp locations		14-10	1.14		45		Moisture-resistant, flame-retardant, nonmetallic
					8–2	1.52		60		
					1–4/0	2.03		80		
					213–500	2.41		95		

					~~310.62~~.			
Moisture-resistant thermoset	RHW[4]	75°C 167°F	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	14–10 8–2 1–4/0 213–500 501–1000 1001–2000 ~~For 601–2000, see Table 310.62~~.	1.14 1.52 2.03 2.41 2.79 3.18	45 60 80 95 110 125	Moisture-resistant, flame-retardant, nonmetallic covering[5]
	RHW-2	90°C 194°F	Dry and wet locations					
~~Moisture-resistant thermoset~~	~~RHW-2~~	~~90°C~~ ~~194°F~~	~~Dry and wet locations~~	~~Flame-retardant moisture-resistant thermoset~~	~~14–10~~ ~~8–2~~ ~~1–4/0~~ ~~213–500~~ ~~501–1000~~ ~~1001–2000~~ ~~For 601–2000, see Table 310.62.~~	~~1.14~~ ~~1.52~~ ~~2.03~~ ~~2.41~~ ~~2.79~~ ~~3.18~~	~~45~~ ~~60~~ ~~80~~ ~~95~~ ~~110~~ ~~125~~	~~Moisture-resistant, flame-retardant, nonmetallic covering[5]~~
Silicone	SA	90°C 194°F 200°C 392°F	Dry and damp locations For special application [2]	Silicone rubber	14–10 8–2 1–4/0 213–500 501–1000 1001–2000	1.14 1.52 2.03 2.41 2.79 3.18	45 60 80 95 110 125	Glass or other suitable braid material
Thermoset	SIS	90°C 194°F	Switchboard wiring only	Flame-retardant thermoset	14–10 8–2 1–4/0	0.76 1.14 2.41	30 45 95	None
Thermoplastic and fibrous outer braid	TBS	90°C 194°F	Switchboard wiring only	Thermoplastic	14–10 8 6–2 1–4/0	0.76 1.14 1.52 2.03	30 45 60 80	Flame-retardant, nonmetallic covering
Extended polytetra-fluoro-ethylene	TFE	250°C 482°F	Dry locations only. Only for leads within apparatus or within raceways connected to apparatus, or as open wiring (nickel or	Extruded polytetra-fluoro-ethylene	14–10 8–2 1–4/0	0.51 0.76 1.14	20 30 45	None

			nickel-coated copper only)				
Heat-resistant thermoplastic	THHN	90°C 194°F	Dry and damp locations	Flame-retardant, heat-resistant thermoplastic	14–12 10 8–6 4–2 1–4/0 250–500 501–1000	0.38 0.51 0.76 1.02 1.27 1.52 1.78	15 20 30 40 50 60 70	Nylon jacket or equivalent
Moisture- and heat-resistant thermoplastic	THHW	75°C 167°F 90°C 194°F	Wet location Dry location	Flame-retardant, moisture- and heat-resistant thermoplastic	14–10 8 6–2 1–4/0 213–500 501–1000	0.76 1.14 1.52 2.03 2.41 2.79	30 45 60 80 95 110	None
Moisture- and heat-resistant thermoplastic	THW[4]	75°C 167°F 90°C 194°F	Dry and wet locations Special applications within electric discharge lighting equipment. Limited to 1000 open-circuit volts or less. (size 14-8 only as permitted in 410.33)	Flame-retardant, moisture- and heat-resistant thermoplastic	14–10 8 6–2 1–4/0 213–500 501–1000 1001–2000	0.76 1.14 1.52 2.03 2.41 2.79 3.18	30 45 60 80 95 110 125	None
	THW-2	90°C 194°F	Dry and wet locations					
Moisture- and heat-resistant thermoplastic	THWN[4]	75°C 167°F	Dry and wet locations	Flame-retardant, moisture- and heat-resistant thermoplastic	14–12 10 8–6 4–2 1–4/0 250–500 501–1000	0.38 0.51 0.76 1.02 1.27 1.52 1.78	15 20 30 40 50 60 70	Nylon jacket or equivalent
	THWN-2	90°C 194°F	Dry and wet locations					
Moisture-resistant thermoplastic	TW	60°C 140°F	Dry and wet locations	Flame-retardant, moisture-resistant thermoplastic	14–10 8 6–2 1–4/0 213–500 501–1000 1001–2000	0.76 1.14 1.52 2.03 2.41 2.79 3.18	30 45 60 80 95 110 125	None
Underground feeder and	UF	60°C 140°F	See Article 340.	Moisture-resistant	14–10 8–2	1.52 2.03	60[6] 80[6]	Integral with insulation

branch-circuit cable — single conductor (for Type UF cable employing more than one conductor, see Article 340.)		75°C 167°F[7]		Moisture- and heat-resistant	1–4/0	2.41	95[6]	
Underground service-entrance cable — single conductor (for Type USE cable employing more than one conductor, see Article 338.)	USE[4]	75°C 167°F	See Article 338.	Heat- and moisture-resistant	14–10 8–2 1–4/0 213–500 501–1000 1001–2000	1.14 1.52 2.03 2.41 2.79 3.18	45 60 80 95[8] 110 125	Moisture-resistant nonmetallic covering (See 338.2.)
	USE-2	90°C 194°F	Dry and wet locations					
Thermoset	XHH	90°C 194°F	Dry and damp locations	Flame-retardant thermoset	14–10 8–2 1–4/0 213–500 501–1000 1001–2000	0.76 1.14 1.40 1.65 2.03 2.41	30 45 55 65 80 95	None
Moisture-resistant thermoset	XHHW[4]	90°C 194°F 75°C 167°F	Dry and damp locations Wet locations	Flame-retardant, moisture-resistant thermoset	14–10 8–2 1–4/0 213–500 501–1000 1001–2000	0.76 1.14 1.40 1.65 2.03 2.41	30 45 55 65 80 95	None
	XHHW-2	90°C 194°F	Dry and wet locations					
~~Moisture-resistant thermoset~~	~~XHHW-2~~	~~90°C~~ ~~194°F~~	~~Dry and wet locations~~	~~Flame-retardant, moisture-resistant thermoset~~	~~14–10~~ ~~8–2~~ ~~1–4/0~~ ~~213–500~~ ~~501–1000~~ ~~1001–2000~~	~~0.76~~ ~~1.14~~ ~~1.40~~ ~~1.65~~ ~~2.03~~ ~~2.41~~	~~30~~ ~~45~~ ~~55~~ ~~65~~ ~~80~~ ~~95~~	~~None~~
Modified ethylene tetrafluoro-ethylene	Z	90°C 194°F 150°C 302°F	Dry and damp locations Dry locations — special applications[2]	Modified ethylene tetrafluoro-ethylene	14–12 10 8–4 3–1 1/0–4/0	0.38 0.51 0.64 0.89 1.14	15 20 25 35 45	None

Modified ethylene tetrafluoro-ethylene	ZW[4]	75°C 167°F	Wet Locations	Modified ethylene tetrafluoro-ethylene	14–10	0.76	30	None
					8–2	1.14	45	
		90°C 194°F	Dry and damp locations					
		150°C 302°F	Dry locations — special applications[2]					
	ZW-2	90°C 194°F	Dry and wet locations					

[1] Some insulations do not require an outer covering.
[2] Where design conditions require maximum conductor operating temperatures above 90°C (194°F).
[3] For signaling circuits permitting 300-volt insulation.
[4] footnote 4 deleted~~Listed wire types designated with the suffix "2," such as RHW-2, shall be permitted to be used at a continuous 90°C (194°F) operating temperature, wet or dry.~~
[5] Some rubber insulations do not require an outer covering.
[6] Includes integral jacket.
[7] For ampacity limitation, see 340.80.
[8] Insulation thickness shall be permitted to be 2.03 mm (80 mils) for listed Type USE conductors that have been subjected to special investigations. The nonmetallic covering over individual rubber-covered conductors of aluminum-sheathed cable and of lead-sheathed or multiconductor cable shall not be required to be flame retardant. For Type MC cable, see 330.104. For nonmetallic-sheathed cable, see Article 334, Part III. For Type UF cable, see Article 340, Part III.

6-38 Log #2960 NEC-P06 **Final Action: Reject**
(Table 310.13)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 7 and 14 for Information.
Submitter: Robert L. Seitz, Artech Engineering
Recommendation: Add text to read as follows:
Marine Shipboard Cable X110 90°C Dry and Wet Location Cross Linked Polyolefin Insulation Thermosetting compound outer cover.
Note 9 - See 505.15(B)(1)(g) for application provisions
Substantiation: A proposal has been submitted for 505.15(B)(1) to allow the installation of Marine Shipboard cable to be installed in Zone 1 classified areas.

I proposed to add marine shipboard to Table 310.13 to permit the installation of this cable with guidance provided in the reference paragraph, and further reference to Article 336.

It is intended that Power cables, control cables and instrument cable configurations all be allowed.

Marine Shipboard cable listed and marked under UL 1309 compliant with IEEE 45 and IEEE 1580.

The purpose is to provide a cable other than MC-HL to be installed in Zone 1 Classified areas to allow proper installation of listed and marked Zone 1 devices. Marine Shipboard cable provides the crush and impact resistance required for MC-HL cable with resistance to abrasion, chemicals and sunlight, durability for a harsh environment while providing necessary flexibility for installation of Zone 1 devices.
Panel Meeting Action: Reject
Panel Statement: Article 310 is for general wiring, and this is for a specific application. Table 310.13 contains information on single conductors, not multiconductor cables. Addition of the proposed text would require a new article to address the power, control, and instrumentation cables mentioned in the substantiation and would, for example, require all of the information contained in Articles 330 or 336. This proposal and panel action should be referred to CMP7 & CMP14 for information.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-39 Log #2990 NEC-P06 **Final Action: Accept in Principle**
(Table 310.13)

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Revise text to read as follows:
Change wall thickness of Type SIS in Table 310.13 for 1-4/0 AWG from 95 mils to 55 mils.
Substantiation: This appears to be a typographical error, since Table 14 of UL 44 states 55 mils for 1-4/0 AWG which would make SIS cable the same thickness at XHHW.
Panel Meeting Action: Accept in Principle
Revise text to read as follows:
Change wall thickness of Type SIS in Table 310.13 for 1-4/0 AWG from “2.41mm” to “1.40 mm” and “95 mils” to “ 55 mils” .
Panel Statement: The panel added the SI equivalent for the corrected value.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-40 Log #3304 NEC-P06 **Final Action: Reject**
(Table 310.13)

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Add text to read as follows:
1. Some insulations do not require an outer covering.
2. Where design conditions require maximum conductor operating temperatures above 90°C (194°F).
3. For signaling circuits permitting 300-volt insulation.
4. Listed wire types designated with the suffix “2” such as RHW-2, shall be permitted to be used as a continuous 90°C (194°F) operating temperature, wet or dry
5. Some rubber insulations do not require an outer covering.
6. Includes integral jacket.
7. For ampacity limitation, see 340.80.
8. Insulation thickness shall be permitted to be 2.03 mm (80 mils) for listed Type USE conductors that have.
9. For the purpose of calculating ampacity of natural rubber insulated conductors it shall be permitted to use TW wire values.

Substantiation: There are many existing structures wired with natural rubber covered conductors. When adding circuit extensions as permitted by code for concealed knob and tube there is no recognized values associated with natural rubber insulated conductors. The current “R” value in the code now represents Thermoset plastic and is not equivalent to the “R” for rubber in earlier editions of the code.
Panel Meeting Action: Reject
Panel Statement: The proposed text is not necessary and may even cause some confusion. When rubber-type insulation was in the NEC it had a 60 degree C temperature value. If rubber-type insulation on conductors is being used as part of an existing wiring method, it would still have a 60 degree C value.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-40a Log #CP600 NEC-P06 **Final Action: Accept**
(310.13,310.6 Exception, 310.10, 310.15, Tables 310.16-310.20, Tables 310.67 through 310.86)

Submitter: Code-Making Panel 6,
Recommendation: Revise 310.13 as follows:
“…the applicable provisions of ~~one or more of the following: Table 310.13, Table 310.61, Table 310.62, Table 310.63, and Table 310.64~~ Tables 310.13(A) through 310.13(E).”
Renumber Table 310.13 as Table 310.13(A)
Renumber Table 310.61 as Table 310.13(B)
Renumber Table 310.62 as Table 310.13(C)
Renumber Table 310.63 as Table 310.13(D)
Renumber Table 310.64 as Table 310.13(E)
310.6 Exception (c) – Revise “310.63” to “310.13(D)”
310.10, FPN No. 1 – revise “Table 310.13 and Table 310.61” to “Table 310.13(A) and Table 310.13(B)”
Revise title – “Table 310.13(A) Conductor Applications and Insulations Rated 0-600 V” Delete phrase “For 601-2000, see Table 310.62” under Thickness of Insulation for Types RHH, RHW, and RHW-2.
Revise title – “Table 310.13(B) Conductor Application and Insulation Rated 2001 V and Higher”. Delete phrase “rated 2001 volts and higher” under Application Provision.
310.15(B)(1) – Revise “310.13” to “310.13(A) and 310.13(C)”
Table 310.16 – In the first line of the Table, revise “310.13” to “310.13(A)”
Table 310.17 – In the first line of the Table, revise “310.13” to “310.13(A)”
Table 310.18– In the first line of the Table, revise “310.13” to “310.13(A)”
Table 310.19 – In the first line of the Table, revise “310.13” to “310.13(A)”
Table 310.20 – In the first line of the Table, revise “310.13” to “310.13(A)”
Tables 310.67 through 310.86 – In the first line of each Table, revise “Table 310.61” to “Table 310.13(B)”
Substantiation: 2.3.1 of the NEC Style Manual stipulates “Tables and figures shall be referenced in the text and shall be designated by the number of the NEC rule in which they are referenced.”

These tables are referenced in 310.13 and, therefore, should be identified as 310.13 tables.

The other revisions correlate references in other Sections with the revisions to the Table numbers.

The titles of Tables 310.13(A) and 310.13(B) were revised for clarity and consistency with other tables in the Article.

The Panel Action on this Proposal should be referred to the following Panels for action on the indicated Sections within their scope.
CMP 5 – 300.3(A)
CMP 7 – 320.104, 322.112, 328.100, 330.112(A), 334.112, 336.104, 340.112, and 396.10(B)
CMP 12 – 610.13, Note to Table 610.14(A)
CMP 15 – 520.42, FPN
CMP 19 – 552.10(B)(2), 675.4(A)
Panel Meeting Action: Accept
Panel Statement: The panel action on this proposal should be referred to the following panels for action on the indicated sections within their scope.
CMP 5 – 300.3(A)
CMP 7 – 320.104, 322.112, 328.100, 330.112(A), 334.112, 336.104, 340.112, and 396.10(B)
CMP 12 – 610.13, Note to Table 610.14(A)
CMP 15 – 520.42, FPN
CMP 19 – 552.10(B)(2), 675.4(A)
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-41 Log #399 NEC-P06 **Final Action: Reject**
(310.13, Table 8)

Submitter: Michael Owen, My Trade Training, LLC
Recommendation: Revise existing Table 310.13 to “Table 310.13(A)”. Relocate Table 8, Chapter 9, to Article 310 and reidentify as “Table 310.13(B) Conductor Properties”.
Substantiation: Article 310 is titled “Conductors” and the information contained in existing Table 8 is physical data about conductors where such information may be used for many differing purposes, such as determination of resistance, voltage drop considerations, conversion of AWG to circular mils, etc.
Panel Meeting Action: Reject
Panel Statement: The information provided by Table 8 is widely applied throughout the Code to make various types of conductor calculations, and the information should remain in Table 8.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-42 Log #3517 NEC-P06 **Final Action: Reject**
(Table 310.14(A) (New))

Submitter: Joseph S. Zimnoch, The Okonite Company
Recommendation: Add a new table to read:

Thickness of Composite Insulation for 0- to – 600 Volts Nonshielded Types RHH and RHW-2

Conductor Size (AWG or kcmil)	Inner Layer mm	Inner Layer mils	Outer Layer mm	Outer Layer Mils
14-10	0.76	30	0.38	15
8	1.14	45	0.38	15
6-2	1.14	45	0.76	30
1-4/0	1.40	55	1.14	45
213-500	1.65	65	1.65	65
501-1000	2.03	80	1.65	65
1001-2000	2.54	100	2.41	95

Substantiation: This adds composite wall thicknesses as currently allowed by UL 44, Table 15 and manufactured by many cable companies. The addition of this table allows designers, users and installers to relate manufacturer's literature to the Code. This is a companion proposal to a similar one for 601-2000 v Composite Insulations.
Panel Meeting Action: Reject
Panel Statement: There is not enough technical data and information to support complete correlation of this conductor type in the code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-43 Log #3518 NEC-P06 **Final Action: Reject**
(Table 310.14(B))

Submitter: Joseph S. Zimnoch, The Okonite Company
Recommendation: Add a new table to read:

Thickness of Composite Insulation for 601- to – 2000 Volts Nonshielded Types RHH and RHW-2

Conductor Size (AWG or kcmil)	Inner Layer mm	Inner Layer mils	Outer Layer mm	Outer Layer Mils
14-10	1.14	45	0.38	15
8	1.40	55	0.76	30
6-2	1.40	55	0.76	30
1-4/0	1.65	65	1.14	45
213-500	1.90	75	1.65	65
501-1000	2.29	90	1.65	65
1001-2000	2.92	115	2.41	95

Substantiation: This adds composite wall thicknesses as currently allowed by UL 44, Table 17 and manufactured by many cable companies. The addition of this table allows designers, users and installers to relate manufacturer's literature to the Code. This is a companion proposal to a similar one for 0-600 v Composite Insulations.
Panel Meeting Action: Reject
Panel Statement: There is not enough technical data and information to support complete correlation of this conductor type in the code
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-44 Log #898 NEC-P06 **Final Action: Reject**
(310.15(4)(a))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
A neutral conductor that carries only the unbalanced current from other conductors of the same circuit <u>or a common neutral in accord with the provisions of 310.15(B)(2)(a)</u> shall not be required to be counted.
Substantiation: Edit. The common neutral of 215.4 should be included.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees that the common neutral won't be a current carrying conductor.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-45 Log #3558 NEC-P06 **Final Action: Reject**
(310.15(A)(2))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for information.
Submitter: Robert Alexander, Laguna Hills, CA
Recommendation: Revise as follows:
310.5(A)(2) Selection of Ampacity. Where more than one calculated or tabulated ampacity including those determined by 110.14(C), could apply for a given circuit ~~length~~ , the lowest value shall be used.
Exception: Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity shall be permitted to be used beyond the point of transition, a distance equal to 3.0 m (10 ft) or 10 percent of the circuit length figures at the higher ampacity, whichever is less. Where an ampacity determined by 110.14(C) is the lowest value this exception shall not apply.
~~FPN: See 110.14(C) for conductor temperature limitations due to termination provisions.~~
Substantiation: This is a coordinating proposal to 110.14(C)(1). It recognizes that if the lowest ampacity value is determined by connections it is the overall limiting value. The FPN is made redundant by the direct reference.
Panel Meeting Action: Reject
Panel Statement: The FPN should remain since it is possible to splice a larger conductor onto the end of a conductor to address the connector temperature limitations.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-46 Log #3135 NEC-P06 **Final Action: Reject**
(310.15(B), FPN)

Submitter: Eric Stromberg, Stromberg Engineering, Inc.
Recommendation: Add new text as follows:
(5) Limitations due to terminations, as per 110.14(c)
Substantiation: It seems as though one of the most misunderstood sections of the *Code* is the sizing of conductors. The requirements of 110.14(c) are, many times, either not known; or are applied incorrectly. Calling out 110.14(c) in 310.15 will point users of the *Code* to this section.
Panel Meeting Action: Reject
Panel Statement: Section 310.15(A)(2) Exception already includes a reference to 110.14(C) and that Section addresses the selection of ampacity whereas 310.15(B) applies to the Tables.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-47 Log #1054 NEC-P06 **Final Action: Reject**
(310.15(B)(2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second sentence as follows:
"...or where single conductors or multiconductor cables are stacked or bundled longer than <u>a continuous length</u> of 600 mm (24 in.).
Substantiation: Edit. To clarify that aggregate lengths of close proximity at supports or fastenings are not intended.
Panel Meeting Action: Reject
Panel Statement: This restriction applies to single conductors and multiconductor cables that are bundled or stacked for 600 mm (24 in.) in a continuous length. It does not apply to applications where the conductors or cables are stacked or bundled numerous times in the run. Once a conductor or cable is no longer bundled or stacked, the air around each conductor will lower the conductor operating temperature before it gets to the next bundle and there is no need to reduce the ampacity.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-48 Log #1771 NEC-P06 **Final Action: Reject**
(310.15(B)(2)(a))

Submitter: Danny Thomas, Durham City-County Inspections
Recommendation: Create a second paragraph to 310.15(B)(2)(a) and provide a definition for the word "bundled". Perhaps this could be accomplished by modifying the definition found in 320.2 and adding the following.
"As used in this section, bundled is defined as follows.
Bundled. Cables or conductors that are periodically bound together by being physically tied, wrapped, taped, or installed in a raceway."
Substantiation: What is the meaning of the word "bundled" in this specific code section? Do we go the dictionary and use a definition found in it, which might match what the NEC is trying to accomplish?
For example as found in Webster's Dictionary!
"a group of things fastened together", "to hustle or hurry", "a considerable number of things".

Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any evidence that the lack of a definition of the term "bundled" is creating a problem in the industry. Bundling of conductors or cables does not require that they be physically tied, wrapped, taped or installed in a raceway; they could simply be installed in close proximity in the same hole in the structure framing.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-49 Log #484 NEC-P06 **Final Action: Reject**
(Table 310.15(B)(2)(a), Exception No. 6 (New))

Submitter: Stanley J. Folz, Morse Electric Company
Recommendation: Add an exception to read:
Exception No. 6: The derating factors shown in Table 310.15(B)(2)(a) do not apply to branch circuits supplying an individual dwelling unit.
Substantiation: Although other applications certainly require derating because of the continuous currents encountered. Dwelling units essentially have one continuous load, the HVAC equipment. All other loads are either small or cycling. It was a common occurrence to have ten to fifteen cables in the same set of bored holes "home run" to the panel. Fifteen 12/2 NM cables would result in 30 conductors that would be derated 45 percent per Table 310.15(B)(2)(a). This would result in 13.5 amperes allowed per 12/2 NM cable. 13.5 ampere times fifteen 12/2 NM cables results in a 110 ampere load @ 220 volts on a typical 100 ampere panel. This type of loading is never encountered in an individual dwelling. This rule does not contribute any additional safety when applied to individual dwelling units.
Panel Meeting Action: Reject
Panel Statement: Testing data has shown that the submitters substantiation is not accurate.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-50 Log #1405 NEC-P06 **Final Action: Reject**
(310.15(B)(2)(a), Exception No. 6 (New))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Add an Exception to read:
<u>Exception No. 6: Of those conductors that are switched cable or raceway installations, only the maximum number of conductors capable of being simultaneously energized need to be derated.</u>
Substantiation: In most threeway and fourway switching methods, the load is alternated between travelers, eliminating the need to include both travelers in derating.
Panel Meeting Action: Reject
Panel Statement: The proposed exception is not necessary. The present language of 310.15(B)(2) already permits what the submitter is proposing.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-51 Log #3150 NEC-P06 **Final Action: Accept in Principle**
(310.15(B)(2)(c))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Travis Lindsey, Travis Lindsey Consulting Services
Recommendation: Add 310.15(B)(2)(c) to read:
(c) Conduits Exposed to Sunlight on Rooftops. Where conductors or cables are installed in conduits exposed to direct sunlight on or above rooftops, the adjustments shown in Table 310-15(B)(2)(c) shall be added to the outdoor temperature to determine the applicable ambient temperature for application of the correction factors in Tables 310.16 and 310.18.

Table 310.15(B)(2)(c) Ambient Temperature Adjustment for Conduits Exposed to Sunlight On or Above Rooftops

<u>Distance Above Roof</u>	<u>Temperature Adjustment</u>
On roof, up to and including 13 mm (½ in.) above roof	33 °C (60 ºF)
Above 13 mm (½ in.), up to and including 90 mm (3-½ in.) above roof	22 °C (40 ºF)
Above 90 mm (3-½ in.), up to and including 300 mm (12 in.) above roof	17 °C (30 ºF)
Above 300 mm (12 in.), up to and including 900 mm (36 in.) above roof	14 °C (25 ºF)

Substantiation: 310.10 stipulates that no conductor shall be used in such a manner that its operating temperature exceeds that designated for the type of insulated conductor involved. The air inside conduits in direct sunlight is significantly hotter than the surrounding air, and appropriate ampacity corrections must be made to comply with 310.10. Addition of this new Section and Table will provide the necessary ampacity derating requirements for conduits containing conductors installed on rooftops where they are exposed to the sun.
Full details are contained in the test report entitled *Effect of Rooftop Exposure on Ambient Temperatures Inside Conduits, November 2005.*
This is a companion proposal to a proposal to delete 310.10 FPN No. 2.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Add 310.15(B)(2)(c) to read:
(c) Conduits Exposed to Sunlight on Rooftops. Where conductors or cables are installed in conduits exposed to direct sunlight on or above rooftops, the adjustments shown in Table 310-15(B)(2)(c) shall be added to the outdoor temperature to determine the applicable ambient temperature for application of the correction factors in Tables 310.16 and 310.18.

Table 310.15(B)(2)(c) Ambient Temperature Adjustment for Conduits Exposed to Sunlight On or Above Rooftops

Distance Above Roof to <u>**Bottom of Conduit**</u>	<u>**Temperature Adder**</u>	
	C°	F°
0 thru 13 mm (½ in.)	33	60
Above 13 mm (½ in.), thru 90 mm (3-½ in.)	22	40
Above 90 mm (3-½ in.), thru 300 mm (12 in.)	17	30
Above 300 mm (12 in.), thru 900 mm (36 in.)	14	25

Panel Statement: The revisions to the Table improve clarity since the values shown are temperature adders for each set of numeric units and not direct conversions from ºC to ºF.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 2
Explanation of Negative:
HUDDLESTON, JR., R.: This proposal should have been rejected. The panel did not really examine the implications of this proposal; rather, they blindly accepted that there is merit to de-rating ampacity in conduits on rooftops due to one elaborate and "scholarly" study. The real implications are onerous - a derating to 33 percent of Table 310.16 ampacity for conductors run across the roof (the example presented by this panel member to the panel) is completely unwarranted. What is the problem that we are trying to fix? Is there any documented evidence of failures of conductors installed on rooftops? None was presented to the Code Panel.
Industrial users of the NEC will be affected in their installation and wiring of rooftop blowers and HVAC units, as well as other rooftop electrical devices. Benefits to the copper industry are obvious. Benefits to users of conductors are much less so. The bottom line is that this proposal stands to make it much more expensive to install equipment on rooftops without any documented safety benefit.
MCCLUNG, L.: Personal experience with conductors installed in metallic conduits across rooftops during 41 years of continuous service at facilities ranging from Edmonton, Alberta to Ponce, Puerto Rico, without a failure of such 600V conductors leads to the conclusion that normal industrial installations using the allowable ampacities with existing derating already in the NEC are safe and reliable.
Comment on Affirmative:
KENT, G.: I agree with this proposal, but feel it necessary to point out averaging was used for the ambient temperature in the study. The Code should reference this averaging to keep inspectors/local jurisdictions from using the hottest day on record as the temperature to begin a de-rating factor from.
LAIDLER, W.: I agree with the panel's action to accept this proposal in part based on the technical substantiation provided by the submitter. The panel should have added language that would give guidance to how the maximum outside ambient temperature should be determined. An AHJ could take the maximum temperature of the hottest day of the year for that location and require that 30°F be added to that temperature to arrive at the temperature in which the correction factors in Tables 310.16 and 310.18 would be applied. I do not believe that the submitter intended that a maximum instantaneous value be used when applying this new section. It was stated in the submitter's substantiation that an average or median temperature value was used in experiments to avoid using extreme temperatures. A FPN could be added along with this new section making reference to several different ways that could be used in determining the maximum average temperature for a specific location.
ZIMNOCH, J.: The submitter should submit a listing of temperatures for various cities.

6-52 Log #2237 NEC-P06 **Final Action: Accept**
(310.15(B)(2)(a), FPN 2)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for Comment.
Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
FPN No. 2: See 366.23(A) for ~~correction~~ <u>adjustment</u> factors for conductors in sheet metal auxiliary gutters and 376.22 for correction factors for conductors in metal wireways.

Substantiation: The term "adjustment factors" is used for adjusting the conductor ampacity where there are more than three current carrying conductors in a raceway or cable. The term "correction factor" is used to correct the conductor ampacity for ambient temperature. I have submitted a proposal to make the same wording change in 366.23(A).
Panel Meeting Action: Accept
Panel Statement: This Panel Action should be sent to CMP 8 for correlation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-53 Log #483 NEC-P06 **Final Action: Reject**
(310.15(B)(2) Exception No. 3)

Submitter: Stanley J. Folz, Morse Electric Company
Recommendation: Revise text to read:
Exception No. 3: Derating cables shall ~~not~~ apply to conductors in nipples having a length ~~not exceeding~~ greater than 600 mm (24 in.).
Substantiation: Creates positive language.
Panel Meeting Action: Reject
Panel Statement: The present language of the exception meets the requirements of section 3.1.4 of the NEC Style Manual by modifying the mandatory language. The Panel understands that this Proposal addresses 310.15(B)(2)(a) Exception No. 3.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-54 Log #264 NEC-P06 **Final Action: Reject**
(310.15(B)(2) Exception No. 4)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Derating factors shall not apply to underground conductors entering or leaving an outdoor trench if those conductors have ~~physical~~ protection in the form of rigid metal conduit, intermediate metal conduit, or rigid nonmetallic conduit having a length not exceeding 3.05 m (10 ft) and the number of conductors does not exceed four.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "protection" means "physical protection."
Panel Meeting Action: Reject
Panel Statement: The word "physical" emphasizes the importance of protection of underground conductors entering or leaving an outdoor trench and should remain in the text. The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference, overheating, voltage and overcurrent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-55 Log #2777 NEC-P06 **Final Action: Reject**
(310.15(B)(2) Exception No. 6 (New))

Submitter: Wayne Foster, Lynn Electric Inc.
Recommendation: Add new text to read as follows:
Exception No. 6: derating factors shall not apply to cables run in bored holes, or cut notches in joists or interior walls in dwellings under the following conditions:
(1) Where these cables are run in bored holes in a wall, floor, or ceiling space, and where the ambient temperature will not exceed 30°C in normal use and,
(2) Where the ambient temperature will not exceed 30°C in normal use and
(3) Where these cables are not larger than No. 12 Cu or No. 10 AL
(4) This exception shall not apply where more than two NM cables containing two or more current carrying conductors are bundled together and pass through wood framing that is to be fire- or draft stopped using thermal insulation or sealing foam, a required in 334.80.
Substantiation: Where there are cables run in bored holes in joists with spacing between each joist, the maximum load on these cables, will most likely never be used because of the load profiles in dwelling units. The temperature rise of these cables is minimal, under these conditions. By limiting this exception to 15 and 20 ampere circuits, the range, dryer, electric furnace, etc. are excluded and the likelihood of more than one or two heavily load circuits are eliminated.
The code now requires multiple holes to be bored in floor joists to accommodate the runs and building regulations limit the amount of these holes that can be safely bored into floor joist. This places an undue burden on the electrician to find exit routing from panelboads. This proposal will provide some relief from the stringent requirements.
And that the dwelling unit load is so diverse and that those circuits are almost totally for convenience: therefore the need for derating is not required as circuits will be used minimally and in small groups. The heaviest loaded circuits would likely be one or two small appliance branch circuits, a bathroom receptacle circuit, and a laundry circuit. Those circuits, mixed in with the other circuits would not require derating.
Panel Meeting Action: Reject
Panel Statement: Testing data has shown that the submitters substantiation is not accurate.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-56 Log #3345 NEC-P06 **Final Action: Reject**
(310.15(B)(2)a. Exception No. 6 (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Insert the following as a new Exception No. 6 :
Exception No. 6: Derating factors shall not apply where 30 or fewer current-carrying conductors occupy no more than 20 percent of the interior cross sectional area of Cellular Concrete Floor Raceways, Article 372; Cellular Metal Floor Raceways, Article 374; and Underfloor Raceways, Article 390.
Substantiation: For good reason, these raceway articles forbid the reinsulation of conductors at abandoned outlets. However, the present Code builds in a powerful economic incentive to violate these rules. This is because the current text of this section and its table complicate the simple solution to the problem. If this proposal is accepted, it will be a simple matter to use one pair of conductors for each outlet, spliced in a header duct of some kind. Then if an outlet is to be abandoned, the pair of wires can be simply withdrawn with a pull wire left in place for the future. Although this can be done now, the literal effect of the current code is to require oversized conductors on many runs, which needlessly discourages the practice. In fact, with generally small loads split up over many pairs of wires, or even a large load using only one pair of wires in a group, there is no problem. These raceways are large in area and well embedded in an excellent "heat sink" medium.
This wording adds restrictions comparable to metal wireways. This will provide a more technically correct basis for the existing rule in terms of preventing overheating. If these installations overheat, then the wireways would also. One of these metal raceways embedded in a concrete floor would be very unlikely to cause a problem for the enclosed conductors based on standard usage patterns and similarities with other raceways of comparable cross section.
Panel Meeting Action: Reject
Panel Statement: The submitter has provided no technical data or calculations in his substantiation to support this new exception.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-57 Log #1065 NEC-P06 **Final Action: Accept in Principle in Part**
(310.15(B)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
Where bare or covered conductors are ~~used~~ installed with insulated conductors in a raceway, auxiliary gutter, cable tray, or supported on a messenger , ~~their allowable ampacities shall be limited to those permitted for the adjacent conductors~~ they shall be considered to have an insulation temperature rating equal to the lowest insulation temperature rating of the insulated conductors, for the purpose of determining ampacity.
Substantiation: Edit. Present wording requires a bare neutral service conductor which is sized larger than the insulated conductors, to compensate for harmonic currents, to have an ampacity limited to that of the ungrounded conductors, which in effect requires an increased ampacity for those conductors even if unaffected by harmonic currents. "Adjacent" is not defined and is to be avoided per Style manual. A bare individual neutral installed as an open conductor in overhead spans per 225.6 and 225.14 is "adjacent" to ungrounded conductors and limited to their ampacity even though Table 310.21 indicates higher ampacity than insulated conductors of the same size in Table 310.17.
Panel Meeting Action: Accept in Principle in Part
The panel accepts the change of "used" to "installed". The Panel does not accept the phrase "in a raceway, auxiliary gutter, cable tray, or supported on a

messenger". The Panel accepts the last phrase in Principle. The Section shall read: "Where bare or covered conductors are installed with insulated conductors, the temperature rating of the bare or covered conductor shall be equal to the lowest temperature rating of the insulated conductors for the purpose of determining ampacity."

Panel Statement: The panel did not accept the phrase "in a raceway…" since the rule applies regardless of the installation and by listing some installations, others may be inadvertently omitted. The panel revised the last phrase for clarity.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-58 Log #3657 NEC-P06 **Final Action: Reject**

(310.15(B)(4)(a))

Submitter: George Rohanna, Local Union #98 IBEW

Recommendation: New wording - A neutral conductor that carries only the unbalanced current (of a dedicated circuit).

Delete - From other conductors of the same circuit.

Substantiation: Delete (From other conductors of the same circuit) is more confusing than - "of a dedicated circuit".

Panel Meeting Action: Reject

Panel Statement: The proposed wording does not improve the clarity of the section.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-59 Log #1589 NEC-P06 **Final Action: Accept**

(310.15(B)(4)(b))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 310.15(B)(4)(b):

Change "neutral" to "neutral conductor." Also change "wire" to "conductor."

The revised text would appear as follows:

(b) In a 3-wire circuit consisting of two phase ~~wires~~ conductors and the neutral conductor of a 4-wire, 3-phase, wye-connected system, a common conductor carries approximately the same current as the line-to-neutral load currents of the other conductors and shall be counted when applying the provisions of 310.15(B)(2)(a).

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Also, the word "wire" should be replaced by "conductor" for consistency.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

LAIDLER, W.: I am voting against this proposal. I was a member of the TCC Task Group that developed the definition of "Neutral Conductor". After reviewing the explanation of negative votes from some members of the TCC, I'm now of the opinion that the Task Group did not come up with a clear definitive definition of what constitutes a neutral conductor. The definition proposed makes no reference to whether or not the neutral conductor needs to be grounded. Any new definition of a neutral conductor should make reference to how it relates to the long used Code terminology of a grounded conductor. Until this is done, the language should remain unchanged.

Comment on Affirmative:

CLINE, S.: While I agree that the use of the word "neutral" itself demands change, that is a separate argument for another Panel. This section itself has what seems to me to be a syntax flaw where it apparently refers to the same conductor as both a "neutral" and as a "common" (a good word to use!). But still, this is not a part of this Proposal's subject.

I can agree that changing "wire" to "conductor" in either "3-wire" or "4-wire" is a different subject with different impacts in the trade, and should not be done here.

Changing "wire" after "phase" to "conductor" is desirable. "Conductor" is an accurate and more inclusive term, and gives more consistency to the Code.

The addition of the word "conductor" after "neutral" will help to focus that the item being discussed is part of the circuit construction, not a point of connection in a piece of equipment.

6-60 Log #1590 NEC-P06 **Final Action: Accept**

(310.15(B)(4)(c))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 310.15(B)(4)(c):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(c) On a 4-wire, 3-phase wye circuit where the major portion of the load consists of nonlinear loads, harmonic currents are present in the neutral conductor; the neutral conductor shall therefore be considered a current-carrying conductor.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

LAIDLER, W.: See my Explanation of Negative Vote on Proosal 6-59.

Comment on Affirmative:

CLINE, S.: While I agree that the use of the word "neutral" itself demands change, that is a separate argument for another Panel.

I can agree that changing "wire" to "conductor" in either "3-wire" or "4-wire" is a different subject with different impacts in the trade, and should not be done here.

The addition of the word "conductor" after "neutral" will help to focus that the item being discussed is part of the circuit construction, not a point of connection in a piece of equipment.

9-7e Log #CP903 NEC-P09 **Final Action: Accept**

(310.15(B)(6))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for action. This action will be considered by Code-Making Panel 6 as a public comment.

Submitter: Code-Making Panel 9,

Recommendation: In 310.15(B)(6),

Delete the phrase "lighting and appliance branch-circuit" from the second sentence.

Substantiation: CMP-9 has removed the category of "lighting and appliance branch circuit panelboard" from Article 408 by virtue of its action on Proposal 9-117. This proposal correlates the reference in this section with that action.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

6-61 Log #194 NEC-P06 **Final Action: Accept in Principle**
(310.15(B)(6))

NOTE: The following proposal consists of Comment 6-40 on Proposal 6-41 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-41 was:

Revise as follows:

(6) 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For individual units of one family, two-family and Multifamily dwelling units, conductors, as listed in Table 310.15(B)(6), shall be permitted as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to ~~a~~ each ~~dwelling~~ unit and are installed in raceway or cable with or without an equipment grounding conductor. For application of this section, the main power feeder shall be the feeder(s) between the main disconnect and the lighting and appliance branch-circuit panelboards(s). The feeder conductor to ~~a dwelling~~ each unit shall not be required to be larger than their service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of 215.2, 220.22, and 230.42 are met.

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Accept the panel action in principle. Clarify the permissible application of the multiple feeder allowances as one of the following four options:

1) "… the main power feeder shall include the feeder(s) serving only loads associated with a single dwelling unit and running to but not originating in the lighting and appliance branch-circuit panelboard(s) serving the dwelling unit." OR

2) "… the main power feeder shall include the feeder(s) serving only loads associated with a single dwelling unit and running to the lighting and appliance branch-circuit panelboard(s) serving the dwelling unit." OR

3) "… the main power feeder shall include the feeder(s) serving only dwelling loads and running between the main disconnect and the lighting and appliance branch-circuit panelboard(s) serving the dwelling unit." OR

4) "… the main power feeder shall include the feeder(s) serving only dwelling loads and running to but not originating in the lighting and appliance branch-circuit panelboard(s) serving a particular dwelling unit."

Substantiation: By clarifying that this note applies to dwelling units within multifamily housing, which is well advised, the proposal raises important questions as to exactly which panelboard feeders are within the scope of this allowance. Options 1 and 2 exclude feeders that are comprised of dwelling loads, but that serve multiple dwelling units. Options 3 and 4 allow such a feeder. Options 1 and 2 as a group and options 3 and 4 as a group sort out whether this allowance applies to subpanel feeders within a dwelling unit. Dwelling unit subpanel loads do not present the same diversity as dwelling unit panels serving the entire dwelling unit, and thereby undercut one of the traditional supporting assumptions underlying these allowances. However, all of these interpretations are possible given the ambiguous "(s)" endings on the word "feeder" and "panelboard." CMP 6 needs to clarify exactly which feeders qualify for this allowance.

Panel Meeting Action: Accept in Principle

Remove the 2 sets of parentheses and the duplicate "s" on panelboards so that the section reads:

(6) 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For individual dwelling units of one family, two-family, and multifamily dwellings, conductors, as listed in Table 310.15(B)(6), shall be permitted as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to each dwelling unit and are installed in raceway or cable with or without an equipment grounding conductor. For application of this section, the main power feeder shall be the feeder between the main disconnect and the lighting and appliance branch-circuit panelboard. The feeder conductors to a dwelling unit shall not be required to have an allowable ampacity rating greater than their service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of 215.2, 220.61, and 230.42 are met.

Panel Statement: The panel agrees that the present wording is ambiguous. It is the panel's intent that this allowance apply only to conductors carrying 100% of the dwelling unit's diversified load.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-62 Log #1138 NEC-P06 **Final Action: Reject**
(310.15(B)(6))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add:

"120/208 volt and" ahead of "120/240 volt" in two places.

Substantiation: Edit. Present wording excluded application where the service supply is 120/208 volt 3 phase 4-wire, for example serving an apartment building.

Panel Meeting Action: Reject

Panel Statement: The neutral conductor of a 120/208 volt, 3 wire system does carry significant load. In a 120/240 volt system the load on the neutral conductor is reduced. No substantiation was provided to justify applying the Table to 120/208-volt service conductors.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-63 Log #1174 NEC-P06 **Final Action: Reject**
(310.15(B)(6))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add:

"or 120/208-volt" after "120/240-volt".

Substantiation: Edit. This section should be applicable where dwelling units in apartment buildings are supplied with 120/208-volt systems.

Panel Meeting Action: Reject

Panel Statement: The neutral conductor of a 120/208 volt, 3 wire system does carry significant load. In a 120/240 volt system the load on the neutral conductor is reduced. No substantiation was provided to justify applying the Table to 120/208-volt service conductors.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-64 Log #1341 NEC-P06 **Final Action: Reject**
(Table 310.15(B)(6))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Add reference to table 310.15(B)(6)

(6) 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For individual dwelling units of one family, two-family, and multifamily dwellings conductors as listed in Table 310.15(B)(6), shall be permitted as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to each dwelling unit and are installed in raceway or cable with or without an equipment grounding conductor. For application of this section, the main power feeder shall be the feeder(s) between the main disconnect and the lighting and appliance branch-circuit panelboards(s). The feeder conductors to a dwelling unit shall not be required to have an allowable ampacity rating greater than their service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors <u>and sized in accordance with Table 310.15(B)(6)</u> provided the requirements of 215.2, 220.61, and 230.42 are met.

Substantiation: This section should be re-written to clarify how the grounded conductor is to be sized.

Panel Meeting Action: Reject

Panel Statement: The grounded conductor is sized in accordance with 230.42(C), not Table 310.15(B)(6). 230.42(C) is presently referenced in 310.15(B)(6). The panel assumes that the submitter's proposal relates to 310.15(B)(6) rather than the Table.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-65 Log #1410 NEC-P06 **Final Action: Reject**
(310.15(B)(6))

Submitter: George Stolz, II, Pierce, CO

Recommendation: Revise the text to read as follows:

<u>Conductors shall be permitted to be connected to equipment rated according to Table 310.15(B)(6) under the following conditions:</u>

<u>(a) The supply is a single phase, 120/240 Volt, 3 wire system.</u>

<u>(b) The conductors are installed for one-family, two-family, and multifamily dwellings.</u>

<u>(c) The conductors are service laterals, service entrance conductors, and/or feeders that serve only one individual dwelling unit.</u>

<u>(d) These conductors shall serve as the main power feeder to each dwelling unit.</u>

<u>(e) These conductors shall serve lighting and appliance branch-circuit panelboards.</u>

<u>For the purposes of this section, the main power feeder shall be the feeder(s) between the main disconnect and the panelboard(s). The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of 215.2, 220.61, 230.42 are met.</u>

Substantiation: As the text currently stands, the first sentence of this section is very difficult to read, containing 56 words separated by no less than nine commas. This section is packed with various requirements. It would be much clearer to understand and more readily and accurately applied in a list format. It is very easy to misapply this section as it currently stands.

In addition, given the smaller size of conductors and the general hierarchy of overcurrent protection and conductor installation, the sentence that allows feeders to not be larger than the service conductors is unnecessary. If such an improbable installation were to occur, then it's reasonable to require the conductor ampacities given in subsequent tables to apply.

Panel Meeting Action: Reject
Panel Statement: The proposed text does not require compliance with all the list items and omits some existing requirements (“and are installed in raceway or cable with or without an equipment grounding conductor”). The panel appreciates the submitter’s efforts to improve the readability and clarity of the Section but any revised text must require that the installation comply all of the existing requirements.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-66 Log #1483 NEC-P06 **Final Action: Accept**
(Table 310.15(B)(6))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise Table 310.15(B)(6) so the service or feeder rating is on the left of the table, and the conductor sizes are on the right as displayed here:

	Conductor (AWG or kcmil)	
Service or Feeder Rating (Amperes)	**Copper**	**Aluminum or Copper-Clad Aluminum**
100	4	2
110	3	1
125	2	1/0
150	1	2/0
175	1/0	3/0
200	2/0	4/0
225	3/0	250
250	4/0	300
300	250	350
350	350	500
400	400	600

Substantiation: When using Table 310.15(B)(6), the code user is trying to determine what size of conductor is required for a particular service or feeder. The existing layout of the table is geared for the user who knows the size of conductor and is trying to determine the size of overcurrent device. This is not the way this table is most commonly used. The table should be changed so that it is more user-friendly.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-67 Log #3615 NEC-P06 **Final Action: Reject**
(310.15(B)(6))

Submitter: Joseph A. Hertel, State of Wisconsin
Recommendation: Add an Exception No. 6 to the requirements of NEC 310.15 (B)(6).
Exception No. 6: The derating factors shown in Table 310.15 (B)(2)(a) do not apply to branch cicuits supplying an individual dwelling unit.
Substantiation: The circuit diversity in an individual dwelling unit is very high. The State of Wisconsin has allowed this exception for more than 20 years with no adverse effects. This exception would allow the use of the exception in NEC 312.5(C) for a dwelling without having to additionally derate the conductor ampacity.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide any data to support his proposal and testing data has shown that the submitters substantiation is not accurate. In addition, the section referenced is inappropriate for branch circuits.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
KOMASSA, D.: I believe this proposal should have been accepted. Twenty years of successful experience in the entire state of Wisconsin is indeed adequate technical support to justify this change.

6-68 Log #2557 NEC-P06 **Final Action: Reject**
(Table 310.63)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as “Reject” because less than two-thirds of the members eligible to vote have voted in the affirmative.
Submitter: Bruce McClung, McSquared Electrical Consulting LLC
Recommendation: Revise text/table as follows:
New Title: “Table 310.63 Thickness of Insulation and Jacket for Nonshielded Solid Dielectric Insulated Conductors Rated 2001 to 5000 Volts” and restore contents of Table 310.63 to include all that portion of Table 310.63 under the 2001 - 5000 Volts subheading from the NEC 2002 Edition.
Substantiation: Support continued/revised permitted use of nonshielded multiconductor cables rated 2001-5000 volts listed by a qualified testing laboratory if the cable has an overall metallic sheath or armor as covered under Section 310.7 Direct Burial Conductors. Exception; and support new permitted use of nonshielded multiconductor cables rated 2001-5000 volts listed by a qualified testing laboratory if the cable has an overall metallic sheath or armor as covered under new 310.6 Shielding. Exception:
Panel Meeting Action: Reject
Panel Statement: The panel agreed with the substantiation submitted for the 2005 Code that the use of nonshielded conductors and cables above 2400 volts provides an increased safety hazard for personnel in close proximity to energized nonshielded conductors or cables and should be eliminated.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 7 Negative: 4
Explanation of Negative:
HUDDLESTON, JR., R.: This proposal should have been accepted. See comments on Proposals 6-13 through 6-19.
KOMASSA, D.: See my explanation of negative vote on Proposal 6-19.
MCCLUNG, L.: Starting with Table 310.63 in the existing 2005 NEC make modifications as follows:
1. Change heading to state: “Thickness of insulation in jacket for nonshielded solid dielectric insulated conductors rated 2400V and 5000V.”
2. Change “dry locations, single conductor” column’s title to state: “dry locations single conductor - 2400V.”
3. Change “wet or dry locations” column’s title to state: “wet or dry locations-2400V and 5000V Type AC or Type MC.”
4. Delete the “jacket” column under “single conductors” - “wet or dry locations.”
WETHERELL, A.: See my explanation of negative vote on Proposal 6-13.
Comment on Affirmative:
CLINE, S.: I understand that this is a difficult subject with two widely separated camps. It seems to have overall people-resistant safety on one side and practical risk-management on the other. The danger when there is a failure is high and, in some cases, literally explosive.
As currently worded , I believe that 310.7 applies to the construction requirements for cables, not applications of voltage operation. It says “rated above,“ not “operated above“ as 310.6 does. It appears that 310.6 still limits the operational voltage of non-shielded cables to below 2000 in the general rule, and 2400 volts under the exception’s allowances.
Evidentiary Substantiation of the equivalent safety performance of an overall metallic sheath or armor compared to shielded construction needs to be presented for me to agree to this expansion of applied use.
LAIDLER, W.: See my affirmative comment on Proposal 6-13.
ZIMNOCH, J.: See my explanation of affirmative vote on Proposal 6-13.

6-69 Log #3303 NEC-P06 **Final Action: Accept in Principle**
(Table 310.63)

Submitter: Joe Zimmoch, The Okonite Company
Recommendation: Add the following to:
Table 310.63 Thickness of Insulated Conductors Rated 2400 Volts and Jacket for Nonshielded Solid Dielectric Insultion (as shown below)

[Proposal 6-69 (Log #3303)]

1001-1250	3.56	140	2.92	115	1.65	65	4.32	170	3.56	140	2.29	115
1251-1500	3.56	140	2.92	115	2.03	80	4.32	170	3.56	140	2.29	115
1501-2000	3.56	140	2.92	115	2.03	80	4.32	170	3.94	155	3.56	140

Substantiation: This extends the conductor range to 2000 kcmil for Table 310.63. Other tables such as 310.13, 310.62, and 310.64 list insulation and jacket thickness to 2000 kcmil. Cables rated 2.4 kV (formerly 5 kV) with conductor sizes from 1001 to 2000 kcmil have been manufactured and used for many years but without a UL label because these sizes are not listed in the Code. These thickness are in accordance with ICEA S-96-659 "Standard for Non-Shielded Cables".

Panel Meeting Action: Accept in Principle

Revise the 1st two entries in the next to last column of the Table from "2.29" to "2.92" to corrolate with the last columns values of "115".

Panel Statement: The panel accepts the proposal with the correction of the two conversion errors.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Abstain: 1

Explanation of Abstention:

MCCLUNG, L.: Fails to address 5000V nonshielded cable restoration issue.

6-70 Log #195 NEC-P06 **Final Action: Accept in Principle**
(Table 310.64)

NOTE: The following proposal consists of Comment 6-57 on Proposal 6-50 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-50 was:

Revise Table 310.64 to include 173 Percent Insulation Levels.

Add an additional column with the heading "173 Percent Insulation Level3" after each of the five "133 Percent Insulation Level 2" columns.

The insulation thicknesses to be entered into the new columns is as follows:

	5001-8000 Volts		**8001-15,000 Volts**		**15,001-25,000 Volts**	
	mm	**mils**	**mm**	**mils**	**mm**	**mils**
8	—	—	—	—	—	—
6-4	4.45	175	—	—	—	—
2	4.45	175	6.60	260	—	—
1	4.45	175	6.60	260	10.67	420
1/0-2000	4.45	175	6.60	260	10.67	420

	25,001-28,000 Volts		**28,001-35,000 Volts**	
	mm	**mils**	**mm**	**mils**
8	—	—	—	—
6-4	—	—	—	—
2	—	—	—	—
1	11.30	445	—	—
1/0-2000	11.30	445	14.73	580

Add an additional note to the table as follows:

3 173 Percent Insulation Level. Cables in this category shall be permitted to be applied under the following conditions.

(1) in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation

(2) where the fault clearing time requirements of the 133 percent level category cannot be met

(3) where an orderly shutdown is essential to protect equipment and personnel, and

(4) there is adequate assurance that the faulted section will be de-energized in an orderly shutdown

Also, cables with this insulation thickness shall be permitted to be used in 100 or 133 percent insulation level applications where additional insulation strength is desirable.

Submitter: H. R. Stewart, HRS Consulting

Recommendation: In second column over 2001-5000 volts, add "100 percent insulation".

Substantiation: This appears to have been left off. This corresponds with the revision Note 2 as made in Proposal 6-51. This makes it much clearer that 5KV shielded cables with 90 mils of insulation is a 100 percent insulation level.

Added note: I support the inclusion of the 173 percent insulation level in Table 310.64.

Panel Meeting Action: Accept in Principle

In second column over 2001-5000 volts, add "100 Percent Insulation Level 1 ".

Panel Statement: The addition of "level" provides consistency with the other columns. The addition of the 173% insulation level columns and the other proposed text, as modified, was included in the 2005 Code.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-71 Log #196 NEC-P06 **Final Action: Reject**
(Table 310.64)

NOTE: The following proposal consists of Comment 6-59 on Proposal 6-51 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-51 was:

In Note 2, revise the last sentence as follows:

"Also, they shall be permitted to be used in <u>100 percent insulation level applications</u> where additional insulation strength ~~over the 100 percent level category~~ is desirable."

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Accept the proposal in principle. Reformat the note in a list format similar to that accepted under Proposal 6-50, as follows:

100 Percent Insulation Level. Cables in this category shall be permitted to be installed where (1) or (2) apply:

(1) on grounded systems, where relay protection is arranged to clear ground faults as rapidly as possible and in not less than 1 minute

(2) on ungrounded systems where the faulted section will be completely de-energized as rapidly as possible and in not less than one minute.

FPN: These cables are applicable to the great majority of installations on grounded systems.

133 Percent Insulation Level. Cables in this category shall be permitted to be installed where (1) and (2) or where (3) apply:

(1) where the fault clearing time requirements of the 100 percent level cannot be met

(2) where the faulted section will be de-energized in an orderly shutdown that protects the integrity of the cable.

(3) As a component of and under the requirements governing 100 percent insulation level applications where additional insulation strength is desirable.

FPN: This insulation level corresponds to that formerly designated for ungrounded systems.

Substantiation: This wording uses parallel language to that accepted for the 173 percent category, allowing a consistent presentation. It avoids imprecise language and transfers explanatory information to fine print notes where it belongs.

Panel Meeting Action: Reject

Panel Statement: While the panel agrees that the tabular format is clearer, the current proposal changes the wording and intent without providing any technical substantiation.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

ARTICLE 312 — CABINETS, CUTOUT BOXES, AND METER SOCKET ENCLOSURES

9-8 Log #926 NEC-P09 **Final Action: Accept**
(312.2)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete "or Hazardous (Classified) (Locations)" in the heading and delete (B).

Substantiation: Edit. Section 90.3 indicates Chapter 5 applies and may modify this section. The style manual indicates references should not be made to entire articles.

Panel Meeting Action: Accept

Delete "or Hazardous (Classified) (Locations)" in the heading and delete (B).

Panel Statement: Delete "or Hazardous (Classified) (Locations)" in the heading and delete (B).

CMP-9 intends to delete (B) and only have a paragraph without the (A).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-9 Log #1434 NEC-P09 **Final Action: Reject**
(312.2)

Submitter: Greg Chontow, Hopatcong, NJ

Recommendation: Delete the following text:

~~Above the level of uninsulated live parts.~~

Substantiation: Water damage from accumulation can corrode enclosure which is vital to prevent contact to live parts.

Panel Meeting Action: Reject

Panel Statement: The present text was added in the 2005 Code to address the matter of wiring methods that enter an enclosure in a wet location above live parts. Section 312.10(A) requires metal cabinets and cutout boxes to be protected both inside and outside against corrosion.

NEMA 3R enclosures have been constructed to meet the provisions of this section for many years prior the action in the previous code cycle to put the text in the Code. CMP-9 is unaware of any loss experience associated with undue corrosion on these enclosures that has not been adequately addressed through revisions to the product standards.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-10 Log #1342 NEC-P09 **Final Action: Reject**
(312.4)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Apply this section to all surfaces, change title
312.4 Repairing ~~Plaster and Drywall or Plasterboard~~ Surfaces.
~~Plaster, drywall, or plasterboard~~ Surfaces that are broken or incomplete shall be repaired so there will be no gaps or open spaces greater than 3 mm (1/8 in.) at the edge of the cabinet or cutout box employing a flush-type cover.
Substantiation: The repair of surfaces, in order to provide a complete and workmanlike installation, should not be limited to just plaster, drywall, or plasterboard.
Panel Meeting Action: Reject
Panel Statement: The proposal as written would have electricians troweling plastic wood around the perimeter of flush boxes in wood-paneled walls. This would go beyond the requirements necessary for safety. This rule addresses a condition where building construction is, in effect, used to complete an electrical enclosure, and there are limitations to the extent that that can be considered safe practice. Since the boxes must come all the way to the surface of a combustible wall, the necessity for repair vanishes. If there is an unusual degree of shoddy workmanship, then 110.12 can still be cited.
These problems would also be true for a cement wall installation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-11 Log #3091 NEC-P09 **Final Action: Reject**
(312.5)

Submitter: Joseph A. Hertel, Safety and Buildings
Recommendation: Revise as follows:
Cabinets, cutout boxes, and meter socket enclosures [NEC 312.5]. (1) Cables [NEC 312.5(C)] Substitute the following wording for 312.5(C) Exception (intro):
Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter an enclosure through one or more nonflexible raceways of not less than a fitting and not more than 10 ft in length, provided all of the following conditions are met:
Delete 312.5(C) Exception paragraph (b).
Substitute the following wording for 312.5(C) Exception paragraph (c):
A fitting is provided on each end of the raceway to protect the cable(s) from abrasion.
Substantiation: The required 18 in. length prevents use of this wiring method in many instances. Reducing the length to that of a fitting would not create a hazard. This method is becoming quite common where panels are placed in an exterior location.
(b) A fitting or raceway used in this manner would have the same characteristics if it was attached to the sides or bottom of the enclosure.
(c) The current language requires that the fittings remain accessible after installation. This method is used in multifamily dwellings to bring the branch circuits into a cabinet and the end of the raceway is not accessible after the gypsum wall covering is installed. There is no real need for the accessibility since modifications to the branch circuitry of multifamily dwellings are rarely encountered.
Panel Meeting Action: Reject
Panel Statement: With respect to the three modifications proposed by the submitter, the panel provides the following response:
1)The 18 inch minimum raceway length was chosen as a distance long enough to provide reasonable containment of the enclosed cables without specifying a length so long as to require mandatory derating of the cables. Removal of this length requirement would create the possibility that the enclosure will no longer perform its intended containment function (A95 ROP – 9-66a).
2)The exception was written to allow such installations only at the top of the enclosure as the panel noted this limitation would assure that the outer raceway termination wouldn’t be readily accessible (A98 ROC – 9-44).
3)The current language not only requires the fitting to remain accessible, but also requires that the enclosure be surface-mounted.
Adequate closure of the enclosure is dependent upon adequate closure of the raceway. No fittings are designed and evaluated to close openings around multiple cables as anticipated by the proposal. The lack of suitable fittings presents the possibility that excess dust, debris, rodents or other pests could enter the enclosure and create a potential hazardous condition. The existing requirements are intended to mitigate this concern and the level of safety afforded by those requirements should not be lessened.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-12 Log #1199 NEC-P09 **Final Action: Reject**
(312.5 Exception (New))

Submitter: Lanny G. McMahill, Phoenix, AZ
Recommendation: Add new Exception.
Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter the back of a surface-mounted enclosure through one or more nonflexible raceways not more than 75 mm (3 in.) in diameter, and not less than 75 mm (3 in.) and not more than 600 mm (24 in.) in length, provided all of the following conditions are met:
(a) Each cable is fastened within 200 mm (8 in.), measured along the sheath, of the outer end of the raceway.
(b) The raceway extends directly into an enclosed wall space.
(c) A fitting is provided on each end of the raceway to protect the cable(s) from abrasion.
(d) The raceway is sealed or plugged at the inner end using approved means so as to prevent access to the enclosure through the raceway.
(e) The cable sheath is continuous through the raceway and extends into the enclosure beyond the fitting not less than 50 mm (2 in.).
(f) The raceway is fastened at its outer end in accordance with the applicable article.
(g) The conductor size is maximum 10 AWG.
(h) The raceway shall be permitted to be filled to 60 percent of its total cross-sectional area, and 310.15(B)(2)(a) adjustment factors need not apply to this condition.
Substantiation: This is a standard wiring practice allowed in many jurisdictions for the past 30 years. This is a safe and reasonable wiring practice for surface mounted enclosures. This proposal is intended to modify the practice. The proposed language is intended to mirror the current exception; yet, it incorporates more restrictions and clarification. The current exception allows Type NM cables to enter a raceway in the top of a surface mounted enclosure. This exception allows Type NM cables to enter a raceway in the back of a surface mounted enclosure. Additional restrictions include:
1) The raceway is limited to a maximum 3 inches in diameter, and restricted to between 3 inches and 24 inches in length. The 3 inches in diameter is to restrict the size of the opening in the back of the enclosure. The minimum length is to ensure that the raceway extends into the wall space. The maximum length is to allow for greater depth of wall and additional flexibility in installation.
2) The cable must be fastened within 8 inches of the raceway end. This mirrors the requirement noted in 314.17(C)1 Exception. It also allows for better securing of the cables.
3) The raceway must extend into an enclosed wall space. This is intended to prevent access to the cables and provide a degree of protction from access to the enclosure.
4) The raceway must be sealed or pluged at the inner end to prevent access.
5) The cable sheath must extend at least 2 inches into the enclosure. The current exception only requires 1/4 inch.
6) The conductor size is restricted to 10 AWG. This is to prevent larger cables from entering the opening.
7) The raceway is restricted to 60 percent fill and adjustment factors need not apply.
Panel Meeting Action: Reject
Panel Statement: The use of short fittings as described is a potential hazard, because an arc in the panel may no longer be contained by the enclosure. CMP-9 has discussed this approach repeatedly over many cycles, and does not agree that it should be allowed. The literal text of this proposal would allow a 3 trade size connector anywhere in the back of a panel, even close to the busbars and even if only a handful of small cables pass through it.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-13 Log #2367 NEC-P09 **Final Action: Reject**
(312.5 Exception (New))

Submitter: Thomas Wandrie, Phoenix, AZ
Recommendation: Add a new Exception to Section 312.5
Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter the back of a surface-mounted enclosure through one or more nonflexible raceways not more than 75 mm (3 in.) in diameter, and not less than 75 mm (3 in.) and not more than 600 mm (24 in.) in length, provided all of the following conditions are met:
(a) Each cable is fastened within 200 mm (8 in.), measured along the sheath, of the outer end of the raceway.
(b) The raceway extends directly into an enclosed wall space.
(c) A fitting is provided on each end of the raceway to protect the cable(s) from abrasion.

(d) The raceway is sealed or plugged at the inner end using approved means so as to prevent access to the enclosure through the raceway.

(e) The cable sheath is continuous through the raceway and extends into the enclosure beyond the fitting not less than 50 mm (2 in.).

(f) The raceway, if greater than 305 mm (12 in.), is fastened at its outer end in accordance with the applicable article.

(g) The raceway shall be permitted to be filled to 60 percent of its total cross-sectional area, and 310.15(B)(2)(a) adjustment factors need not apply to this condition.

Substantiation: This is a standard wiring practice allowed in many jurisdictions for the past 30 years. This is a safe and reasonable wiring practice for surface mounted enclosures. This proposal is intended to codify the practice. The proposed language is intended to mirror the current exception; yet, it incorporates more restrictions and clarification. The current exception allows Type NM cables to enter a raceway in the top of a surface mounted enclosure. This exception allows Type NM cables to enter a raceway in the back of a surface mounted enclosure. Additional restrictions include:

1) The raceway is limited to a maximum 3 inches in diameter, and restricted to between 3 inches and 24 inches in length. The 3 inches in diameter is to restrict the size of the opening in the back of the enclosure. The minimum length is to ensure that the raceway extends into the wall space. The maximum length is to allow for greater depth of wall and additional flexibility in installation.

2) The cable must be fastened within 8 inches of the raceway end. This mirrors the requirement noted in Section 314.17(C), Exception. It also allows for better securing of the cables.

3) The raceway must extend into an enclosed wall space. This is intended to prevent access to the cables and provide a degree of protection from access to the enclosure.

4) The raceway must be sealed or plug at the inner end to prevent access.

5) The cable sheath must extend at least 2 inches into the enclosure. The current exception only requires ¼ inch.

6) The raceway is restricted to 60 percent fill and adjustment factors need not apply.

Panel Meeting Action: Reject

Panel Statement: The use of short fittings as described is a potential hazard, because an arc in the panel may no longer be contained by the enclosure. CMP-9 has discussed this approach repeatedly over many cycles, and does not agree that it should be allowed. The literal text of this proposal would allow a 3 trade size connector anywhere in the back of a panel, even close to the busbars and even if only a handful of small cables pass through it.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-14 Log #2417 NEC-P09 **Final Action: Reject**

(312.5(C)(b))

Submitter: Dan Frohberg, Northeast Community College

Recommendation: Revise text to read as follows:

The raceway may extend directly above or below the enclosure and penetrate to the attic or crawl space for the purpose of adding circuits at a later time.

Substantiation: We need to build in expansion or growth in our installations. A conduit that extends into an attic space or crawl space would facilitate adding circuits later after the initial project was finished. Raceways would need to be sealed at those levels yet to prevent air flow and fire. We are seeing Habitat housing built slab on grade with no way to add circuiting at a later date. These projects are built to minimum specs with donated funds.

Panel Meeting Action: Reject

Panel Statement: The concept of extending a raceway into an accessible location is good design but does not address a safety issue. See 90.1(B) and 90.8(A). The use of an empty conventional raceway terminating in a box is always permitted and where used, can be of any length. This provision is limited to cable sleeves, which are a special case.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-15 Log #608 NEC-P09 **Final Action: Reject**

(312.5(C) Exception (New))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read:

(C) Cables. Where cable is used, each cable shall be secured to the cabinet, cutout box, or meter socket enclosure.

Exception No. 1: Fittings listed for securing multiple cables to cabinets, cutout boxes, or meter socket enclosures while maintaining the integrity of the electrical enclosure shall be permitted.

Exception No. 2 : Cables with entirely nonmetallic sheaths shall be permitted to enter the top of a surface-mounted enclosure through one or more nonflexible raceways not less than 450 mm (18 in.) and not more than 3.0 m (10 ft) in length, provided all of the following conditions are met:

(a) Each cable is fastened within 300 mm (12 in.) measured along the sheath, of the outer end of the raceway.

(b) The raceway extends directly above the enclosure and does not penetrate a structural ceiling.

(c) A fitting is provided on each end of the raceway to protect the cable(s) from abrasion and the fittings remain accessible after installation.

(d) The raceway is sealed or plugged at the outer end using approved means so as to prevent access to the enclosure through the raceway.

(e) The cable sheath is continuous through the raceway and extends into the enclosure beyond the fitting not less than 6 mm (1/4 in.).

(f) The raceway is fastened at its outer end and at other points in accordance with the applicable article.

(g) Where installed as conduit or tubing, the allowable cable fill does not exceed that permitted for complete conduit or tubing systems by Table 1 of Chapter 9 of this Code and all applicable notes thereto.

FPN: See Table 1 in Chapter 9, including Note 9, for allowable cable fill in circular raceways. See 310.15(B)(2)(a) for required ampacity reductions for multiple cables installed in a common raceway.

Substantiation: Issues have been raised about common installation practices for nonmetallic sheathed cables that are not recognized by any Code rule as acceptable. These practices have to do with the method of securing each cable to the enclosure as required in the general requirement of this section. The identified practices that are currently not permitted by the NEC involve attaching a PVC male adaptor or other chase nipple or bushing to the enclosure and routing multiple cables through that opening. The integrity of the electrical enclosure in this type of installation is compromised.

This proposed new Exception No. 1 provides an alternative method that could be recognized by an exception to this requirement as long as the fitting used for this type of installation was evaluated and listed for this use. Otherwise this method is not permitted by the NEC. It appears that there are currently some fittings (two-screw, clamp-type) that are available and have been recognized for attachment of more than one cable to the enclosure. However, these fittings have a pretty restrictive limitation on the number and sizes of cables permitted to be installed when using the fitting to attach more than one cable to the enclosure. Adding this new exception will provide users with an alternative recognized by the NEC for such installations and also provide enforcement officials with more language in this section to clarify what is required and what is not permitted regarding these types of installations. It also would allow manufacturers the ability to develop a fitting for this use that can be listed and evaluated for multiple cable attachment to enclosures while still maintaining the integrity of the electrical enclosure. Openings in electrical enclosures are required to be effectively closed (110.12). This common practice that is not recognized by Code rules as acceptable appears to be a regional issue primarily found used in the south and southwestern part of the country but may even be a more widespread problem.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The base rule requires each cable to be secured to an enclosure. If a fitting were developed that accomplished this for multiple cables passing through a single opening, then such a fitting could be used under the existing wording without requiring a new exception. The proposal is not necessary.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-16 Log #2250 NEC-P09 **Final Action: Reject**

(312.5(C) Exception)

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona

Recommendation: Revise as follows:

Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter the top, back or side of a surface mounted enclosure through one or more nonflexible raceways or fittings not ~~less than 450 mm (18 in.) or~~ more than 3.0 m (10 ft) in length, provided all of the following conditions are met:

(a) Each cable is fastened within ~~300~~ 200 mm (~~12~~ 8 in.) measured along the sheath of the outer end of the raceway.

(b) The raceway or fitting extends into a wall or ceiling space directly above or behind the enclosure and does not penetrate a structural ceiling.

(c) A fitting is provided on each end of the raceway to protect the cable(s) from abrasion when a raceway is used ~~and the fittings remain accessible after installation.~~

(d) The raceway or fitting is sealed or plugged at the outer end using approved means so as to prevent access to the enclosure through the raceway.

(e) The cable sheath is continuous through the raceway or fitting and extends into the enclosure beyond the fitting not less than 6 mm (1/4 in.)

(f) The raceway or fitting is fastened at its outer end and at other points in accordance with the applicable article.

(g) Where installed as conduit or tubing, the allowable cable fill does not exceed that permitted for complete conduit or tubing systems by Table 1 of Chapter 9 of this code and all applicable notes thereto.

Substantiation: This will allow a code compliant installation that has been allowed for an unknown amount of time. This installation is currently a code violation however the Phoenix and Tucson Metro areas have amended the NEC to locally allow this installation. I have provided a draft of the resolution allowing this installation, and the amended text.

DRAFT

WHEREAS The Maricopa Association of Governments Building Codes Committee (heretofore referred to as the "Committee") approved the amendments to the 2002 edition of the National Electrical Code (heretofore referred to as the "NEC") with the intent to promote and present a uniform set of electrical codes and amendments for jurisdictions within Maricopa County AND;

WHEREAS Sections 312.5, and 314.17 of the 2002 NEC (E3807.7 and E3806.1.1 of the 2003 International Residential Code), that addresses cables and conductors entering cabinets, cutout boxes and meter socket enclosures, requires the closure of openings through which cables enter a cabinet, cutout box or meter socket enclosures, and further requires that nonmetallic cables be permitted to only enter the top of a surface mounted enclosure if not secured to the cabinet, cutout box or meter socket enclosure and that the nonmetallic cable be protected at points of entry into a cabinet, cutout box, or meter socket enclosure from damage and abrasion, AND;

WHEREAS electricians in Maricopa County and elsewhere in the state and nation have been installing the above referenced meter socket enclosures commonly referred to as "all-in-ones" for decades in tens of thousands of homes in a manner consistent with the methods described in Exhibit "A" with no documented record of fires or life safety hazards attributable to this practice AND;

WHEREAS the Association of Governments Building Codes Committee resolved to enforce these provisions of the Code as written and adopted unless a viable and approved alternative method was presented and approved prior to December 1, 2005 AND;

WHEREAS the Maricopa Association of Governments Building Codes Committee, the MAG/RPR Building Inspectors/Plan Review Forum, the Arizona Building Officials Code Development and Review Committee, the Southern Arizona Chapter of the International Code Council, and the Grand Canyon Chapter of the International Code Council have all worked together to develop an alternate method to validate the practice as meeting the intent of the Code AND;

WHEREAS the alternate method as described in Exhibit "A" was approved by the Development Advisory board Technical Subcommittee of the City of Phoenix and addresses the major areas of concern as identified by the previous referenced organizations.

BE IT SO RESOLVED by the Committee that the alternate method described in Exhibit "A": meets the intent of the NEC and is acceptable to the Committee for use in MAG jurisdictions and that the method of enforcement whether by adopted ordinance or written policy be the decision of the local jurisdiction.

Reference the 2002 National Electrical Code and replace the first paragraph with the flowing (the remainder of Section 312.5 to remain the same)

312.5 Cabinets, Cutout Boxes, and Meter Socket Enclosures. Conductors entering enclosures within the scope of this article shall be protected from abrasion and shall comply with 312.5(A) through (C).

Exception: For one- and two-family dwellings, cables with entirely nonmetallic sheaths shall be permitted to enter the back of a surface-mounted enclosure through one or more nonflexible raceways not more than 75 mm (3 in.) in diameter, and not less than 75 mm (3 in.) and not more than 600 mm (24 in.) in length, provided all of the following conditions are met:

a. Each cable is fastened within 200 mm (8 in.) measured along the sheath of the outer end of the raceway.

b. The raceway extends directly into an enclosed wall space.

c. A fitting is provided on each end of the raceway to protect the cable(s) from abrasion.

d. The raceway is sealed or plugged using approved means so as to prevent access to the enclosure through the raceway.

e. The cable sheath is continuous through the raceway and extends into the enclosure beyond the fitting not less than 50 mm (2 in.)

f. The raceway, if greater than 305 mm (12 in.) is fastened at its outer end in accordance with the applicable article.

g. The raceway shall be permitted to be filled to 60 percent of its total cross sectional area, and 310.15(B)(2)(a) adjustment factors need not apply to this condition.

Panel Meeting Action: Reject

Panel Statement: The installation procedure described in the proposal is one that CMP-9 voted to prohibit during previous code making cycles (1993, 1996, 1999, and 2005). Connectors or fittings as presented in the proposal are not designed for this purpose. A connector, bushing or other fitting without a length of raceway creates the possibility that the enclosure will no longer perform its intended containment function.

See panel actions and statements on Proposals 9-11, 9-12 and 9-15.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-17 Log #2489 NEC-P09 **Final Action: Reject**
(312.11(A)(2))

Submitter: Sukanta Sengupta, North Brunswick, NJ

Recommendation: 312.11(A)(2) Doors. Exception

Substantiation: For shock protection, the Prohibited Approach Boundary for 301V to 750V is 25.4 mm (0 ft 1 in.). NFPA 70E Table 130.2(C).

Distance between a door and any live metal part should be more than the Prohibited Approach Boundary recommended in NFPA 70E.

Panel Meeting Action: Reject

Panel Statement: The long accepted practice of supplementing air space with an insulation material provides safe installations and continues to be acceptable.

Section 312.11(A)(2) is not germane to the Prohibited Approach Boundary of NFPA 70E.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

ARTICLE 314 — OUTLET, DEVICE, PULL, AND JUNCTION BOXES, CONDUIT BODIES; FITTINGS; AND MANHOLES

9-18 Log #1538 NEC-P09 **Final Action: Accept in Principle in Part**
(314, 404, 408, 450, and 490)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Revise Articles 314, 404, 408, 450, and 490 as described in the following, relative to the terms bonding and grounding.

314.4 Revise 314.4 as follows:

Metal Boxes. Unless otherwise permitted or required in Article 250, all metal boxes shall be connected to an equipment grounding conductor ~~grounded~~ in accordance with the provisions of Part VI of Article 250.

314.30(D) Revise 314.30(D) as follows:

Covers. (Last sentence) Metal covers and other exposed conductive surfaces shall be connected to an equipment grounding conductor ~~bonded~~ in accordance with Part VI of Article 250. ~~250.96(A).~~

404.9(B) Revise 404.9(B) as follows:

(B) Grounding. Snap switches, including dimmer and similar control switches, shall be connected to an equipment grounding conductor ~~effectively grounded~~ and shall provide a means to connect ~~ground~~ metal faceplates to a metal yoke , whether or not a metal faceplate is installed. Snap switches shall be considered as providing an effective ground fault current path ~~effectively grounded~~ if either of the following conditions is met.

(1) The switch is mounted with metal screws to a metal box that is connected to an equipment grounding conductor or to a nonmetallic box with integral means for connecting to an equipment grounding conductor ~~grounding devices~~ . (2) An equipment grounding conductor or equipment bonding jumper is connected to an equipment grounding termination of the snap switch.

Exception to (B): Where no ~~grounding~~ means exists within the snap-switch enclosure for connecting to the equipment grounding conductor or where the wiring method does not include or provide an equipment ground ing conductor , a snap switch without a ~~grounding~~ connection to an equipment grounding conductor shall be permitted for replacement purposes only. A snap switch wired under the provisions of this exception and located within reach of earth, grade conducting floors, or other conducting surfaces shall be provided with a faceplate of nonconducting, noncombustible material or shall be protected by a ground fault circuit interrupter.

404.12 Revise 404.12 as follows:

Grounding of Enclosures. Metal enclosures for switches or circuit breakers shall be connected to an equipment grounding conductor ~~grounded~~ as specified in Part IV of Article 250. Metal enclosures for switches or circuit breakers used as service equipment shall comply with the provisions of Part V of Article 250. Where nonmetallic enclosures are used with metal raceways or metal-armored cables, provision shall be made for connecting the equipment grounding conductor(s) ~~grounding continuity~~ .

Except as covered in 404.9(B), Exception, nonmetallic boxes for switches shall be installed with a wiring method that provides or includes an equipment grounding conductor ~~ground~~ .

408.3(D) Revise 408.3(D) as follows:

(D) Terminals. In switchboards and panelboards, load terminals for field wiring, including grounded circuit conductor load terminals and connections to the equipment-grounding-conductor ~~ground~~ bus for load equipment grounding conductors, shall be located so that it is not necessary to reach across or beyond an uninsulated ungrounded line bus in order to make connections.

408.40 Revise 408.40 as follows:

Grounding of Panelboards. Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be connected to an equipment grounding conductor ~~grounded~~ . Where the panelboard is used with nonmetallic raceway or cable or where separate equipment grounding conductors are provided, a terminal bar for the equipment grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the cabinet and panelboard frame, if of metal; otherwise it shall be connected to the equipment grounding conductor that is run with the conductors feeding the panelboard.

Exception: Where an isolated equipment grounding conductor is provided as permitted by 250.146(D), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar.

Equipment g rounding conductors shall not be connected to a terminal bar provided for grounded conductors (may be a neutral) unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Article 250.

450.5(B) and (C) Revise 450.5(B) and (C) as follows:

Ground Reference for Fault Protection Devices. A n ~~grounding~~ autotransformer used to make available a specified magnitude of ground-fault current for operation of a ground- fault responsive protective device on a 3-phase, 3-wire ungrounded system shall conform to 450.5(B)(1) and (2).

(1) Rating. The autotransformer shall have a continuous neutral-current rating sufficient for the specified ground-fault current.

(2) Overcurrent Protection. An overcurrent protective device of adequate short-circuit rating that will open simultaneously all ungrounded conductors when it operates shall be applied in the ~~grounding~~ autotransformer branch circuit and shall be rated or set at a current not exceeding 125 percent of the autotransformer continuous per-phase current rating or 42 percent of the continuous-current rating of any series connected devices in the autotransformer neutral connection. Delayed tripping for temporary overcurrents to permit the proper operation of ground- fault responsive tripping devices on the main system shall be permitted but shall not exceed values that would be more than the short-time current rating of the ~~grounding~~ autotransformer or any series connected devices in the neutral connection thereto.

(C) Ground Reference for Damping Transitory Overvoltages. A n ~~grounding~~ autotransformer used to limit transitory overvoltages shall be of suitable rating and connected in accordance with 450.5(A)(1).

490.21(B)(1) Revise 490.21(B)(1) as follows:

(B) Power Fuses and Fuseholders.

(1) Use. Where fuses are used to protect conductors and equipment, a fuse shall be placed in each ungrounded conductor. Two power fuses shall be permitted to be used in parallel to protect the same load if both fuses have identical ratings and both fuses are installed in an identified common mounting with electrical connections that will divide the current equally. Power fuses of the vented type shall not be used indoors, underground ~~under ground~~ , or in metal enclosures unless identified for the use.

490.36 Revise 490.36 as follows:

Grounding. Frames of switchgear and control assemblies shall be connected to an equipment grounding conductor or, where permitted, the grounded conductor ~~grounded~~ .

490.37 Revise 490.37 as follows:

Grounding of Devices. The ~~Devices with~~ metal cases or frames, or both, such as instruments, relays, meters, and instrument and control transformers, located in or on switchgear or control, shall be connected to an equipment grounding conductor ~~have the frame or case grounded~~ .

490.55 Revise 490.55 as follows:

Power Cable Connections to Mobile Machines. A metallic enclosure shall be provided on the mobile machine for enclosing the terminals of the power cable. The enclosure shall include terminal bar connections to the machine frame ~~provisions for a solid connection~~ for the equipment grounding conductor ~~ground wire(s) terminal to effectively ground the machine frame~~ . Ungrounded conductors shall be attached to insulators or be terminated in approved high-voltage cable couplers (which include equipment grounding conductor ~~ground wire~~ connectors) of proper voltage and ampere rating. The method of cable termination used shall prevent any strain or pull on the cable from stressing the electrical connections. The enclosure shall have provision for locking so only authorized and qualified persons may open it and shall be marked

DANGER — HIGH VOLTAGE — KEEP OUT.

490.72 Revise 490.72 as follows:

(D) Ground Current Detection. Means shall be provided for detection of the sum of the neutral and equipment grounding conductor ~~ground~~ currents and shall trip the circuit-interrupting device if the sum of those currents exceeds the greater of 5 amperes or 7½ percent of the boiler full-load current for 10 seconds or exceeds an instantaneous value of 25 percent of the boiler full-load current.

490.74 Revise 490.74 as follows:

Grounding. All exposed non–current-carrying metal parts of the boiler and associated exposed metal ~~grounded~~ structures or equipment shall be bonded to the pressure vessel or to the neutral conductor to which the vessel is connected in accordance with 250.102, except the ampacity of the bonding jumper shall not be less than the ampacity of the neutral conductor.

Substantiation: 314.4: Changes are proposed to correct the terms to the definition proposed for Article 100. The proposed changes also are intended to make the requirements more prescriptive in nature. The proposal recognizes that in some cases, boxes are permitted to be grounded by connection the grounded service conductor.

314.30(D): The proposed changes are intended to make the requirements more prescriptive in nature.

404.9(B): Changes are proposed to correct the terms to the definitions proposed for Article 100 and to the terms defined in 250.2. The proposed changes also are intended to make the requirements more prescriptive in nature.

404.12: The proposed changes are intended to make the requirements more prescriptive in nature and to include a reference to where the requirements are found in Article 250.

408.3(D): The proposal intends to use a defined term for the bus used to connect equipment grounding conductors.

408.40: Changes are proposed to use terms as defined in Article 100. The proposed changes also are intended to make the requirements more prescriptive in nature.

450.50(B) and (C): The word "grounding" is proposed to be deleted as in essence these are not "grounding autotransformers" but are autotransformers that are used for the purpose indicated. Other changes are editorial in nature.

490.21(B)(1): Editorial revision.

490.36: The proposed changes are intended to make the requirements more prescriptive in nature and to comply with the defined terms.

490.37: The changes proposed are for clarity as well as to be more prescriptive in nature.

490.55: Changes are proposed to use terms as defined in Article 100. The proposed changes also are intended to make the requirements more prescriptive in nature.

490.72: Changes are proposed to use terms as defined in Article 100. The proposed changes also are intended to make the requirements more prescriptive in nature.

490.74: Changes are proposed to use terms as defined in Article 100. The proposed changes also are intended to make the requirements more prescriptive in nature.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

For clarity, CMP-9 numbered the statement items to correspond with the action items.

1. Accept in principle the revision of 314.4. Revise the opening clause to read as follows:" Except as permitted in 250.112(I)... ". Accept the remainder of 314.4 as proposed.
2. Reject the revision of 314.30(D)
3. Accept in principle the revision to 404.9(B); accept the wording of all changes except those to the first two sentences, which are revised as follows instead of that in the proposal:

Snap switches, including dimmer and similar control switches, shall be connected to an equipment grounding conductor ~~effectively grounded~~ and shall provide a means to connnect ~~ground~~ metal faceplates to the equipment grounding conductor whether or not a metal faceplate is installed. Snap switches shall be considered ~~effectively grounded~~ to be part of an effective ground-fault current path if either of the following conditions is met:

4. Accept the revision of 404.12.
5. Accept the revision to 408.3(D).
6. Accept the revision to 408.40.
7. Reject the changes to 450.5(B) and (C).
8. Accept the changes to 490.21(B)(1).
9. Accept the changes to 490.36
10. Accept the changes to 490.37 in principle. Add the phrase ", or, where permitted, the grounded conductor" at the end.
11. Accept the changes to 490.55 in principle. Delete the word "bar" after the word "terminal".
12. Accept in principle the change to 490.72(D) as follows:... the neutral conductor and equipment grounding conductor ~~ground~~ currents...
13. Accept the changes to 490.74.

Panel Statement: CMP-9 addressed the concerns of the Technical Correlating Committee.

For clarity, CMP-9 numbered the statement items to correspond with the action items.

1. The revision incorporates the concept of Proposal 9-21. CMP-9 continues to believe that the reference to 250.112(I) is correct and adequately inclusive for the intent of this action.
2. Handhole enclosure covers may be used to enclose a portion of a service lateral, and as such, Part IV of Article 250 would not apply. The bonding language in the existing code is appropriate.
3. There have been fairly recently, and may be again, listed snap switches with nonmetallic yokes that included ground-screw equipped brass inserts to

receive the faceplate screws. The literal text of the proposal would make these designs noncompliant for no observable reason. The second sentence is revised because a switch cannot be a ground-fault current path, it can only be a small part of the entire grounding circuit.

7. In this case the word "grounding" is simply a useful adjective that calls out the fact that these transformers have a different function than autotransformers generally. The panel considered substituting the appellation "ground-reference" and decided that it would be only change for the sake of change. The terminology does not need to change, and there is no evidence that the usage in this section has ever confused anyone.

10. Here again this equipment, especially under medium voltage applications, may be connected to a grounded circuit conductor.

11. This equipment is often provided with a single grounding terminal.

12. CMP-9 added the word "conductor" to correlate with Proposal 9-163.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:

HARTWELL, F.: Note that item 3 of the panel action on this proposal was subsequently modified by the action on Proposal 9-93. As clearly stated in the panel action text on that proposal, the action thereon modifies the wording in 404.9(B)(1) accepted in this action.

9-19 Log #2486 NEC-P09 **Final Action: Reject**
(314.3)

Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise text to read as follows:

314.3 Nonmetallic Boxes. Nonmetallic boxes shall be permitted with the following wiring methods.

Open wiring on insulators
Concealed knob-and-tube wiring
Cabled wiring methods with entirely nonmetallic sheaths
Flexible cords
Nonmetallic raceways
Metal raceways or metal-armored cables in nonmetallic boxes with internal bonding means between all entries
Metal raceways or metal-armored cables in listed nonmetallic boxes with integral bonding means and provisions for attaching equipment bonding jumpers between all threaded entries

Substantiation: Wiring practice utilizing metallic raceways or metal-armored cable and nonmetallic boxes are very common. Code should recognize this practice as a standard one and not an exception.
Panel Meeting Action: Reject
Panel Statement: CMP-9 concludes that such applications are comparatively unusual and deserving of coverage in an exception that carefully sets out the conditions, instead of being folded into the main rule.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-20 Log #2490 NEC-P09 **Final Action: Reject**
(314.3)

Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: None Provided.
Substantiation: Wiring practice utilizing metallic raceways or metal-armored cable and nonmetallic boxes are very common. Code should recognize this practice as standard one and not an exception.
Panel Meeting Action: Reject
Panel Statement: CMP-9 notes that this proposal contains no recommendation and therefore does not conform to the Regulations Governing Committee Projects. However, an inference can be made as to the intent based on Proposal 9-19, and CMP-9 rejects this proposal for the same reason.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-21 Log #197 NEC-P09 **Final Action: Accept in Principle**
(314.4)

NOTE: The following proposal consists of Comment 9-38 on Proposal 9-21 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 9-21 was:

Revise as follows:

All metal boxes shall be grounded ~~in accordance with the provisions of Article 250.~~

The Technical Correlating Committee directs that Proposal 9-21 and Comment 9-38 be reported as "Hold". The Technical Correlating Committee has concerns that the reference to the 250.112(i) requirement may not adequately address all of the relevant Article 250 grounding issues.

Submitter: Noel Williams, Herriman, UT
Recommendation: This proposal should have been rejected or accepted in principal by deleting the entire section.
Substantiation: Article 250 does not require all metal boxes to be grounded. In particular, metal boxes used for Class 2, Class 3, Power-limited fire alarm, and boxes used for communications are usually not required to be grounded (See 250.112(I)). This proposal would override those rules and require grounding even where there is no shock hazard and there is no grounding means available in the wiring method. Since the apparent intent of the proposal is to comply with the NEC Style Manual, the entire section should be deleted as nothing is added by this section that is not covered by Article 250. Otherwise, the specific applicable sections would have to be listed and this would be unnecessarily cumbersome.
Panel Meeting Action: Accept in Principle
Panel Statement: See action and statement in Proposal 9-18, item 1
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-22 Log #941 NEC-P09 **Final Action: Accept in Principle**
(314.4)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:

METAL BOXES and CONDUIT BODIES . All metal boxes conduit bodies, and fittings shall be grounded ~~in accordance with the provisions of Article 250~~ except as otherwise permitted or required elsewhere in this code.

Substantiation: Edit. Reference should not be made to an entire article. Since Article 250 already applies. The latter part of the proposal may alert code users to other parts which may modify this section such as 668.30(B), 668.32(B(3) and 675.12, Exception.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel has addressed the concerns in this proposal through its action on Proposal 9-18, item 1.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-23 Log #1098 NEC-P09 **Final Action: Reject**
(314.15(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Insert "exposed" before "boxes" in two places.
Substantiation: Edit. "Exposed" indicates on or attached to the surface per Article 100. Recessed (flush) boxes in a wet location with a weatherproof cover appears to comply with 404.4and 406.8 and "weatherproof" as defined in Article 100.
Panel Meeting Action: Reject
Panel Statement: A "wet location" is one that is "…in unprotected locations exposed to the weather". Recessed boxes with weatherproof covers are in locations protected by the building structure and the weatherproof cover.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-24 Log #942 NEC-P09 **Final Action: Accept in Principle**
(314.15(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:

Installations in hazardous (classified) locations shall conform to applicable provisions of other articles in this code. ~~Article 500 through 517~~ .

Alternatively, delete this section.

Substantiation: Edit. To comply with Style Manual requirements. Already covered by 90.3.
Panel Meeting Action: Accept in Principle

Delete 314.15(B).
314.15(A) becomes 314.15.

Panel Statement: The panel action addresses the submitter's concerns and is consistent with the action and statement on Proposal 9-8.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-25 Log #2730 NEC-P09 **Final Action: Reject**
(314.16)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for information.
Submitter: Doug Boggus, City of Grand Prairie
Recommendation: Add additional text and Fine Print Note as follows:

314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies. Boxes and conduit bodies shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box, as calculated in 314.16(A), be less than the fill calculation as calculated in 314.16(B). The minimum volume for conduit bodies shall be calculated in 314.16(C).

The provisions of this section shall not apply to terminal housing supplied with motors, and boxes or wiring compartments for appliances .

FPN No. 1 : For volume requirements of motor terminal housings, see 430.12.

FPN No. 2: For volume requirements for appliance terminal connections, see 422.19.

Boxes and conduit bodies enclosing conductors 4 AWG or larger shall also comply with the provision of 314.28.

Substantiation: This is a companion proposal to a proposal to add requirements to Article 422 (proposed Section 422.19) for specific requirements for boxes and wiring compartments utilized in the connection of appliances to a power supply. The added wording and FPN No. 2 are needed to correlate the proposed requirement to Article 422 with the requirements of 314.16(A). The proposal for inclusion into Article 422 is as follows:

422.19 Boxes and Wiring Compartments for Appliances. Boxes or wiring compartments used for a point of junction to an electrical power source, whether separate or furnished as a part of the appliance, shall comply with (1) through (5) where applicable:

(1) Where wire leads are provided by an appliance manufacturer for connection to an electrical power source, at least 150 mm (6 in.) of free conductor, measured from the wall of the box or wiring compartment opposite where the conductors emerge for termination to an electrical power source, shall be provided for splices to either a permanent wiring method or a cord connection.

(2) For either permanent wiring methods or cord connections used to supply the appliance, at least 150 mm (6 in.) of free conductor, measured from the point in the box or wiring compartment where the conductors emerges from its raceway or cable sheath shall be left for splices or for connection to terminals provided as a part of the appliance.

(3) Where the provided opening in a box or wiring compartment is less than 200 mm (8 in.) in any dimension and where wire leads are provided by the appliance manufacturer for connection to an electrical power source, each conductor shall be long enough to extend at least 75 mm (3 in.) outside the opening.

(4) Boxes and wiring compartments shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box or wiring compartment be less than the fill calculation as calculated in Table 422.19(A). Volumes of standard boxes that are not marked with their volume shall be as given in Table 314.16(A). Other boxes shall be durably and legibly marked with their volume by the box manufacturer, and appliance wiring compartments shall be durably and legibly marked with their volume by the appliance manufacturer.

(5) Conductors shall not be deflected within a box or wiring compartment unless a minimum wire-bending space per Table 422.19(B) is provided.

Table 422.19(A) Volume Allowance Required per Conductor

Size of Conductor (AWG)	mm²	Free Space Within Box for Each Conductor cm³	in.³
14 or smaller	2.1	32.8	2.00
12	3.3	36.9	2.25
10	5.3	41.0	2.50
8	8.4	49.2	3.00
6	13.3	81.9	5.00

Table 422.19(B) Minimum Wire-Bending Space within Box or Wiring Compartment

Size of Conductor (AWG)	Wire Bending Space mm	in.
14-10	Not Specified	
8-6	38.1	1 1/2
4-3	50.8	2
2	63.5	2 1/2
1	76.2	3

Panel Meeting Action: Reject

Panel Statement: CMP-9 will revisit this proposal in the event that CMP-17 takes favorable action on the companion Proposal, 17-21.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-26 Log #2923 NEC-P09 **Final Action: Accept**
(314.16)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 13 for information.

Submitter: Peter D. Noval, Jr., Philadelphia, PA

Recommendation: Revise text to read as follows:

314.16 Number of conductors in outlet, device, and junction boxes, and conduit bodies. Boxes and conduit bodies, shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box, as calculated in 314.16(A), be less than the fill calculation as calculated in 314.16(B).

The minimum volume for conduit bodies shall be as calculated in 314.16(C).

The provisions of this section shall not apply to terminal housings supplied with motors or generators .

FPN: For volume requirements of motor ~~terminal housings~~ or generator terminal housings , see 430.12.

Substantiation: As presently written, this section is not consistent with the requirements of 445.17, which refers to Section 430.12 for generator terminal housing volume requirements.

The revisions to text adding generator terminal housings serve to clarify the intent of the code, facilitating design, installation, and inspection of such housings.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-27 Log #2135 NEC-P09 **Final Action: Accept in Principle**
(Table 314.16(A))

Submitter: Russell LeBlanc, Peterson School of Engineering

Recommendation: In top portion of table add:

AWG after each wire size:

18 (AWG) 16 (AWG) 14 (AWG) 12 (AWG) 10 (AWG) 8 (AWG) 6 (AWG)

Substantiation: The heading for that portion of the table says “maximum number of conductors” so when you read the next line it seems that those numbers are amounts, and not wire sizes.

Panel Meeting Action: Accept in Principle

Instead of the proposal recommendation, change the table heading by adding a second line, centered under the first line that will remain “Maximum Number of Conductors”, as follows: “(arranged by AWG size)”

Panel Statement: CMP-9 agrees with the submitter, but prefers not to repeat the term “AWG” seven times.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-28 Log #588 NEC-P09 **Final Action: Reject**
(Table 314.16(A) Note)

Submitter: Larry T. Smith, National Electrical Seminars

Recommendation: Revise text to read as follows:

*Where no volume allowances are required by 314.16(B)(2) through (B) ~~(5)~~ (4) .

Substantiation: Table 314.16(A) applies to metal boxes that are being used as pull or junction boxes. As the note at the bottom of Table 314.16(A) indicates, the rules of Box Fill Calculations in 314.16(B) apply whenever the box contains any of the items listed in 314.16(B)(2) through (B)(5) - (B)(5) is Equipment Grounding Conductor Fill.

If a 120-volt circuit with two-12 AWG conductors, without a separate equipment grounding conductor, is being pulled through a 4-in. square metal box, Table 314.16(A) applies - total number of conductors is two.

If a three-phase multi-wire circuit with four-12 AWG conductors, without a separate equipment grounding conductor, is being pulled through a 4-in. square metal box, Table 314.16(A) applies - total number of conductors is four.

But, if a 120-volt circuit with three-12 AWG conductors, including a separate equipment grounding conductor, is being pulled through a 4-in. square metal box, 314.16(B) applies - total number of conductors is three.

It doesn’t make much sense; especially since 250.148 permits equipment grounding conductors to be pulled through metal boxes without being attached to the box as long as they aren’t spliced. The inclusion of an equipment grounding conductor shouldn’t automatically require the use of 314.16(B) to calculate box fill.

Panel Meeting Action: Reject

Panel Statement: The presence of the equipment grounding conductor, terminated or not in the box, occupies a portion of the box volume. The allowance calculation accounts for the reduction in box volume.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-29 Log #2488 NEC-P09 **Final Action: Accept in Part**
(314.16(B)(1))

Submitter: Sukanta Sengupta, North Brunswick, NJ
Recommendation: Revise text to read as follows:
314.16(B)(1) Conductor Fill. Each conductor that originates outside the box and terminates or spliced within the box shall be counted once, and each conductor that passes through the box without splice or termination shall be counted once. Each loop or coil ~~A looped,~~ of unbroken conductor ~~not less than twice the minimum length~~ required for free conductor in 300.14 shall be counted twice. The conductor fill shall be calculated using Table 314.16(B). A conductor, no part of which leaves the box, shall ~~not~~ be counted once .
Substantiation: Second sentence:
Loop or coil occupies space. Present code dictates that the space taken by a conductor in the form of “a single loop” or “a coil” or “multiple loops” is the same. It does not follow rules of simple solid geometry.
Last sentence:
A conductor, no part of which leaves a box, still occupies space.
Present code calculation does not recognize these facts. For a box with electronic items, where free space is essential for heat dissipation, this calculation may be critical.
Panel Meeting Action: Accept in Part
Revise proposed text to read as follows:
314.16(B)(1) Conductor Fill. Each conductor that originates outside the box and terminates or spliced within the box shall be counted once, and each conductor that passes through the box without splice or termination shall be counted once. Each loop or coil of unbroken conductor not less than twice the minimum length required for free conductor in 300.14 shall be counted twice. The conductor fill shall be calculated using Table 314.16(B). A conductor, no part of which leaves the box, shall not be counted.
Panel Statement: CMP-9 accepts the addition of the substitution of the text “Each loop or coil” for “A loop” since it clarifies the need to account for all loops in the box. The Panel rejects the elimination of the length requirement used to define amount of unbroken conductor for a double deduction. Without a definition, the point at which a double deduction is required would by subjective. The Panel also rejects the change in the allowance requirement for conductors that do not leave the box. The submitter did not provide technical substantiation to support a change.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-30 Log #1469 NEC-P09 **Final Action: Reject**
(314.16(B)(1) Exception)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term “fixture wires” to “luminaire wires” in 314.16(B)(1) exception.
Substantiation: With the changing of the term “fixture” to “luminaire” it only makes sense that the term “fixture wires” be changed to “luminaire wires”.
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: Fixture wires are not only used for luminaires, and the term may stand on its own for that reason. If CMP-6 changes the terminology in Article 402 and other correlating locations, then CMP-9 will revisit this issue.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-31 Log #3398 NEC-P09 **Final Action: Accept**
(314.16(B)(4))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal by replacing text that is vague and unclear, such as “precludes” and “judges”. This action will be considered by the Panel as a Public Comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Add the following sentence at the end:
“A device or utilization equipment of a width that precludes mounting in a single 50 mm (2 in.) device box as described in Table 314.16(A) shall be judged on the basis of the minimum number of gangs required for this purpose.”
Substantiation: A large device that cannot be mounted in a conventional single-gang box, and must be installed in a box with multiple gangs, should carry the conductor allowances that multiple devices in adjacent gangs already carry. This is simple common sense and the submitter has applied the concept as an inspector as a matter of interpretation for almost twenty years without difficulty. The proposal is carefully drafted so it will not reach a 3-pole 3-wire nongrounding dryer receptacle, for example (first installed prior to the 1996 NEC), installed in a two-gang box. This is because it could be mounted in a single-gang box and the decision to use a two-gang box was a design choice on the part of the installer. However, the current version of this receptacle, which would be 3-pole 4-wire grounding, will not mount in a single gang box, and would be subject to the rule.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
RUPP, B.: This proposal should be rejected for the following reasons:
1) The present allowance requirements adequately cover the size of these products and their installations. This can be determined by looking at the basis for the present language and comparing the products. During the 1990 code cycle CMP 9 changed the allowances for the device strap and yoke from one (1) to two (2). The driving factor for this change was the physical size of the GFCI receptacles on the market. These receptacles were larger than the current 50 amp receptacles.
2) This proposal did not provide one shred of technical substantiation, i.e., pictures, samples, problems from inspectors and/or electricians, for justifying the change. Products have been designed specifically for this application and have been successfully utilized in the market for as many as 7 years. This proposal will force a redesign of these products if they are to be used in the same applications.
Comment on Affirmative:
HARTWELL, F.: At first glance, this may seem more complicated than necessary. The reason for the specific reference to a device box as described in Table 314.16(A) is because some single-gang nonmetallic device boxes are either slightly larger or just flexible enough to allow 3-pole 4-wire receptacles to be forced into them. If such an application were used to justify being judged as a single gang application, it would completely evade the intent of the change.

9-32 Log #3595 NEC-P09 **Final Action: Reject**
(314.16(B)(4))

Submitter: Robert Hagarty, RANDL Industries, Inc.
Recommendation: Revise as follows:
For each yoke or strap containing one or more devices or equipment, ~~a double volume allowance in accordance with Table 314.16(B)(shall be made for each yoke or strap based on the largest conductor connected to a device(s) or equipment supported by that yoke or strap~~ , the volume of the device(s) or equipment shall be deducted from the box volume. The box shall not be filled with device(s) or equipment greater than 35 percent of the box volume .
Substantiation: Observation
The proposed code changes are necessary to meet the intent of NEC 314.16 where it states:
Boxes shall be of sufficient size to provide free space for all enclosed conductors.
It has been observed repeatedly during 12 years tracking projects that for many modern devices the required free space is not available for conductors in the device box.
Goal
Demonstrate mathematically that a code change is necessary and essential to meet the intent of the code for box fill when using modern devices and equipment.
Problem and Solution
The volume allowance for device(s) and equipment in electrical boxes that is based upon the largest size of conductor terminated to the device(s) or equipment does not achieve the conductor free space required in Table 314.16(B) when modern devices and equipment that are larger than traditional receptacles and switches are installed.
The proposed method is based upon the actual device and equipment volume. Research indicates 35 percent of box fill for devices and equipment provides adequate free space for conductors.
To calculate box fill using this proposed method:
1. Check the volume of the device or equipment and deduct that volume from the box volume and verify it is no more than 35 percent of the box volume.
2. The remaining volume is then used to determine the maximum number of conductors allowable per Table 314.16(B).
Mathematical Demonstration
The representative few examples below are actual and commonly used in industry today.
Example A – Sensor, Timer and Dimmer Devices
1. Current Code: When a 9 in. 3 device is installed in a 16 in. 3 box it fills 56 percent of the box volume and leaves 7 in. 3 of free space for conductors. Per existing code 8 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus, 6 conductors in 7 in. 3 of free space yields a ratio of 1.17 in. 3 of free space per conductor. This is only 59 percent of the free space required by Table 314.16(B).
2. Proposed Code. A 9 in. 3 device would require a minimum of 26 in. 3 at 35 percent fill. 26 less 9 equals 17 in. 3 free space available for up to 8 #14 AWG conductors with 2.125 in. 3 of free space for each conductor, thus meeting the 2.0 in. 3 requirement of Table 314.16(B).
Example B – Fire Alarm Device

1. Current Code: When a 13 in. 3 device is installed in a 21 in. 3 box as specified by the manufacturer the device fills 62 percent of the box volume and leaves only 8 in. 3 of free space for conductors. Per existing code 10 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus 8 conductors (required by the device) in 8 in. 3 of free space yields a ratio of 1.0 in. 3 of free space per conductor. This is only 50 percent of the free space required by Table 314.16(B).

2. Proposed Code: A 13 in. 3 device would require a minimum of 37 in. 3 at 35 percent fill. 37 less 13 equals 24 in. 3 free space available for up to 12 #14 AWG conductors with 2.0 in. 3 free space for each conductor, thus meeting the 2.0 in. 3 requirements of Table 314.16(B).

Example C – Fire Alarm Device

1. Current Code: When a 27 in. 3 device is installed in a 51 in. 3 box it consumes 53 percent of the box volume and leaves 24 in. 3 of space for conductors. Per existing Code 25 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus, 23 conductors in 24 in. 3 of free space yields a ratio of 1.04 in. 3 of free space per conductor. This is only 52 percent of the free space required by Table 314.16(B).

2. Proposed Code: A 27 in. 3 device would require a minimum of 78 in. 3 at 35 percent fill. 78 less 27 equals 51 in. 3 free space available for up to 25 #14 AWG conductors with 2.04 in. 3 free space for each conductor, thus meeting the 2.0 in. 3 requirement of Table 314.16(B).

Response to Alternatives

1. If a box has conductors only and the maximum fill by actual volume of those conductors does not exceed 5 percent, why would we then allow a device to fill 65 percent the box volume and yet only reduce the number of conductors by two? Why not fill a conductor only box up to 65 percent? The hazards become very obvious and so should the hazards of allowing devices and equipment with this same level of fill.

2. Some suggest a quadruple conductor allowance to resolve this problem. If we install a 27 in. 3 device in a 51 in. 3 box existing code allows 25 #14 AWG conductors less 4 conductors, still leaving 21 conductors. The device only requires 8 conductors; therefore a quadruple deduction has no real impact. The only thing that does alleviate these problems is limiting the volume that a device or equipment may consume in a box.

Impact of Proposed Code Change

The previous cycle of the code making panel expressed concern that manufacturers may be forced to stop making some products and be forced out of business. Our research indicates that this is unlikely because a larger box size is all that will be required for a product to meet the revised code. More importantly, these products will be installed more safely and with fewer wiring problems. As a result, even with the marginal cost increase for larger boxes, the overall costs will be less due to reduced installation and troubleshooting time.

It is our contention that if implemented the industry will see a marked decrease in the number of box related fires and fire related injuries and equipment damage.

Conclusion

The mathematical calculations using actual modern device volumes and the existing code fill allowances demonstrate unequivocally that the proposed code change is necessary to meet the spirit and safety intent of the code.

Panel Meeting Action: Reject

Panel Statement: CMP-9 prefers to address the problem through separately stated rules on box depths. See action on Proposal 9-52.

CMP-9 concludes this approach will address the concerns expressed in the proposal.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-33 Log #2487 NEC-P09 **Final Action: Reject**

(314.16(B)(5))

Submitter: Sukanta Sengupta, North Brunswick, NJ

Recommendation: Revise text to read as follows:

314.16(B)(5) When one or more equipment grounding conductors or equipment bonding jumpers enter a box, a single volume allowance in accordance with 314.16(B)(1) ~~table 314.16(B)~~ shall be made. ~~based on the largest equipment grounding conductor or equipment bonding jumper present in the box.~~ Where an additional set of equipment grounding conductors, as permitted by 250.146(D), is present in the box, an additional volume allowance shall be made for each equipment grounding conductor of the set based on 314.16(B)(1) ~~the largest equipment grounding conductor in the additional set.~~

Substantiation: Equipment grounding conductors are not invisible or ghost conductors and occupy space. The core issue of this section is free space of a box after the installation of conductors and all calculations following Tables 314.16(A) and 314.16(B) should produce one free space volume not the multiple free space volumes reflecting grounding conductors.

Panel Meeting Action: Reject

Panel Statement: As written the proposal would require a substantial increase in box volumes; the panel is unaware of any practical loss experience that would justify this step.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-34 Log #990 NEC-P09 **Final Action: Reject**

(314.16(C)(1))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

Conduit bodies enclosing 6 AWG conductors, or smaller, other than short radius conduit bodies described in 314.5, shall have a cross sectional area not less than twice the hub of the conduit body ~~largest conduit or tubing to which it is attached.~~ The maximum number of conductors shall be the maximum number permitted by Table 1 of Chapter 9 for a conduit or tubing of the same size as the conduit hub . ~~To which is attached.~~

Substantiation: Edit. All conduit bodies are not attached to conduit or tubing. There is no prohibition for use with cables or cords.

Panel Meeting Action: Reject

Panel Statement: As a practical matter, the cross-section of a conduit body is determined at the time of manufacture, and not in the field. In turn, that area is based on the largest hub on the conduit body. If the conduit body is used with some cable assembly, the hub size is still a reasonable basis for evaluation. See 314.28(A)(2) (final paragraph) for an example.

Support requirements for conduit bodies rely on a conduit system as a means of support, and therefore conduit size is an appropriate criteria.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-35 Log #3093 NEC-P09 **Final Action: Reject**

(314.17 Exception (New))

Submitter: Joseph A. Hertel, Safety and Buildings

Recommendation: This is an exception in addition to the requirements of 314.17(B) and (C):

Exception: Nonmetallic sheathed cable shall not be required to be secured to the box or conduit body where it is installed in accordance with the wiring method specified in 312.5(C).

Substantiation: 312.5(C) has provisions for cables entering cabinets, cutout boxes or meter socket enclosures. These electrical enclosures are really no different than the outlet, device, pull and junction boxes, conduit bodies, fittings and handlholes of Article 314.

Panel Meeting Action: Reject

Panel Statement: The wiring methods permitted in 312.5(C) are not suitable for boxes, conduit fittings or fittings. The main rule of 312.5(C) prohibits the installation of several cables bunched together and run through a knockout or chase nipple. Individual cable clamps or connectors are required to be used with only one cable per clamp or connector, unless the clamp or connector is identified for more than a single cable.

The requirement of cable securement to the box provides assurance that the wire is not pushed out of the box when the device is pushed into position after wiring. The wiring in cabinets, cutout boxes and meter socket enclosures do not have same forces placed on them during the installation process.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-36 Log #940 NEC-P09 **Final Action: Reject**

(314.17(B) and (C))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text of (B):

Where metal boxes or conduit bodies are installed with messenger supported wiring, open wiring on insulators, or concealed knob-an -tube wiring, single individual conductors shall enter through an insulating bushing ~~s~~ for each conductor, or in dry locations shall be permitted in flexible nonmetallic tubing or loom extending from the last ~~insulating~~ support, but not greater than 1.4 mm (4-1/2 ft) , to not less than 6 mm (1/4 in.) inside the box or conduit body and beyond any cable clamps or connectors ~~bushings~~ . Except as provided in 300.15(C) the wiring shall be firmly secured to the box or conduit body. Where flexible nonmetallic tubing or loom , or raceway s, or multiconductor cable is installed with metal boxes or conduit bodies, the flexible nonmetallic tubing or loom , raceway, or cable shall be secured to such boxes or conduit bodies.

FPN: See 300.2(B) where single alternating current conductors pass through metal.

(C) Nonmetallic boxes and conduit bodies shall be suitable for the lowest temperature rated conductor entering the box or conduit body. Where nonmetallic boxes or conduit bodies are used with messenger supported wiring, open wiring on insulators, or concealed knob-and-tube wiring, single (individual) conductors shall enter the box or conduit body through individual holes. ~~Where~~ Nonmetallic flexible tubing or loom shall be permitted as in (B) ~~is used~~ to enclose the conductors. The nonmetallic tubing or loom shall extend from the last ~~insulating~~ support to not less than 6 mm (1/4 in.) inside the box or conduit body and beyond any cable clamp or connector . Where nonmetallic-sheathed cable, multiconductor Type UF cable, multiconductor service-entrance cable, and other multiconductor cables with an overall nonmetallic covering or sheath is used, the covering or sheath shall extend not less than 6 MM (1/4 in.) inside the box or conduit body and beyond any cable clamp or connecto r. In all instances except where single conductors with flexible nonmetallic tubing or loom enter the box or conduit body through an insulating bushing, all permitted wiring methods shall be secured to the box or conduit body .

Substantiation: Edit. This proposal is intended for clarification. Flexible nonmetallic loom should be permitted which may not be perceived as tubing; tubing should be specified as nonmetallic; all supports for messenger supported wiring may not be insulating type per 396.2; all wiring methods (open single conductors) may not be safely secured to a box or conduit body. Other multicondutor covered or sheathed cables should be included with NMSC and Type UF cable as other types are permitted in 396.10.

Panel Meeting Action: Reject

Panel Statement: As proposed, the added language does not add clarity. The term "loom" is not used in the Code. See 394.19(B) for the correct terminology.

CMP-9 concludes that the installation requirements in Article 394 are sufficient.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-37 Log #2575 NEC-P09 **Final Action: Reject**

(314.17(C))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read as follows:

314.17(C) Exception.

Substantiation: The information in 314.17(C) belongs in 334.30 to be useful and relevant.

Panel Meeting Action: Reject

Panel Statement: CMP-9 does not have jurisdiction in Article 334. Furthermore, Type NM cable is not the only wiring method to which these rules apply.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-38 Log #634 NEC-P09 **Final Action: Reject**

(314.17(E))

Submitter: Carlo Compagnone, Compa Covers, Inc.

Recommendation: Add the following wording to 314.17(E) or 314.26:

"Protection of Outlet Boxes During Construction. The open front of both metal and nonmetallic electrical outlet boxes shall be temporarily covered to protect insulated electrical conductors from physical damage or deterioration due to power routers, plaster spray, spray foam insulation, and other potential damage during construction. The covers shall be constructed of a nonmetallic material and shall be clearly marked "Not for Permanent Installation"."

Substantiation: Leaving the front end of an electrical box open during the preliminary stages of construction results in exposed wires. This allows electrical wiring vulnerable to be cut or damaged during construction with power routers along with plaster filled boxes and overspray from paint guns and spray foam insulation guns, which in the end will leave a poor and unsafe working environment. Having a temporary cover on an electrical box is most of all a safety factor. The covers prevent build up of debris and puts a stop to unauthorized personnel tampering with wiring during the time of construction.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Protection of all electrical equipment enclosures is important during construction. The panel agrees that electrical equipment of all types (i.e., including cabinets and cutout boxes as covered by Article 312) are vulnerable as noted in the substantiation. The concerns presented are addressed in 110.12(C), "Integrity of Electrical Equipment and Connections". This existing requirement addresses the damage or contamination by foreign materials to the internal parts of electrical equipment. As Article 100 defines "equipment" as a general term, the concern presented is already addressed and additional requirements in Article 314 are not deemed necessary.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 9 Negative: 1

Ballot Not Returned: 1 de Vega, H.

Explanation of Negative:

BELISLE, R.: We believe the submitter's request is intended to protect conductors enclosed in boxes during the construction phase, not equipment. My notes indicate that there was a general consensus that routers and other tools used by other crafts can do substantial damage to conductors. CMP-9 states that 110.12 satisfies the submitters request. The definition of "equipment" found in Article 100 does not mention,nor elude to include conductors. We believe that action should be taken to stop the damage and potential hazards that are currently being created due to other trades not concerning themselves with enclosed wiring of boxes. Panel 9 should have accepted this proposal in principle editing the proposal as follows:

314.26: "Protection of Outlet Boxes During Construction. The open front of ~~both~~ metal and nonmetallic electrical outlet boxes shall be temporarily covered to protect insulated ~~electrical~~ conductors from physical damage or deterioration ~~due to power routers, plaster spray, spray foam insulation, and other potential damage~~ during construction. The covers shall be constructed of a ~~nonmetallic~~ suitable material and shall be clearly marked "Not for Permanent Installation"."

9-39 Log #136 NEC-P09 **Final Action: Reject**

(314.19)

Submitter: Jerry Ibey, Creative Technical Services

Recommendation: Revise as follows:

Boxes used to enclosure flush devices shall be of such design that the device will be completely enclosed on back and sides and *substantial support for the device will be provided.

~~Screws for supporting the box shall not be used in the attachment of the device contained therein.~~

(Add Explanation) *Substantial support for the device is intended to mean that devices should be firmly secured to the box or plaster ring mounting tabs and not soley to the finished surface so that unwanted movement of the device is eliminated. Where a 1/4 in. gap exists due to box setback and where the finished surface is noncombustible, it is recommended to place electrical grade PVC spacers between the device yoke and the box or ring mounting tabs in such a manner that the spacers cannot come off during tightening of the device screws and thereby provide a substantial support of the device to its box.

(New Wording) Screws for supporting the box and/or ring shall be independent of the supporting means for the devise such that the device may be removed without any degradation to the support utilized by the box and/or ring.

Substantiation: With several years of field installation experience, I have encountered these types of problems many times: broken faceplates where the installer tries to "pull" the device flush and support it primarily by the faceplate where the act of inserting a plug causes the device to "sink-in" and where removal of the plug causes the device to "pull-out" thus cracking the faceplate. Excessive movement of the device also "works" the metal yoke to a point of failure or causes the bonding action of the device screws to be momentarily interrupted during the plugging or unplugging.

The internal wiring may also work loose or break, leading to arcing problems and potential fires. Additionally, lateral movement (from side-to-side) can also cause arcing. Some installers also rely on only a tiny portion of the device yoke "ears" to support to the finished surface. These device ears are inherently weak as most have crop-points etched into the metal for easy removal of said ears. Being so weakened by design, a substantial support is not provided when there exists gap a between the device yoke and the box or ring mounting tabs and without placing spacers there between.

As for the change to the wording regarding the screws...it was simply unclear as to the intent which I interpreted to mean that one should not try to use an excessively long screw to mount through the device and then through the ring and then through the box to finally support all pieces to some framing member and where the removal of such could cause the whole assembly to fall off or apart.

Panel Meeting Action: Reject

Panel Statement: The issues covered in the substantiation are real, particularly in the case of receptacles. However, no change in this section is required, because the issue is addressed in 406.4(A).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-40 Log #491 NEC-P09 **Final Action: Reject**

(314.19)

Submitter: Jerry Ibey, Creative Technical Services

Recommendation: Section 314.19 currently reads as follows:

"Boxes used to enclose flush devices shall be of such design that the device will be completely enclosed on back and sides and a substantial support for the device will be provided. Screws for supporting the box shall not be used in the attachment of the device therein."

Proposed wording:

Boxes and/or their attached rings used to enclose flush devices shall be of such design that the device attached thereto shall be completely enclosed on back and sides. The box shall be substantially supported to the wall, ceiling or some framing member such that the facia of the box lies flush with the finished surface. The device attached thereto shall be substantially supported to the box and/or ring by means of screws which are independent of any screws or means used to attach the box. Where allowable box setbacks exist, and where the finished surface is noncombustible, electrical-grade PVC spacers shall be placed between the device yoke(s) and the box mounting tabs with the device screws passing there-through thus restoring a rigid, surface-to-surface connection of the device to its box.

Delete the phrase "screws for supporting the box shall not be used in the attachment of the device therein."

Substantiation: Problem: The wording of this article is vague and only addresses the need for a substantially supported device and ignores the extreme need for a substantially supported box as well. There is a need to remove devices occasionally for servicing and the box support should not be compromised if the device screws are removed, the proposed wording clarifies that much better.

The article does not address the correct solution for accommodating box setbacks although a thorough description of allowable setbacks with a detailed definition of combustible materials is set forth. The other problems posed by improperly supported devices are electrical and fire safety issues that do indeed exist if gaps between devices and their boxes are left without proper spacers to substantially support the device to its box.

Substantiation: In my 16 years of installation experience, I encounter these problems constantly; installers rely on the tiny pre-scored “ears” of the device yoke to support solely to the finished surface where often times only a fraction of these ears actually touch the finished surface. Because these ears are inherently weak due to the scoring they can break off leaving a device unsupported and able to flop around within the space. Similarly, installers rely on an often singular center faceplate screw to “pull” the device flush with the finished surface and thus the fragile faceplate bears all of the forces exerted by “plugging-in” and “unplugging” apparatus thus ultimately causing a cracked or broken faceplate with perhaps exposed live parts, and again, an unsupported device. Perhaps the most significant of the problems is unwanted movement of the device which can cause internal wiring to fatigue and break, cause termination points to become loose and may interrupt the bonding action of the device screws if not firmly anchored to its grounded box.

All of which may present potential fire hazards and electrical safety concerns. Nearly every installer recognizes the need for spacers and have devised all sorts of undesirable methods such as pieces of wood, cardboard, metal washers (sometimes the very “ears” previously mentioned are purposely broken off to become these washers), loops of wire wrapped around the device screws, cut off pieces of wiring nuts and other improper spacer means have been encountered. Most all of these will compress with time and eventually work lose leaving the device able to flop around with minimal lateral stability which may allow arcing against adjacent live parts. PVC is the preferred self-extinguishing material for nonmetallic electrical boxes and should be the preferred material for spacers needed to substantially support devices to their boxes.

As for the deleted phrase above, it is simply unlikely that one would have screws long enough to go through the device and then through the entire box and/or ring to then mount to some framing members that would support all of these components, thus the wording is vague and thus merits further elaboration.

Panel Meeting Action: Reject

Panel Statement: The issue primarily concerns receptacles, and there is already a sufficient rule in 406.4(A).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-41 Log #3594 NEC-P09 **Final Action: Reject**

(314.19)

Submitter: Robert Hagarty, RANDL Industries, Inc.

Recommendation: Revise as follows:

Boxes used to enclose flush devices and equipment shall be of such design and size that the devices or equipment will be completely enclosed on back and sides and no fill greater than 35 percent of the box volume and substantial support for the devices or equipment will be provided. Screws for supporting the box shall not be used in attachment of the device or equipment contained therein.

Substantiation: Observation

The proposed code changes are necessary to meet the intent of NEC 314.16 where it states:

Boxes shall be of sufficient size to provide free space for all enclosed conductors.

It has been observed repeatedly during 12 years tracking projects that for many modern devices the required free space is not available for conductors in the device box.

Goal

Demonstrate mathematically that a code change is necessary and essential to meet the intent of the code for box fill when using modern devices and equipment.

Problem and Solution

The volume allowance for device(s) and equipment in electrical boxes that is based upon the largest size of conductor terminated to the device(s) or equipment does not achieve the conductor free space required in Table 314.16(B) when modern devices and equipment that are larger than traditional receptacles and switches are installed.

The proposed method is based upon the actual device and equipment volume. Research indicates 35 percent of box fill for devices and equipment provides adequate free space for conductors.

To calculate box fill using this proposed method:

1. Check the volume of the device or equipment and deduct that volume from the box volume and verify it is no more than 35 percent of the box volume.

2. The remaining volume is then used to determine the maximum number of conductors allowable per Table 314.16(B).

Mathematical Demonstration

The representative few examples below are actual and commonly used in industry today.

Example A – Sensor, Timer and Dimmer Devices

1. Current Code: When a 9 in.^{3} device is installed in a 16 in.^{3} box it fills 56 percent of the box volume and leaves 7 in.^{3} of free space for conductors. Per existing code 8 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus, 6 conductors in 7 in.^{3} of free space yields a ratio of 1.17 in.^{3} of free space per conductor. This is only 59 percent of the free space required by Table 314.16(B).

2. Proposed Code. A 9 in.^{3} device would require a minimum of 26 in.^{3} at 35 percent fill. 26 less 9 equals 17 in.^{3} free space available for up to 8 #14 AWG conductors with 2.125 in.^{3} of free space for each conductor, thus meeting the 2.0 in.^{3} requirement of Table 314.16(B).

Example B – Fire Alarm Device

1. Current Code: When a 13 in.^{3} device is installed in a 21 in.^{3} box as specified by the manufacturer the device fills 62 percent of the box volume and leaves only 8 in.^{3} of free space for conductors. Per existing code 10 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus 8 conductors (required by the device) in 8 in.^{3} of free space yields a ratio of 1.0 in.^{3} of free space per conductor. This is only 50 percent of the free space required by Table 314.16(B).

2. Proposed Code: A 13 in.^{3} device would require a minimum of 37 in.^{3} at 35 percent fill. 37 less 13 equals 24 in.^{3} free space available for up to 12 #14 AWG conductors with 2.0 in.^{3} free space for each conductor, thus meeting the 2.0 in.^{3} requirements of Table 314.16(B).

Example C – Fire Alarm Device

1. Current Code: When a 27 in.^{3} device is installed in a 51 in.^{3} box it consumes 53 percent of the box volume and leaves 24 in.^{3} of space for conductors. Per existing Code 25 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus, 23 conductors in 24 in.^{3} of free space yields a ratio of 1.04 in.^{3} of free space per conductor. This is only 52 percent of the free space required by Table 314.16(B).

2. Proposed Code: A 27 in.^{3} device would require a minimum of 78 in.^{3} at 35 percent fill. 78 less 27 equals 51 in.^{3} free space available for up to 25 #14 AWG conductors with 2.04 in.^{3} free space for each conductor, thus meeting the 2.0 in.^{3} requirement of Table 314.16(B).

Response to Alternatives

1. If a box has conductors only and the maximum fill by actual volume of those conductors does not exceed 5 percent, why would we then allow a device to fill 65 percent the box volume and yet only reduce the number of conductors by two? Why not fill a conductor only box up to 65 percent? The hazards become very obvious and so should the hazards of allowing devices and equipment with this same level of fill.

2. Some suggest a quadruple conductor allowance to resolve this problem. If we install a 27 in.^{3} device in a 51 in.^{3} box existing code allows 25 #14 AWG conductors less 4 conductors, still leaving 21 conductors. The device only requires 8 conductors; therefore a quadruple deduction has no real impact. The only thing that does alleviate these problems is limiting the volume that a device or equipment may consume in a box.

Impact of Proposed Code Change

The previous cycle of the code making panel expressed concern that manufacturers may be forced to stop making some products and be forced out of business. Our research indicates that this is unlikely because a larger box size is all that will be required for a product to meet the revised code. More importantly, these products will be installed more safely and with fewer wiring problems. As a result, even with the marginal cost increase for larger boxes, the overall costs will be less due to reduced installation and troubleshooting time.

It is our contention that if implemented the industry will see a marked decrease in the number of box related fires and fire related injuries and equipment damage.

Conclusion

The mathematical calculations using actual modern device volumes and the existing code fill allowances demonstrate unequivocally that the proposed code change is necessary to meet the spirit and safety intent of the code.

Panel Meeting Action: Reject

Panel Statement: CMP-9 prefers to address the problem through separately stated rules on box depths. See action on Proposal 9-52.

CMP-9 concludes this approach will address the concerns expressed in the proposal.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-42 Log #139 NEC-P09 **Final Action: Reject**
(314.20)

Submitter: Roderic Tosetti, Tosetti Electrical Consultants
Recommendation: Add text to read as follows:

In walls or ceilings of concrete, tile or other noncombustible material, boxes, fittings and cabinets shall be so installed that the front edge of the box or fitting will not set back of the finished surface more than 1/4 in. In walls and ceilings constructed of wood or other combustible material, outlet boxes, fittings and cabinets shall be flush with the finished surface or project therefrom.

Substantiation: The 2002 NEC section 314.20 was revised in response to a singular recommendation by Mr. Joseph A. Hertel. Mr. Hertel states in his recommendation, "Most electricians and inspectors will treat a wall of this construction as noncombustible...".

The above stated treatment by "Most electricians and inspectors..." cannot be justified. By definition: The term combustible refers to material "that catches fire and burns". By definition: The term "non" preceding the work "combustible" refers to "the opposite of, negative, used to give perforative force". (Webster's New World Dictionary, third College Edition, Simon & Schuster, Inc.)

In essence, you cannot refer to a material or assembly that burns as "noncombustible".

We all know the purpose of the NEC is the practical safeguarding of persons and property from hazards arising from the use of electricity. 314.20 specifically refers to fire hazards and has remained almost the same since the 1937 NEC. In short, we should work toward reinforcing the code rather than diluting its purpose.

1937 NEC

3711. Position in Wall. In walls or ceilings of concrete, tile or other noncombustible material, boxes, fittings and cabinets shall be so installed that the front edge of the box or fitting will not set back of the finished surface more than 1/4 inch. In walls and ceilings <u>constructed of</u> wood or other combustible material, outlet boxes, fittings and cabinets shall be flush with the finished surface or project therefrom.

1999 NEC

370.20. In Wall or Ceiling. In walls or ceilings of concrete, tile or other noncombustible material, boxes, shall be so installed that the front edge of the box or fitting will not set back of the finished surface more than 1/4 inch (6.35 mm). In walls and ceilings <u>constructed of</u> wood or other combustible material, outlet boxes, shall be flush with the finished surface or project therefrom.

2002 NEC

314.20 In Wall or Ceiling. In walls or ceilings with a surface of concrete, tile, gypsum, plaster, or other noncombustible material, boxes shall be installed so that the front edge of the box will not be set back of the finished surface more than 6 mm (1/4 in.)

In walls and ceilings constructed of wood or other combustible surface material, boxes shall be flush with the finished surface or project there from.

Sometime between 1937 and 1947 the term "cabinet" was removed. The 1996 NEC removed the term "fitting".

"In walls and ceilings <u>constructed of</u> wood or other combustible material", speaks to the construction of the wall or ceiling. Wood stud walls covered with sheetrock burn. Furthermore, sheetrock (gypsum) has a flame spread rating and is combustible.

The 2002 NEC 314.20 drastically diminished the code section making it reference only to the construction of the "surface material".

Therefore, to eliminate disagreements and assist the interpretations of 314.20, we need to go back to the 1937 wording and insert the definition of "combustible" in Article 100.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: Dry wall has a fire resistance rating and has been used for these purposes for generations. CMP-9 has no basis to impose this type of restriction.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-43 Log #3219 NEC-P09 **Final Action: Reject**
(314.20)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:

"In Wall ~~or Ceiling.~~ <u>,Ceiling, or Floor.</u> In walls or ~~ceilings~~ <u>ceilings, or floors...".</u>

Substantiation: Penetrations for installations of floor boxes appear to compromise a fire barrier just as do penetrations for wall boxes.
Panel Meeting Action: Reject
Panel Statement: The rules in 314.20 have to do with limiting the use of building construction to complete an electrical enclosure, and not fire separation. Floor boxes are self contained entities, with the tops in secure contact with the sides, and need not be subject to the setback limitations of this section.

The manufacturers of the floor boxes provide set-back instructions to insure the proper alignment of the box, cover and finished floor surface.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-44 Log #1343 NEC-P09 **Final Action: Reject**
(314.21)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Apply this section to all surfaces, change title

314.21 Repairing ~~Plaster and Drywall or Plasterboard~~ <u>Surfaces.</u> ~~Plaster, drywall, or plasterboard~~ Surfaces that are broken or incomplete around boxes employing a flush-type cover or faceplate shall be repaired so there will be no gaps or open spaces greater than 3 mm (1/8 in.) at the edge of the box.

Substantiation: The repair of surfaces, in order to provide a complete and workmanlike installation, should not be limited to just plaster, drywall, or plasterboard.
Panel Meeting Action: Reject
Panel Statement: The proposal as written would have electricians troweling plastic wood around the perimeter of flush boxes in wood-paneled walls. This would go beyond the requirements necessary for safety. This rule addresses a condition where building construction is, in effect, used to complete an electrical enclosure, and there are limitations to the extent that that can be considered safe practice. Since the boxes must come all the way to the surface of a combustible wall, the necessity for repair vanishes. If there is an unusual degree of shoddy workmanship, then 110.12 can still be cited.

These problems would also be true for a cement wall installation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-45 Log #967 NEC-P09 **Final Action: Accept in Principle**
(314.22 Exception)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:

A surface extension shall be permitted from the cover of a flush-mounted <u>or exposed</u> box where... (remainder unchanged).

Substantiation: 314.28(C) also permits this extension which is more properly located in this section relating to extension while that section primarily relates to covers.

(See my proposal for 214.28(C).
Panel Meeting Action: Accept in Principle
Change 314.22 to read as follows:

314.22 ~~Exposed~~ Surface Extensions. Surface extensions ~~from a flush-mounted box~~ shall be made by mounting and mechanically securing an extension ring over the ~~flush~~ box. Equipment grounding ~~and bonding~~ shall be in accordance with <u>Part VI of</u> Article 250.

Exception: A surface extension shall be permitted to be made from the cover of a ~~flush-mounted~~ box where the cover is designed so it is unlikely to fall off or be removed if its securing means becomes loose. The wiring method shall be flexible for a length sufficient to permit removal of the cover and provide access to the box interior, and arranged so that any ~~bonding or~~ grounding continuity is independent of the connection between the box and cover.

Panel Statement: CMP-9 agrees with the submitter's concept and has rewritten the section accordingly.

CMP-9 also made editorial changes to comply with the NEC Manual of Style.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-46 Log #2015 NEC-P09 **Final Action: Reject**
(314.23(E))

Submitter: Dennis Baker, Springs & Sons Electrical Contractors, Inc. / Rep. IEC
Recommendation: Add text to read as follows:

(E) Raceway Supported Enclosure, Without Devices, Luminaires (Fixtures), or Lampholders. An enclosure that does not contain a device(s) other than splicing devices or support a luminaire(s) [fixture(s)], lampholder, or other equipment and is supported by entering raceways shall not exceed 1650 cm 3 (100 in. 3) in size. It shall have threaded entries or have hubs identified for the purpose. It shall be supported by two or more conduits threaded wrenchtight into the enclosure or hubs. When conduit is run underground one conduit connection can be made using a listed threadless connector. Each conduit shall be secured within 900 mm (3 ft) of the enclosure, or within 450 mm (18 in.) of the enclosure if all conduit entries are on the same side.

Substantiation: When running rigid metal or intermediate metal conduit underground between several boxes such as for receptacles in the back yard of a residential occupancy, a threadless connector would be plenty adequate to support the box when the two conduits are turned up and one conduit threaded into the box and the other fastened with a threadless fitting.

Panel Meeting Action: Reject
Panel Statement: The conduits need to be threaded in, and there is no basis for making this rule more lenient just because one or more of the raceway entries are running underground. Often a conduit supported by soil has more give than one supported through conventional anchors. If a conduit cannot be turned in, the code permits the use of a threaded union to solve this problem.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-47 Log #1102 NEC-P09 **Final Action: Reject**
(314.23(E) Exception No. 2, (F), and Exception No. 3)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text of (E): An enclosure that does not contain a device(s), other than splicing devices, or support a luminaire (fixture), lampholder, or other equipment and is supported solely by ~~entering~~ connected raceways... (remainder unchanged).
Add:
Exception No. 2: Where it is impractical to thread more than one conduit into one side of the enclosure a threadless connector shall be permitted for the additional conduits.
Revise text of (F:) An enclosure that contains a device(s) other than splicing devices or supports a luminaire (fixture), lampholder, or other equipment and is supported solely by ~~entering~~ connected raceways. (remainder unchanged).
Add:
Exception No. 3: Where it is impractical to thread more than one conduit into one side of the enclosure a threadless connector shall be permitted for the additional conduits.
Substantiation: This rule is only justified where the conduits are the sole support. It is virtually impossible in some instances to comply with (E) and (F) where conduit bends are stubbed up from earth or concrete for future connection to boxes with threaded entries, without the use of threadless fittings or unions. Two or more short nipples threaded into a box and connected to conduit stub ups with threadless couplings comply with the rule, but is essentially no different than using threadless connectors. The proposed exceptions are commonly accepted installations per 90.4 by AHJs who have been electricians. The exception for (E) permits EMT support of conduit bodies for practical reasons, including a single hub type (one support) Exception No. 2 for (F) is practical but has less stringent restrictions where a conduit body supports a luminaire (fixture). For example, one conduit may be used for support and support may be 3 feet from the luminaire box and the weight supported may be 20 pounds. 680.5(B)(2) appears to permit enclosure support by only one conduit. It appears a steel FS box would be just as suitable as an (aluminum) conduit body for support.
Panel Meeting Action: Reject
Panel Statement: The conduits need to be threaded in, and there is no basis for making this rule more lenient just because one or more of the raceway entries are running underground. Often a conduit supported by soil has more give than one supported through conventional anchors. If a conduit cannot be turned in, the code allows the use of a threaded union to solve this problem.
CMP-9 was unable to find 680.5(B), however, the panel calls the submitter's attention to Table 680.3, which specifically invokes the support rules in 314.23 in cases such as this.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-48 Log #1675 NEC-P09 **Final Action: Reject**
(314.23(E) Exception)

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: This is a companion proposal to ones for 342.10(E), 344,10(E), 358.10(D).
Delete text as follows:
~~314.23(E), Exception Rigid metal, intermediate metal, or rigid nonmetallic conduit or electrical metallic tubing shall be permitted to support a conduit body of any size, including a conduit body constructed with only one conduit entry, provided the trade size of the conduit body is not larger than the largest trade size of the conduit or electrical metallic tubing.~~
Substantiation: The proper place for this type of information is within Articles 342, 344, 352, and 358. For example, see 352.10(H) for RNC.
Panel Meeting Action: Reject
Panel Statement: Article 314 covers this aspect of box wiring, namely, box supports. If it were moved to the raceway articles, then a new generation of electricians would have just as much trouble finding the requirements for box support. See also the panel statement on Proposal 9-81a.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-49 Log #2016 NEC-P09 **Final Action: Reject**
(314.23(F))

Submitter: Dennis Baker, Springs & Sons Electrical Contractors, Inc. / Rep. IEC
Recommendation: Add text to read as follows:
(F) Raceway Supported Enclosure, With Devices, Luminaires (Fixtures), or Lampholders. An enclosure that does not contain a device(s) other than splicing devices or support a luminaire(s) [fixture(s)], lampholder, or other equipment and is supported by entering raceways shall not exceed 1650 cm 3 (100 in. 3) in size. It shall have threaded entries or have hubs identified for the purpose. It shall be supported by two or more conduits threaded wrenchtight into the enclosure or hubs. When conduit is run underground one conduit connection can be made using a threadless connector. Each conduit shall be secured within 450 mm (18 in.) of the enclosure.
Substantiation: When running rigid metal or intermediate metal conduit underground between several boxes such as for receptacles in the back yard of a residential occupancy, a threadless connector would be plenty adequate to support the box when the two conduits are turned up and one conduit threaded into the box and the other fastened with a threadless fitting.
Panel Meeting Action: Reject
Panel Statement: The conduits need to be threaded in, and there is no basis for making this rule more lenient just because one or more of the raceway entries are running underground. Often a conduit supported by soil has more give than one supported through conventional anchors. If a conduit cannot be turned in, the code permits the use of a threaded union to solve this problem.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-50 Log #1676 NEC-P09 **Final Action: Reject**
(314.23(F) Exception)

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: This is a companion proposal to ones for 342.10(E), 344.10(E), and 358.10(D).
Delete the following text:
~~314.23(F), Exception Rigid metal or intermediate metal conduit shall be permitted to support a conduit body of any size, including a conduit body constructed with only one conduit entry, provided the trade size of the conduit body is not larger than the largest trade size of the conduit.~~
Substantiation: The proper place for this type of information is within Articles 342, 344 and 358. The general rule refers to enclosures while the exception refers to conduit bodies and conduit.
Panel Meeting Action: Reject
Panel Statement: Article 314 covers this aspect of box wiring, namely, box supports. If it were moved to the raceway articles, then a new generation of electricians would have just as much trouble finding the requirements for box support. See also the panel statement on Proposal 9-81a.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-51 Log #2559 NEC-P09 **Final Action: Reject**
(314.23(H))

Submitter: Robert Hale, City of Hillsboro
Recommendation: After the word "strain", delete "such as a strain-relief connector threaded into a box w/a hub". Replace with "strain relief connector shall be threaded into a box w/a hub".
Substantiation: The phrase "such as a strain relief...box w/a hub" is a suggestion and needs to be specific to requiring a box w/a threaded hub.
Panel Meeting Action: Reject
Panel Statement: The section is as specific as it needs to be. The requirement is for an approved means (so it has to be passed by the inspector). CMP-9 does not want to preclude other methods.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-52 Log #3322 NEC-P09 **Final Action: Accept**
(314.24)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. CMP 9 Task Group on Allowable Box Depth
Recommendation: Revise 314.24 to read as follows:
314.24 Depth of Boxes. Outlet and device boxes shall have sufficient depth to allow equipment installed within them to be mounted properly and without likelihood of damage to conductors within the box.
(A) Outlet and Device Boxes With Enclosed Devices or Utilization Equipment. Outlet and device boxes that enclose devices or utilization equipment shall have a minimum internal depth that accommodates the

rearward projection of the equipment and the size of the conductors that supply the equipment. The internal depth shall include, where used, that of any extension boxes, plaster rings, or raised covers. The internal depth shall comply with all applicable provisions of (1) through (5).

(1) Large Equipment. Boxes that enclose devices or utilization equipment that projects more than 48 mm (1 7/8 in.) rearward from the mounting plane of the box shall have a depth that is not less than the depth of the equipment plus 6 mm (1/4 in.).

(2) Conductors Larger Than 4 AWG. Boxes that enclose devices or utilization equipment supplied by conductors larger than 4 AWG shall be identified for their specific function.

(3) Conductors 8, 6, or 4 AWG. Boxes that enclose equipment supplied by 8, 6, or 4 AWG conductors shall have an internal depth that is not less than 52.4 mm (2 1/16 in.).

(4) Conductors 12 or 10 AWG. Boxes that enclose equipment supplied by 12 or 10 AWG conductors shall have an internal depth that is not less than 30.2 mm (1 3/16 in.). Where the equipment projects rearward from the mounting plane of the box by more than 25 mm (1 in.), the box shall have a depth not less than that of the equipment plus 6 mm (¼ in.).

(5) Conductors 14 AWG and Smaller. Boxes that enclose equipment supplied by 14 AWG or smaller conductors shall have a depth that is not less than 23.8 mm (15/16 in.).

Exception to (1) through (5): Equipment that is listed to be installed with specified boxes shall be permitted.

(B) Outlet Boxes Without Enclosed Devices or Utilization Equipment. Outlet boxes that do not enclose devices or utilization equipment shall have a minimum internal depth of 12.7 mm (½ in.).

Substantiation: This proposal is the result of a task group created as part of the CMP 9 discussion of Public Comment 9-62 on Proposal 9-34 in the 2005 NEC cycle. The members were Frederic Hartwell (CMP 9, Chair), William Hopple (CMP 16) Robert Osborne (CMP 9) Brian Rock (CMP 17) and Bradford Rupp (CMP 9). Proposal 9-34 raised issues regarding inadequate box sizing requirements in prior editions of the NEC, and suggested modifications to the volume allowance provisions in 314.16 accordingly. CMP 9 believed that the issue needed attention, but that changes to volume provisions would not adequately address the concerns, because it was easily possible for box-mounted equipment to have a very deep profile and yet take up a comparatively small volume. The task group was therefore charged with reviewing both the volume rules in 314.16 and the box depth coverage in 314.24. The latter section had only seen one substantial change in the previous 70 years, so it probably needed very careful review.

The task group concluded that the work should be done in 314.24, and this proposal completely rewrites the section. This section took its present form in the 1975 NEC. Prior to that time, and extending back into the 1930s or before, the requirement was for boxes for concealed work to have a minimum depth of 1½ inches unless such a depth would damage the building structure or was otherwise impracticable, in which case a box of minimum depth of ½ inch could be used. The rule in the 1975 NEC and thereafter was designed to accommodate a box design that would allow a device to be installed on a wall made with 3/4-in. furring strips and 3/16-in. paneling.

At the time, only a single conductor allowance needed to be made for a device. Since a typical 1 inch deep (15/16 inch internal depth) box configured for this purpose has a volume of 6.5 in 3 , if armored cable or metal raceway entered the box with no additional grounding conductors, the box had a practical application at the time. These boxes are still available (reference RACO #404 or equal). However, for the past fifteen years two allowances have been and continue to be required for devices, so a single gang 15/16 inch internal depth box has little practical application unless augmented by a surface extension of some sort, such as are readily available from manufacturers of various types of surface raceways. Another marginal application of a box this shallow would involve the two-gang versions of the same boxes, which have volumes running over 14 in 3 . Note that only the two-gang versions are currently listed, (although the NEC does not require these metal device boxes to be listed).

The task group was also aware that introducing additional marking requirements on electrical equipment is frequently problematic and not to be done lightly. Over the years some of the most intense discussions within the panel have grown out of suggestions that may have, often inadvertently, forced changes in product markings. These changes are extremely expensive for the industry to accommodate, they are genuine, and should never be imposed if there is some other way. This proposal carefully avoids any mandatory change in marking requirements, although the option is there for a manufacturer to pursue a special listing if it chooses.

As part of its discussions, the task group gave considerable thought to at what point a rearward projection becomes problematic. Clearly this is in part related to the wire sizes involved in a given installation. The task group considered incorporating by reference the Table 312.6(A) bending radii to this end, but rejected that approach because Table 312.6(A) distances assume an installer bringing a wire to a fixed terminal; this is not appropriate for a device wired outside a box and then mounted into the box. The other part of the discussion involved an informal survey of current device designs in an effort to write a rule that could be easily applied and that would readily comport with likely applications. Although the 2005 proposal that resulted in the task group creation addressed fire alarm equipment, it became quickly apparent that any rule in this area had to work easily with power devices.

As a result of the device survey, the task group settled on 1 7/8 inches as good number to set as a limit beyond which field measurements or manufacturers' specifications would need to be consulted. 314.24(A)(1) of the proposal language describes equipment with a deeper profile as "large equipment" and requires the box to be at least 1/4-inch deeper than such equipment. The term "box" as used here means [and the parent language in (A) makes clear] the underlying box together with any extension boxes, plaster rings, or raised covers employed. The same principle has been used in 314.16(A) for many generations. Virtually all common devices with mounting yokes do not exceed this limit, and therefore do not fall into the "large equipment" category. This "large equipment" category does, however, directly address the concerns in 2005 NEC Proposal 9-34.

The next step was to set a logical sequence of workable rules for more conventional devices. The task group believes it is important that there be enough space behind these devices so if one of their supply conductors falls behind the device, it will not be damaged by being compressed against the rear wall of the box. Since the largest devices in the category of power devices rated 60 amperes and below run about 1 3/4 inches, the 2 1/16-inch internal depth requirement in (A)(3) allows for clearance of the largest conductors likely to be used on such devices, based on wire diameters in Table 5 of Chapter 9. It also corresponds to the actual overall depth of a standard 2 1/8-inch deep outlet box.

Although there are some insulated conductors that are large enough in diameter to be pinned against some device brands, the task group is recommending a simple requirement that works well in the overwhelming majority of cases. If the AHJ wants an enforcement tool in the event of a significant problem, the parent language in 314.24 of this proposal ("accommodates the rearward projection of the equipment and the size of the conductors that supply the equipment") provides an answer. This is an exact and intended parallel to the parent language in 314.16 (that there be "sufficient size to provide free space for all enclosed conductors"). For over 70 years, this language has allowed and continues to allow the AHJ to insist on a larger box in those rare cases where all the volume calculations work out but the box is still overcrowded.

If the wires are even larger, such as for 100-ampere pin-and-sleeve devices, device boxes would generally be inappropriate, and the (A)(2) rule requires boxes "identified for their specific function." Generally, these are cast boxes with mating covers (frequently angled) that contain the receptacle body, all to be assembled with 1/4-inch or larger bolts at all four corners. Note that the word "identified" rather than "listed" was chosen because some manufacturer's back boxes are designed to be interchangeable with other manufacturer's receptacle housings, but they are not specifically listed for this purpose.

The task group then turned to more modest applications, including conventional 15-, 20-, and 30-ampere circuits and associated devices. In this context, the task group considered locking receptacle configurations and yoked manual motor-controllers. As covered in (A)(4), the minimum internal depth is 1 3/16 inch, with a requirement to make sure there is a 1/4-inch space behind the device for devices deeper than 1 inch. Since most flush applications involve spacings of at least 1 3/4 inches (1 1/4-inch deep box plus a mud ring or raised cover of some sort with a rise in the ½-inch range), and since devices in this amperage range (including 30-ampere locking, TVSS, and GFCI receptacles) don't much exceed 1 1/4 inches deep, this will not require much in the way of field measurements. Some dimmer and occupancy sensor switches, however, do approach 1 3/4 inches in depth, and will require field consideration. Note that even in this case, however, if the underlying box is 1 1/2 inches deep (very common) with the same plaster ring or raised cover, even these devices meet the rule easily.

With that settled, the task group finished the work in this section by addressing the current provisions of 314.24, which allow for a 1-inch device box for flush work. This is a 15/16-inch deep box measured internally, because 314.40(B) requires steel boxes to be of 1/16-inch thick steel as a minimum. Although the volume requirements have largely driven these applications off the market, the task group did not want to abandon the allowance all together. Some residential grade devices project less than 3/4 inch into a box, so the solution was to reserve these boxes for 14 AWG wire connections. The other piece of the current rule concerns outlet boxes that do not contain flush equipment. This minimum depth rule becomes the (B) subsection, the requirement remaining unchanged in over 70 years.

A note on the metrication process in this proposal. CMP 9 decided to use soft conversions in both Table 314.16(A) and in 314.24 (see Proposals 9-6 and 9-14 for the 2002 NEC) because hard conversions could have the effect of forcing the redesign of products built to current standards. Therefore, the dimensions in this proposal that describe the minimum depth of a box use soft conversions. Dimensions that describe the rearward projection of mounted equipment, and that would likely be field-measured, are hard conversions.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-53 Log #3593 NEC-P09 **Final Action: Reject**
(314.24)

Submitter: Robert Hagarty, RANDL Industries, Inc.
Recommendation: Revise as follows:
No box shall have an internal depth of less than 12.7 mm (1/2 in.). Boxes intended to enclose flush devices or equipment shall have an internal depth of not less than 23.8 mm (15/16 in.) and shall not be filled to greater than 35 percent of the box volume by devices or equipment.
Substantiation: Observation
The proposed code changes are necessary to meet the intent of NEC 314.16 where it states:
Boxes shall be of sufficient size to provide free space for all enclosed conductors.
It has been observed repeatedly during 12 years tracking projects that for many modern devices the required free space is not available for conductors in the device box.
Goal
Demonstrate mathematically that a code change is necessary and essential to meet the intent of the code for box fill when using modern devices and equipment.
Problem and Solution
The volume allowance for device(s) and equipment in electrical boxes that is based upon the largest size of conductor terminated to the device(s) or equipment does not achieve the conductor free space required in Table 314.16(B) when modern devices and equipment that are larger than traditional receptacles and switches are installed.
The proposed method is based upon the actual device and equipment volume. Research indicates 35 percent of box fill for devices and equipment provides adequate free space for conductors.
To calculate box fill using this proposed method:
1. Check the volume of the device or equipment and deduct that volume from the box volume and verify it is no more than 35 percent of the box volume.
2. The remaining volume is then used to determine the maximum number of conductors allowable per Table 314.16(B).
Mathematical Demonstration
The representative few examples below are actual and commonly used in industry today.
Example A – Sensor, Timer and Dimmer Devices
1. Current Code: When a 9 in. 3 device is installed in a 16 in. 3 box it fills 56 percent of the box volume and leaves 7 in. 3 of free space for conductors. Per existing code 8 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus, 6 conductors in 7 in. 3 of free space yields a ratio of 1.17 in. 3 of free space per conductor. This is only 59 percent of the free space required by Table 314.16(B).
2. Proposed Code. A 9 in. 3 device would require a minimum of 26 in. 3 at 35 percent fill. 26 less 9 equals 17 in. 3 free space available for up to 8 #14 AWG conductors with 2.125 in. 3 of free space for each conductor, thus meeting the 2.0 in. 3 requirement of Table 314.16(B).
Example B – Fire Alarm Device
1. Current Code: When a 13 in. 3 device is installed in a 21 in. 3 box as specified by the manufacturer the device fills 62 percent of the box volume and leaves only 8 in. 3 of free space for conductors. Per existing code 10 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus 8 conductors (required by the device) in 8 in. 3 of free space yields a ratio of 1.0 in. 3 of free space per conductor. This is only 50 percent of the free space required by Table 314.16(B).
2. Proposed Code: A 13 in. 3 device would require a minimum of 37 in. 3 at 35 percent fill. 37 less 13 equals 24 in. 3 free space available for up to 12 #14 AWG conductors with 2.0 in. 3 free space for each conductor, thus meeting the 2.0 in. 3 requirements of Table 314.16(B).
Example C – Fire Alarm Device
1. Current Code: When a 27 in. 3 device is installed in a 51 in. 3 box it consumes 53 percent of the box volume and leaves 24 in. 3 of space for conductors. Per existing Code 25 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus, 23 conductors in 24 in. 3 of free space yields a ratio of 1.04 in. 3 of free space per conductor. This is only 52 percent of the free space required by Table 314.16(B).
2. Proposed Code: A 27 in. 3 device would require a minimum of 78 in. 3 at 35 percent fill. 78 less 27 equals 51 in. 3 free space available for up to 25 #14 AWG conductors with 2.04 in. 3 free space for each conductor, thus meeting the 2.0 in. 3 requirement of Table 314.16(B).
Response to Alternatives
1. If a box has conductors only and the maximum fill by actual volume of those conductors does not exceed 5 percent, why would we then allow a device to fill 65 percent the box volume and yet only reduce the number of conductors by two? Why not fill a conductor only box up to 65 percent? The hazards become very obvious and so should the hazards of allowing devices and equipment with this same level of fill.
2. Some suggest a quadruple conductor allowance to resolve this problem. If we install a 27 in. 3 device in a 51 in. 3 box existing code allows 25 #14 AWG conductors less 4 conductors, still leaving 21 conductors. The device only requires 8 conductors; therefore a quadruple deduction has no real impact. The only thing that does alleviate these problems is limiting the volume that a device or equipment may consume in a box.
Impact of Proposed Code Change
The previous cycle of the code making panel expressed concern that manufacturers may be forced to stop making some products and be forced out of business. Our research indicates that this is unlikely because a larger box size is all that will be required for a product to meet the revised code. More importantly, these products will be installed more safely and with fewer wiring problems. As a result, even with the marginal cost increase for larger boxes, the overall costs will be less due to reduced installation and troubleshooting time.
It is our contention that if implemented the industry will see a marked decrease in the number of box related fires and fire related injuries and equipment damage.
Conclusion
The mathematical calculations using actual modern device volumes and the existing code fill allowances demonstrate unequivocally that the proposed code change is necessary to meet the spirit and safety intent of the code.
Panel Meeting Action: Reject
Panel Statement: CMP-9 prefers the approach taken in Proposal 9-52, that focuses on actual rearward projection distances.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-54 Log #1230 NEC-P09 **Final Action: Reject**
(314.27)

Submitter: Michael Dempsey, Municipal Code Inspections
Recommendation: Add text to read as follows:
All boxes installed in dining rooms and two story foyers shall be minimum 1 1/2 deep.
Substantiation: The common fixtures installed at the locations are chandeliers, which all have a fixture bar and nipple to attach the fixture to the box, this would prevent pancake boxes from being used, it is common to see the center knockout removed and the ceiling joist drilled out to make room for the nipple, possible weakening a ceiling joist or drilling a truss.
Panel Meeting Action: Reject
Panel Statement: This is a design consideration. Not all large luminaires require a crow's foot, fixture strap or equivalent hardware in a box.
The submitter's statement includes "All boxes". It is not CMP-9's intent to make such a restriction.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-55 Log #1231 NEC-P09 **Final Action: Reject**
(314.27)

Submitter: Michael Dempsey, Municipal Code Inspections
Recommendation: Add text to read as follows:
All ceiling boxes installed in dining rooms and two story foyers shall be fan box rated.
Substantiation: The fixtures installed at these locations are often installed after final inspection, when the homeowner removes the keyless fixture supplied by the contractor and installs his own fixtures, this would prevent a 40 lb. chandelier or heavier hanging from a plastic ceiling box.
Panel Meeting Action: Reject
Panel Statement: This is a design consideration. It is not necessary to have every ceiling box rated for paddle fans that may never be actually installed.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-56 Log #2611 NEC-P09 **Final Action: Accept in Principle**
(314.27(A) & (B))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
(A) Boxes at Luminaire (Lighting Fixture) Outlets. Boxes used at luminaire (lighting fixture) or lampholder outlets in a ceiling shall be designed for the purpose and shall be required to support a luminaire (light fixture) weighing a minimum of 23 kg (50 lb.). Boxes used at luminaire (lighting fixture) or lampholder outlets in a wall shall be designed for the purpose and shall be marked to indicate the maximum weight of the luminaire (light fixture) that is permitted to be supported by the box in the wall . At every outlet used exclusively for lighting, the box shall be designed or installed so that a luminaire (lighting fixture) may be attached.
Exception: A wall-mounted luminaire (fixture) weighing not more than 3 kg (6 lb.) shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the luminaire (fixture) or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.

(B) Maximum Luminaire (Fixture) Weight. Outlet boxes or fittings designed for the support of luminaires (lighting fixture) and installed as required by 314.23 shall be permitted to support a luminaires (lighting fixtures) weighing 23 kg (50 Lb) or less. A luminaire (lighting fixture) that weighs more than 23 kg (50 lb) shall be supported independently of the outlet box unless the outlet box is listed and marked for the maximum weight to be supported.

Substantiation: This proposal clarifies the requirements for listed boxes used for luminaire support. Currently, there are outlet boxes on the market that are listed and marked for luminaires weighing between 3 kg (6 lb) and 23 kg (50 lb) for ceiling applications. I believe that Panel 9 always intend that a ceiling box for luminaire support shall be required to support a minimum of 23 kg (50 lbs) or less.

Markings for boxes between 3 kg (6 lb) and 23 kg (50 lb) was initially permitted for wall mounted luminaires only and was not intended for ceiling mounted luminaires. Homeowners may unknowingly change a ceiling luminaire to a heavy weight than the box is listed for.

314.27(B) was revised to indicate that boxes listed for luminaires weighing more than 23 kg (50 lb) are required to be marked with the maximum weight.

Panel Meeting Action: Accept in Principle

Revise the proposed wording to read as follows:

"(A) Boxes at Luminaire (Lighting Fixture) Outlets. Boxes used at luminaire (lighting fixture) or lampholder outlets in a ceiling shall be designed for the purpose and shall be required to support a luminaire (light fixture) weighing a minimum of 23 kg (50 lb.). Boxes used at luminaire (lighting fixture) or lampholder outlets in a wall shall be designed for the purpose and shall be marked on the interior of the box to indicate the maximum weight of the luminaire (light fixture) that is permitted to be supported by the box in the wall, if other than 23 kg (50 lb) . At every outlet used exclusively for lighting, the box shall be designed or installed so that a luminaire (lighting fixture) may be attached.

Exception: A wall-mounted luminaire (fixture) weighing not more than 3 kg (6 lb.) shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the luminaire (fixture) or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.

(B) Maximum Luminaire (Fixture) Weight. Outlet boxes or fittings designed for the support of luminaires (lighting fixture) and installed as required by 314.23 shall be permitted to support a luminaires (lighting fixtures) weighing 23 kg (50 Lb) or less. A luminaire (lighting fixture) that weighs more than 23 kg (50 lb) shall be supported independently of the outlet box unless the outlet box is listed and marked for the maximum weight to be supported."

Panel Statement: Code-Making Panel 9 agrees with the submitter to change 314.27(A) & (B).

Code-Making Panel 9 made two changes to the submitter's text. The first change assures that no additional marking requirements will apply to a conventional outlet box suitable for a 50 lb load. The second change assures that the capacity of the box can be reviewed at the time of a finish inspection.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

Comment on Affirmative:

HARTWELL, F.: Obviously it would be preferable to pick up a weight problem at the time of the rough inspection, and an interior marking can and should be read and applied at that time. However, the final luminaire decision may not be in place at that time, and the panel revision allows for review on the final inspection as well.

9-57 Log #597 NEC-P09 **Final Action: Reject**
(314.27(B))

Submitter: Jerry Spadaro, Middletown, NJ

Recommendation: Add text to read as follows:

Outlet boxes installed for lighting purposes on ceilings over 10 ft with attic access should be listed type box which independently supports fixture from building structure.

Substantiation: By having a listed type box for ceilings over 10 ft would solve a major problem. At this time, boxes are installed according to fixture weight. Example, having a new home with a 22 ft ceiling, a contractor installs a plastic box or nail-on box in hall because the fixture they are installing weighs about a pound (contractor fixture). This is not the fixture that would be permanently installed in that location. The correct practice would be to change the box to accommodate the weight of the fixture. This does not happen. They are installing fixtures weighing hundreds of pounds on boxes which are only designed to hold 50 pounds which causes fixtures to fall and create a major safety hazard. By sizing a box according to ceiling height makes more sense because if the ceiling height is over 10 ft you know that the fixture eventually installed on the ceiling will most likely weigh over 50 pounds. The box that should be installed in a new home should be a listed type box where the weight of the fixture is not on the box but independently supported by the building frame.

I am a licensed electrician in the states of New Jersey and New York with 25 years of experience. I have developed such a support box. It is patented and UL listed and able to support fixtures r anging from 0 to 800 pounds. The box is licensed to Westinghouse and is sold as (Hercules Heavy-Duty Chandelier & Fixture Brace - Westinghouse Model Number 01800).

Panel Meeting Action: Reject

Panel Statement: There has been no fact-finding work to support the broad assertion that most homeowners will install very heavy (over 50 lb) fixtures in high ceilings. The NEC cannot be written to anticipate every attempt to violate its terms.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-58 Log #286 NEC-P09 **Final Action: Reject**
(314.27(C) Exception)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"Where the Authority Having Jurisdiction judges them free from likely exposure to ~~physical damage~~ blows or abrasion...".

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

The proposed rewording is an attempt at precision. Furthermore, if you reject the full rewording I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject

Panel Statement: The use in CMP-9's articles is consistent with the rest of the Code. CMP-9 understands that this is a global proposal and if this terminology changes, it must be evaluated by the Technical Correlating Committee and guidance provided to code making panels so the results will be consistent.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-59 Log #930 NEC-P09 **Final Action: Reject**
(314.27(C) Exception)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete "Receptacles and covers shall be listed as an assembly for this type of location."

Substantiation: The requirement is vague; is there a specific listing for this location? Where the location is free from exposure to damage, moisture, and dirt there does not seem to be a substantial reason not to permit standard type receptacles, plates, or weatherproof covers.

Panel Meeting Action: Reject

Panel Statement: Removal of this requirement would be incorrect, as products listed under the category for "Receptacles for Plugs and Attachment Plugs" may additionally be evaluated and listed as an assembly for this type of application. As noted on the UL guide card for this category: "Display receptacles are provided with a flush device cover plate or outlet box cover and closure plug or plugs. They are intended for use in show window floors and similar locations where the device is not likely to be subjected to scrub water. They are not intended to be used as substitutes for floor boxes, which are covered under Metallic Outlet Boxes (QCIT) and Nonmetallic Outlet Boxes (QCMZ)."

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-60 Log #1961 NEC-P09 **Final Action: Accept**
(314.27(D))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Add text to read as follows:

(D) Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

Where two or more separately switched, ungrounded conductors are provided to a ceiling mounted outlet box, the outlet box or outlet box system shall be listed for sole support of a ceiling-suspended (paddle) fan.

Substantiation: Many new homes are built where they have multiple wired switches for future fans with luminaire kits. Standard boxes are installed with standard luminaires. The homeowner will replace the luminaire with a fan unaware that the ceiling box is not rated for the support of a fan and lumnaire kit.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 7 Negative: 3

Ballot Not Returned: 1 de Vega, H.

Explanation of Negative:

HARTWELL, F.: The action on this proposal should have been to reject, using a similar statement to the one that appears on Proposal 9-57. How many homes are wired like this? There is no fact-finding work to support this proposal, only an assertion. I have been and remain, not always full time but always in some capacity, an electrical inspector for about 25 years and I have never seen a single instance of the wiring described in this proposal that resulted in a paddle fan. Fan boxes go in on the ceilings in selected locations, and then the fans go in as part of the final inspection process.

The scenario presented in the proposal is either a fraud or a conspiracy. If the new owners are aware that they will be installing paddle fans on substandard boxes, then it is a conspiracy and the NEC cannot be written in such a way as to preclude the effects of such conspiracies. If the new owners are not aware of the rules, and if the builders tell them that a fan with conventional mounting arrangements is an option, then such owners are the victims of a fraud. Listed fan boxes present little marginal cost in comparison to the significant risk to those who would perpetrate such a practice. There are far better ways to address this problem, if it really is a widespread problem, which do not violate the most sacred principles of NEC philosophy as expressed in 90.1.

For example, we could require actual notice, perhaps on the panel, that the ceiling outlet boxes wired as suggested in the proposal and located in rooms (specify) must not be used as the direct support of a paddle fan. This notice could be easily verified on inspection, and the existence of such a notice would immediately end the fraudulent practice where it exists. No builder is going to try and save the small amount of money involved in fan boxes and end up having to explain such a notice to a buyer or to a Realtor. The notice would also allow such an application when the multiple switched conductors were installed for legitimate purposes.

Examples abound. Many chandeliers are wired with one set of lamps controlled independently from the remaining lamps. Many ceilings are wired with multi-circuit lighting track for which such switching arrangements are required. In addition, the panel must never forget that fan boxes are not and never have been the only acceptable method of hanging a paddle fan. They are only required when the box is the sole support of the fan. I recently wired a group of paddle fans in a school cafeteria using surface metal raceway. After carefully special ordering surface raceway boxes listed for paddle fan support (yes, they exist), I discovered that the fans that came in later actually mounted to hooks that had to be structurally mounted. The outlet box classification turned out to be irrelevant, because the fans hang from 3/8-inch threaded eyehooks set in concrete anchors. The boxes still serve an aesthetic purpose, of course, because they rise to meet the fan canopies.

Remember, nothing in this proposal restricts its application to housing. I also once wired a paddle fan to an outlet box that was placed in a home run involving many circuits running through ¾-in. EMT. The outlet box consisted of a 4 11/16-in. sq. by 2 1/8-inch deep steel box, with a similar size extension box, and a 4 11/16-in. sq. by 4-inch round by 5/8-in. rise plaster ring. Does anyone seriously believe such a box is or ever will be available as a fan box? Did it matter? No, because the framing supporting the box was specifically intended to receive the pair of lag bolts used to hold the fan bracket. This installation met all NEC requirements, but it would fail the requirements in this proposal. Why should we send the inspection community into the uncertain realm of 90.4 for all these legitimate applications, both residential and nonresidential?

We must never forget that a ceiling outlet box wired as described in the proposal is entirely safe until and unless a paddle fan is mounted in such a way that the box is the sole support of the fan. And 90.1(B) clearly tells us that NEC compliant installations today may not be suitable for future uses tomorrow. What stands between today and tomorrow is qualified, disinterested third-party inspection. If some jurisdictions are seeing the instances described in the proposal substantiation, it can only be because these jurisdictions have failed to create a regulatory environment that supports such inspections. This was the importance of the “Inspection Initiative” in the 1990s. Without inspection (and also without product standards) the NEC becomes invalid on its face, and our electrical safety system unravels. The logo of IAEI depicts the inspector as the keystone of the industry. That logo is exactly correct, and rules that presume the absence of inspection create a completely misleading sense of security.

LEMAY, T.: There are multiple reasons for installing two or more separately switched ungrounded conductors to a ceiling mounted outlet box. A few examples are independent control of a paddle fan-light kit assembly, dual level switching of multiple lamp or multiple ballasted luminaries, control of an outlet “down stream” from the referenced lighting outlet or having a spare controlled ungrounded circuit conductor in a light outlet for extension to a load in another part of the room at a later time, i.e. the addition of recessed light(s) to illuminate a special piece of furniture that has not yet been purchased.

There are multiple reasons that would require an installer to use a ceiling fan rated outlet box in lieu of a standard Lighting Outlet Box. A few examples would be if the room or area or volume of an area in an occupancy provided for an obvious use of a paddle fan or if the builder, and user or designer specified a paddle fan at a specific outlet location, or perhaps it is known that a luminaire with excessive weight would be installed at the outlet location.

The premise that having two or more separately switched ungrounded conductors present in ceiling mounted outlet box as being “the” reason to require this box to be a ceiling fan rated box does not, in itself, provide substantiation for an additional code requirement.

MCCULLOUGH, R.: The submitter has not provided any data to support the claim that the homeowner will replace the luminaire with a fan unaware that the ceiling box is not rated for the support of a fan and luminaire kit. Changes to UL 507 in recent years require clearly visible markings on the outside of the carton for ceiling-suspended (paddle) fans as well as statements in the installation instructions regarding proper support for these fans. The substantiation only talks about homes but the proposed language would require fan support boxes in any type of occupancy and at many locations where two switch legs are provided yet fans could never be installed. An example of this could be a commercial showroom where two separately switched ungrounded conductors may be provided to allow for the future installation of two-circuit track lighting or perhaps separately switched night lighting. In many cases, a ceiling outlet box for such track lighting is located 18 in. off the wall and paddle fans would not be installed there, but this proposal would require a fan box. This change would also require a fan rated box at a location where provisions may have already been made to support the fan independently of the box.

I do not feel that we should be trying to write Code rules to cover every possible misuse of products or people ignoring clearly stated installation rules or all possible scenarios of future installations.

9-61 Log #3172 NEC-P09 **Final Action: Reject**
(314.27(D))

Submitter: Wally Harris, Atlantic Inland Inspections

Recommendation: Revise this section to read as follows:

(D) Boxes at Ceiling-Suspended (Paddle) Fan Outlets

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall comply with the following:

(1) Boxes shall be listed

(2) Shall be marked by their manufacturer as suitable for this purpose.

(3) Shall not support ceiling-suspended (paddle) fans that weigh more than 32kg (70 lb).

(4) Outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16kg (35 lb), shall have the required marking state the maximum weight to be supported.

Substantiation: Will clarify and make section easier to understand.

Panel Meeting Action: Reject

Panel Statement: The proposed wording is no clearer than the present text, and violates the NEC Manual of Style for list items because parallel construction is not used.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-62 Log #2612 NEC-P09 **Final Action: Accept in Principle**
(314.27(E) (New))

Submitter: David H. Kendall, Carlon

Recommendation: Add a new section 314.27 to read as follows:

(E) Outlet Boxes in a Ceiling. Single gang outlet boxes not larger than 57 mm x 100 m (2 1/4 in. x 4 in.) and round or octagonal outlet boxes not larger than 100 mm (4 in.) in diameter are permitted to be installed in a ceiling for receptacles, smoke detectors or any device not defined as a luminaire (fixture) or lampholder and that weighs 3 kg (6 lbs) or less.

Substantiation: This proposal is for clarification and to make the code more user friendly. Outlet boxes are installed in ceilings as a common practice. The most common use for outlet boxes in a ceiling is for garage door openers where a receptacle is required. The only reference in the NEC that indicates that single gang boxes may be permitted to be installed in a ceiling is 314.17(C) Exception. This new text makes it clear to the user of the Code that these types of boxes are permitted in the ceiling. Round or octagonal boxes listed as outlet boxes and are not marked for luminaire support and should not be excluded from this rule.

Panel 9, during the 2005 ROP, confirmed that there is confusion in the Code by Stating “CMP 9 recognizes confusion with regard to this issue and recommends coverage in the NECHB.” The confusion and rule can be addressed by accepting the proposed language. The NECHB is not an enforceable code book and not all contractors and inspectors carries the NECHB with them. The new text makes it clear and user friendly that these types of boxes are permitted in the ceiling.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 9-63.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-63 Log #3399 NEC-P09 **Final Action: Accept in Principle**
(314.27(E) (New))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal by replacing text that is vague and unclear, such as "comparable size and weight". This action will be considered by the Panel as a Public Comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Add a new 314.27(E) as follows:
E. Utilization Equipment. Boxes used for the support of utilization equipment other than ceiling-suspended (paddle) fans shall meet the requirements of 314.27(A) and (B) for the support of a luminaire (fixture) of comparable size and weight.
Exception: Utilization equipment weighing no more than 3 kg (6 lb) shall be permitted to be ceiling mounted.
Substantiation: During the preceding NEC cycle, CMP 9 spent considerable time reviewing whether smoke detectors and the like were covered by this section, and therefore whether they needed to be mounted on outlet boxes (as opposed to device boxes). CMP 9 concluded, correctly, that no language in this part of the code restricted such placements. However, that result opened the question as to whether there were any enforceable limitations on utilization equipment so mounted, and whether there should be. This proposal provides the framework to place definitive limitations in the NEC. Note that the exception is necessary because the device box exception in 314.27(A) only applies to wall-mounted applications.
Panel Meeting Action: Accept in Principle
Revise the submitter's Exception text to read as follows:
Exception: Utilization equipment weighing not more than 3 kg (6 lb) shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the equipment or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.
Panel Statement: The Panel concludes that the revised text clarifies the intent of the submitter.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-64 Log #1461 NEC-P09 **Final Action: Reject**
(314.28)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
314.28 Pull and Junction Boxes and Conduit Bodies.
Boxes and conduit bodies used as pull or junction boxes shall comply with 314.28(A) through (D).
Exception: Terminal housing supplied with motors shall comply with the provisions of 430.12.
(A) Minimum Size. For raceways containing conductors of 4 AWG or larger, and for cables containing conductors of 4 AWG or larger, the minimum dimensions of pull or junction boxes installed in a raceway or cable run shall comply with (A)(1) through (A)(3). Where an enclosure dimension is to be calculated based on the diameter of entering raceways, the diameter shall be the metric designator (trade size) expressed in the units of measurement employed.
(1) Straight Pulls. ~~In straight pulls~~ . <u>In pulls where conductors are deflected 30 degrees or less,</u> the length of the box shall not be less than eight times the metric designator (trade size) of the largest raceway.
(2) Angle or U Pulls. Where splices <u>are made</u> or <u>in pulls where conductors are deflected greater than 30 degrees,</u> ~~angle or U pulls are made~~ , the distance between each raceway entry inside the box and the opposite wall of the box shall not be less than six times the metric designator (trade size) of the largest raceway in a row. This distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in the same row on the same wall of the box. Each row shall be calculated individually, and the single row that provides the maximum distance shall be used.
Exception: Where a raceway or cable entry is in the wall of a box or conduit body opposite a removable cover, the distance from that wall to the cover shall be permitted to comply with the distance required for one wire per terminal in Table 312.6(A).
The distance between raceway entries enclosing the same conductor shall not be less than six times the metric designator (trade size) of the larger raceway.
When transposing cable size into raceway size in 314.28(A)(1) and (A)(2), the minimum metric designator (trade size) raceway required for the number and size of conductors in the cable shall be used.
Substantiation: This proposal is intended to clarify what the difference between an angle pull and a U pull is. As currently written, it is subject to much interpretation. This language uses the 30 degree deflection parameter already set forth in many code sections, such as 366.58, 376.23 and 378.23.
Panel Meeting Action: Reject
Panel Statement: The Code is quite clear. Except in an infinitesimal number of custom-made pull box applications, the boxes all have four sides, one at right angles to the next. When conduits arrive at the box, the enclosed conductors do one of three things: They turn back on themselves and exit the side they came in on ("U" pull); they turn a right angle and leave an adjacent side (angle pull), or they leave the opposite side in something approximating a straight line (straight pull). They could also leave the back of the box, which would be an angle pull as well.
In the event that there is an actual enforcement issue, the submitter is encouraged to submit documentation in the future.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-65 Log #2731 NEC-P09 **Final Action: Reject**
(314.28, Exceptions No. 1 & No. 2)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for information.
Submitter: Doug Boggus, City of Grand Prairie
Recommendation: Revise text to read:
314.28 Pull and Junction Boxes and Conduit Bodies. Boxes and conduit bodies used as pull or junction boxes shall comply with 314.28(A) through (D).
Exception <u>No. 1</u> : Terminal housing supplied with motors shall comply with the provisions of 430.12.
<u>Exception No. 2: Boxes and wiring compartments utilized for the connection of appliances to supply conductors shall comply with 422.19.</u>
Substantiation: This is a companion proposal to a proposal to add requirements to Article 422 (proposed Section 422.19) for specific requirements for boxes and wiring compartments utilized in the connection of appliances to a power supply. The added Exception No. 2 is needed to correlate the proposed requirement to Article 422 with the requirements of 314.28. The proposal for inclusion into Article 422 is as follows:
422.19 Boxes and Wiring Compartments for Appliances. Boxes or wiring compartments used for a point of junction to an electrical power source, whether separate or furnished as a part of the appliance, shall comply with (1) through (5) where applicable:
(1) Where wire leads are provided by an appliance manufacturer for connection to an electrical power source, at least 150 mm (6 in.) of free conductor, measured from the wall of the box or wiring compartment opposite where the conductors emerge for termination to an electrical power source, shall be provided for splices to either a permanent wiring method or a cord connection.
(2) For either permanent wiring methods or cord connections used to supply the appliance, at least 150 mm (6 in.) of free conductor, measured from the point in the box or wiring compartment where the conductors emerges from its raceway or cable sheath shall be left for splices or for connection to terminals provided as a part of the appliance.
(3) Where the provided opening in a box or wiring compartment is less than 200 mm (8 in.) in any dimension and where wire leads are provided by the appliance manufacturer for connection to an electrical power source, each conductor shall be long enough to extend at least 75 mm (3 in.) outside the opening.
(4) Boxes and wiring compartments shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box or wiring compartment be less than the fill calculation as calculated in Table 422.19(A). Volumes of standard boxes that are not marked with their volume shall be as given in Table 314.16(A). Other boxes shall be durably and legibly marked with their volume by the box manufacturer, and appliance wiring compartments shall be durably and legibly marked with their volume by the appliance manufacturer.
(5) Conductors shall not be deflected within a box or wiring compartment unless a minimum wire-bending space per Table 422.19(B) is provided.

Table 422.19(A) Volume Allowance Required per Conductor

Size of Conductor (AWG)		Free Space Within Box for Each Conductor	
	mm^2	cm^3	in.^{3}
14 or smaller	2.1	32.8	2.00
12	3.3	36.9	2.25
10	5.3	41.0	2.50
8	8.4	49.2	3.00
6	13.3	81.9	5.00

Table 422.19(B) Minimum Wire-Bending Space within Box or Wiring Compartment

Size of Conductor (AWG)	Wire Bending Space mm	Wire Bending Space in.
14-10	Not Specified	
8-6	38.1	$1^1/_2$
4-3	50.8	2
2	63.5	$2^1/_2$
1	76.2	3

Panel Meeting Action: Reject
Panel Statement: CMP-9 will revisit this proposal in the event that CMP-17 takes favorable action on the companion Proposal, 17-21.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-66 Log #3400 NEC-P09 **Final Action: Accept**
(314.28(A))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise the first sentence by inserting the word "that are required to be insulated" after the first instance of the words "4 AWG or larger" as follows:
For raceways containing conductors of 4 AWG or larger that are required to be insulated , and for cables containing conductors of 4 AWG or larger, the minimum dimensions of pull or junction boxes installed in a raceway or cable run shall comply with (A)(1) through (A)(3).
Substantiation: Raceways are commonly used to route grounding electrode conductors, which are not required to be insulated and are often run bare. Such conduit runs often use conduit bodies to make changes of direction. The rules in 314.28 are related to the safety objective of making sure that conductor insulation is not degraded through excessively cramped bend radii in pull boxes and conduit bodies, whether through installation difficulty or through continuing stress after installation. These objectives are irrelevant to conductors that need not be insulated in the first place, whether or not insulated conductors are used. It is plainly excessive, for example, to require a mogul LB on a ½ trade size conduit body enclosing a 2 AWG grounding electrode conductor. Although this section is seldom applied this way, the literal text makes no allowance for these cases, and should. The concern raised in this proposal does not apply to cable assemblies, and therefore the other part of the sentence does not require a comparable modification.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-67 Log #2289 NEC-P09 **Final Action: Accept in Principle**
(314.28(A)(2))

Submitter: D. Williams, Lansing, MI
Recommendation: Revise text to read as follows:
(2) Splice and Angle or U Pulls. Where splices or where angle or U pulls are made, the distance between each raceway entry inside the box and the opposite wall of the box shall not be less than six times the metric designator (trade size) of the largest raceway in a row. This distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in the same row on the same wall of the box. Each row shall be calculated individually, and the single row that provides the maximum distance shall be used.
Substantiation: Sizing of junction boxes for splices wasn't very clear that for a straight pull that is being spliced you would use 314.28(A)(2) instead of (A)(1). This will clear this up.
Panel Meeting Action: Accept in Principle
Reword the title as follows:
"Angle or U Pulls, or Splices."
Panel Statement: CMP 9 prefers to keep the more customary application first.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-68 Log #966 NEC-P09 **Final Action: Accept**
(314.28(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete the last sentence:
An extension from the cover of an exposed box shall comply with 314.22, Exception.
Substantiation: Edit. This section primarily relates to covers while 314.22 primarily relates to extensions and is a more appropriate section. (See my proposal for 314.22, Exception).
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-69 Log #2917 NEC-P09 **Final Action: Reject**
(314.29)

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Revise as follows:
Boxes, Conduit Bodes, and Handhole Enclosures to Be Accessible. Boxes, conduit bodies, and handhole enclosures shall be installed so that the wiring contained in them can be rendered accessible without removing any part of the building or building mechanical systems . In underground circuits, enclosures shall be accessible without excavating sidewalks, paving, earth, or other substance that is to be used to establish the finished grade.
Substantiation: Plumbing pipes and heating ducts that are installed and used as building mechanical systems may not be considered "part of the building?" Unfortunately, some installers and enforcement authorities allow these items to impede access to electrical enclosures. This change would clarify the requirement that these items remain accessible.
Panel Meeting Action: Reject
Panel Statement: The Code is quite clear. CMP-9 refers the submitter to Article 100 for the definition of Accessible (as applied to wiring methods).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-70 Log #2130 NEC-P09 **Final Action: Reject**
(314.29 Exception No. 2 (New))

Submitter: Russell LeBlanc, Peterson School of Engineering
Recommendation: Add exception no. 2 to read:
Boxes connected to de-energized and abandoned wiring or wiring methods shall be permitted to be concealed.
Substantiation: There should be no safety concerns for a concealed box if wiring has been abandoned and de-energized.
Panel Meeting Action: Reject
Panel Statement: CMP-9 concludes that safety concerns still exist for concealed wiring that has been abandoned that may become energized.
The status of this wiring must be decided by the AHJ because the NEC is an installation code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-71 Log #440 NEC-P09 **Final Action: Accept**
(314.30)

Submitter: John D. Minick, National Electrical Manufacturers Association
Recommendation: Revise text to read as follows:
Handhole Enclosures. Handhole enclosures shall be identified for use in underground systems and shall be designed and installed to withstand all loads likely to be imposed.
Substantiation: The NEC TCC requested that NEC Panel 1 submit a proposal for the 2008 Code cycle to correct the wording in the definition of "handhole enclosure" so that the definition complies with the NEC Style Manual. A joint effort was undertaken by CMP-1 members John Troglia and John Minick to resolve the issue. This effort resulted in a proposal to delete the word "identified", which is a word that is in violation of NEC Style Manual Section 2.2.2. This proposal is a companion proposal to revise Section 314.30 by adding the word "identified" plus additional wording for clarification so that the section is not affected by the loss of the word "identified" in Article 100, definition of "Handhole Enclosure". The proposed revised definition of "Handhole Enclosure" to Article 100 will allow the 2008 NEC definition to read, "Handhole Enclosure. An enclosure ~~identified~~ for use in underground systems, provided with an open or closed bottom, and sized to allow personnel to reach into, but not enter, for the purpose of installing, operating, or maintaining equipment or wiring or both." These revisions should not affect the current intended requirements or uses permitted for such enclosures and retains the requirement that handhole enclosures be identified as well as being designed and installed to withstand all loads likely to be imposed.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-72 Log #1207 NEC-P09 **Final Action: Accept in Principle**
(314.30)

Submitter: Dennis Downer, Morrisville, VT
Recommendation: Delete the wording of 314.30 as follows:
314.30 Handhole Enclosures.
(C) Handhole Enclosures ~~Without Bottoms~~ . Where handhole enclosures ~~without bottoms~~ are installed, all enclosed cables conductors and any splices or terminations, if present, shall be listed as suitable for wet locations.
Substantiation: Where handhole enclosures are installed, what difference does it make if the enclosure has a bottom or not, the box has the possibility of having water enter the enclosure the enclosed conductors, cables and any splices or terminations if present, shall be listed as suitable for wet locations. Also, the word cables should be added to make it consistent with 300.5(B).
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 9-77.
The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-73 Log #589 NEC-P09 **Final Action: Accept in Principle**
(314.30(C))

Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Revise text to read as follows:
(C) ~~Handhole Enclosures Without Bottoms.~~ Conductors, Splices, and Terminations. ~~Where handhole enclosures without bottoms are installed,~~ All enclosed conductors and any splices or terminations, if present, shall be listed as suitable for wet locations.
Substantiation: Wet locations, in Article 100, are defined as: Installations under ground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather.
300.5(B) addresses conductors: (B) Listing. Cables and insulated conductors installed in enclosures or raceways in underground installations shall be listed for use in wet locations.
Water can, and will accumulate in underground raceways, and handhole enclosures with or without bottoms; it's essential that conductors, splices, and terminations in both types of enclosures be listed for wet locations.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 9-77.
The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-74 Log #1749 NEC-P09 **Final Action: Accept in Principle**
(314.30(C))

Submitter: Don Watters, Wheeler Electric
Recommendation: Revise text to read as follows:
(C) Conductors in handhole enclosures ~~without bottoms. where handhole enclosures without bottoms are installed,~~ all enclosed conductors and any splices or terminations, if present, shall be listed as suitable for wet locations.
Substantiation: Handhole enclosures may be constructed with or without bottoms, and are installed at or below ground level in direct contact with concrete, masonry or the earth. Installations in these enclosures with bottoms are subject to becoming, a wet location by penetrations for conductors or raceways which are not required to be mechanically connected to the enclosure or sealed.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 9-77.
The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-75 Log #3296 NEC-P09 **Final Action: Reject**
(314.30(C))

Submitter: David Mercier, Southwire Co.
Recommendation: Add text to read as follows:
314.30 Handhole Enclosures
(C) Handhole Enclosures Without Bottoms - Where handhole enclosures without bottoms are installed, all enclosed conductors shall be listed for direct burial and any splices or terminations, if present, shall be listed as suitable for wet locations.
Substantiation: Handhole enclosures without bottoms often use rock fill to drain water that may collect in the enclosure due to rain. The rock and possible debris found in the bottom of handhole enclosures can easily damage conductors rated for wet locations due to the thinner insulations used on these conductors. Conductors listed for direct burial have a robust construction that is designed for installations in contact with earth.
Panel Meeting Action: Reject
Panel Statement: CMP-9 discussed the possibility of including a direct burial parameter at length during the comment meetings for the 2005 NEC, and decided against it. The only difference in the test protocol for a direct-burial rating and a wet location rating for conductors is that the direct-burial conductors get an additional impact test to simulate backfill being shoveled over the wiring. Although handholes are frequently flooded, and subject to dirt infills, those infills take place over very long time periods such that the conditions that prompted an impact test would never be seen on the inside of the handhole. Therefore a direct burial requirement in these cases is excessive.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-76 Log #3401 NEC-P09 **Final Action: Accept in Principle**
(314.30(C))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
Handhole enclosures shall be identified for the use. They shall be designed and installed to withstand all loads likely to be imposed.
Substantiation: This is a companion proposal to one that removes the identification requirement from Article 100. All rules that apply to handhole applications should be located here. In addition, inserting a requirement into a definition violates 2.2.2 of the NEC Style Manual. This proposal and its companion taken together do not change any requirements in the NEC.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 9-71.
The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-77 Log #3402 NEC-P09 **Final Action: Accept**
(314.30(C))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise to read as follows:
(C) Enclosed Wiring. All enclosed conductors and any splices or terminations, if present, shall be listed as suitable for wet locations.
Substantiation: The current requirement conditions the wet location rule on the handhole having no bottom, in spite of the fact that the enclosure will be located in a wet location. Under the terms of the Article 100 definitions that apply to locations, as well as the 2005 revision to 300.5(B), the interior of a handhole enclosure is classified as a wet location regardless of whether it has a bottom. This paragraph originated as a placeholder for a requirement that wiring in handhole enclosures without bottoms be suitable for direct burial. When CMP 9 decided during its meeting on comments for the 2005 NEC that wet location suitability was sufficient, the present wording was included, but the scope of this paragraph was not changed accordingly. This proposal corrects the oversight.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-78 Log #2238 NEC-P09 **Final Action: Accept in Principle**
(314.30(C))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
(C) Handhole Enclosures Without Bottoms. Where handhole enclosures without bottoms are installed ~~, all enclosed conductors and~~ any splices or termination, ~~if~~ present, shall be listed as suitable for wet locations.
Substantiation: This wording is not needed as 300.5(B) already requires that conductors installed in underground enclosures be listed as suitable for use in wet locations.
Panel Meeting Action: Accept in Principle Panel Statement: See panel action and statement on Proposal 9-77.
The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-79 Log #1715 NEC-P09 **Final Action: Reject**
(314.45 (New))

Submitter: Timothy Edwards, Alcan Cable
Recommendation: Add text to read as follows:
Part III Construction Specifications
314.45 Mounting Brackets. The mounting brackets for supporting Metal Boxes shall be listed for the purpose and shall have a thickness not less than 0.0625 in. (16 gauge) steel.

Substantiation: 314.40(B) Thickness of Metal defines the minimum thickness of metal boxes but the thickness for the bracket used to support and secure the boxes is not identified in the code. To ensure their suitability to support and secure boxes, it is essential that this requirement be specified in the code for the brackets. This change will ensure that the brackets, where used, will be capable of supporting the weight likely to be imposed on them from the boxes and other components of the system. Proposed thickness (16 gauge or 0.0625 in.) is consistent with the minimum dimensions used for the thickness of the steel used for boxes.
Panel Meeting Action: Reject
Panel Statement: Listed mounting brackets and outlet boxes including mounting brackets are governed by product standards that define the required level of performance necessary to support the loads likely to be placed upon them.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-80 Log #3088 NEC-P09 **Final Action: Reject**
(314.45 (New))

Submitter: Timothy Edwards, Alcan Cable
Recommendation: Add text to read as follows:
Part III Construction
314.45 (New) Mounting Brackets. The mounting brackets for supporting Metal Boxes shall be listed for the purpose and shall have a thickness not less than 0.0625 in. (16 gauge) steel.
Substantiation: 314.40(B) Thickness of Metal defines the minimum thickness of metal boxes but the thickness for the bracket used to support and secure the boxes is not identified in the code. To ensure their suitability to support and secure boxes, it is essential that this requirement be specified in the code for the brackets. This change will ensure that the brackets, where used, will be capable of supporting the weight likely to be imposed on them from the boxes and other components of the system. Proposed thickness (16 gauge or 0.0625 in.) is consistent with the minimum dimensions used for the thickness of the steel used for boxes.
Panel Meeting Action: Reject
Panel Statement: Listed mounting brackets and outlet boxes including mounting brackets are governed by product standards that define the required level performance necessary to support the loads likely to be placed upon them.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-81 Log #2568 NEC-P09 **Final Action: Reject**
(314.72)

Submitter: Larry Rogers, Vattertott College-Tulsa / Rep. Vatterott Colleges, NFPR and IAEI Member
Recommendation: Add new text as follows:
Enclosure fronts or faces; All unfinished edges, internally and externally of enclosure faces shall be rounded or de-burred to a smooth finish.
Substantiation: I am using enclosures in a generic form to include panel boards, auxiliary gutters, surface metal raceways, and large junction boxes above 4 11/16. Sharp corners/edges on enclosures have caused thousands of injuries to workmen and also thousands of hours of lost time man hours. Also, damage to the integrity of conductor insulation during installation or inspection is a problem with results of sometimes immediate arc flash or they are found later with a bare hand, which could lead to a fatal shock or serious cut due to jerk reaction. We ask this panel to consider having the manufacturer remove these sharp edges prior to shipment, thus attacking the problem from the start. Sharp edges stay sharp for years.
Panel Meeting Action: Reject
Panel Statement: CMP 9 notes that the proposal is improperly located, in that it would only apply to medium voltage applications.
Regardless of the intended location, CMP-9 agrees with the submitter that there are legitimate concerns in this area.
This proposal is a product standards requirement and does not need to be part of the installation code. It is suggested that the submitter propose revisions to the appropriate product standards through the particular standards revision process.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
BELISLE, R.: My notes indicate CMP-9 generally agreed that there is a legitimate concern over the issue relating to sharp edges and worker injuries, yet failed to act due to improper section numbering. We believe the submitter has a valid point, which deserves attention. Product standards are responsible for construction of electrical equipment, but will not change until the NEC changes. If the NEC disallows the practice of sharp edges, Standards will be quick to follow with appropriate changes.
We believe the CMP should act to insert the proposed language into new sections <u>312.10(D)</u> and <u>314.40 (E)</u> .
These locations would apply to all boxes and enclosures of concern.

Comment on Affirmative:
LEMAY, T.: The submitte's concerns are valid with regard to numerous electrical equipment parts and enclosures having sharp corners and edges that cause accidental injury.
There are many emergency room visits requiring suturing of open wounds caused by accidental impact with these items that could be avoided if efforts were taken to provide for rounded or deburred edges.
I agree with the panel in that this is a product standards issue.

ARTICLE 320 — ARMORED CABLE: TYPE AC

7-1 Log #1536 NEC-P07 **Final Action: Accept**
(320, 330, 332, 334 and 340)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 320, 330, 332, 334, and 340 as described in the following, relative to the terms bonding and grounding.
320.108 Revise 320.108 as follows:
320.108 Equipment Grounding <u>Conductor</u> . Type AC cable shall provide an adequate path <u>for fault current as required by 250.4(A)(5) or 250.4(B)(4) to act as an</u> equipment grounding <u>conductor</u> ~~as required by 250.4(A)(5) or 250.4(B)(4)~~ .
330.108 Revise 330.108 as follows:
330.108 Equipment Grounding <u>Conductor</u> . Where Type MC cable is used ~~for~~ <u>to provide</u> an equipment grounding <u>conductor,</u> it shall comply with 250.118(10) and 250.122.
332.108 Revise 332.108 as follows:
332.108 Equipment Grounding <u>Conductor</u> <u>.</u> Where the outer sheath is made of copper, it shall provide an adequate path <u>to serve as an equipment grounding conductor</u> ~~for equipment grounding purposes~~ . Where <u>the outer sheath is</u> made of steel, ~~an~~ <u>a separate</u> equipment grounding conductor shall be provided.
334.15(C) Revise 334.15(C) as follows:
(C) In Unfinished Basements. Where cable is run at angles with joists in unfinished basements, it shall be permissible to secure cables not smaller than two 6 AWG or three 8 AWG conductors directly to the lower edges of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. NM cable used on a wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing. Conduit or tubing shall utilize a nonmetallic bushing or adapter at the point the cable enters the raceway. Metal conduit and tubings and metal outlet boxes shall be connected to an <u>equipment grounding conductor</u> ~~grounded.~~
334.108 Revise 334.108 as follows:
334.108 Equipment Grounding <u>Conductor</u> . In addition to the insulated conductors, the cable shall have an insulated or bare <u>equipment grounding</u> conductor ~~for equipment grounding purposes only~~ .
340.108 Revise 340.108 as follows:
340.108 Equipment Grounding <u>Conductor</u> <u>.</u> In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare <u>equipment grounding</u> conductor ~~for equipment *grounding* purposes only~~ .
Substantiation: 320.108: The term “Equipment Grounding Conductor” instead of “Equipment Grounding” is proposed in order to use defined terms.
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334.15(C): The proposed text is more prescriptive. The existing rule requires a connection to an equipment grounding conductor.
334.108: The proposed text is more prescriptive. The existing rule requires a connection to an equipment grounding conductor.
340.108: The proposed text is more prescriptive. The existing rule requires a connection to an equipment grounding conductor.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms “bonded”, “grounded”, and “equipment grounding conductor” in Article 100 relative to this Task Group’s recommendations. These changes clarify the present requirement in more prescriptive language.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BROWN, H.: We recommend that this proposal be rejected.
While it is apparent that an enormous amount of work went into this project by the task group, the participation level reported, including the 50.0% and 61.1% involved in the final decision-making teleconferences, makes us question how it was determined that consensus was achieved. Section 4.1 reports “all TG members who participated in the review of the purpose and the intent of the existing Grounding and Bonding terms in the 2005 NEC achieved consensus with the results as shown in the table in Attachment 4 titled ‘Table of NEC article 100 Summary of Proposed Terms and Substantiation.

It is not clear to us whether the consensus noted in Section 4.1 is consensus of the 52.8% participation rate for all eight meetings as indicated in Section 1.2, or the 50.0% and 61.1% involved in the final decision-making teleconferences. Either way, we are not confident that the results of this Task Group represent consensus and justification for the TCC to offer those findings as a TCC Proposals for the 2008 NEC.

7-2 Log #1495 NEC-P07 **Final Action: Accept**
(320.10(1))

Submitter: Chris MacCreery, Battle Creek Electrical JATC
Recommendation: Revise text to read as follows:
320.10 Uses Permitted.
Type AC cable shall be permitted as follows:
(1) For feeders and branch circuits in both exposed and concealed work.
Substantiation: Some cable articles (MI cable, MC cable, IGS cable, FCC, etc.) stipulate that the cable can be used for feeders, branch circuits and sometimes service entrance. AC cable is not so stipulated. What type of circuits can it be used on? Shouldn't all the articles be similar in uses and permitted and uses not permitted?
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-3 Log #331 NEC-P07 **Final Action: Reject**
(320.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) Where subject to ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-4 Log #3043 NEC-P07 **Final Action: Reject**
(320.13)

Submitter: Melvin K. Sanders, TECo Inc.
Recommendation: Insert in new Section 320.13 the following.
320.13 Protection Against Physical Damage
Where subject to physical damage, wiring methods shall be protected by either, or all, in the following manner.
(A) Cables and Raceways Through Wood Members.
(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in joists, rafters, or wood members, holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/ 4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.
Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(2) Notches in Wood. Where there is no objection because of weakening the building structure, in both exposed and concealed locations, cables or raceways shall be permitted to be laid in notches in wood studs, joists, rafters, or other wood members where the cable or raceway at those points is protected against nails or screws by a steel plate at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width, installed to cover the area of the wiring. The steel plate shall be installed before the building finish is applied.
Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(B) Nonmetallic-Sheathed Cables and Electrical Nonmetallic Tubing Through Metal Framing Members.
(1) Nonmetallic-Sheathed Cable . In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings or listed grommets covering all metal edges that are securely fastened in the opening prior to installation of the cable.
(2) Nonmetallic-Sheathed Cable and Electrical Nonmetallic Tubing. Where nails or screws are likely to penetrate nonmetallic-sheathed cable or electrical nonmetallic tubing, a steel sleeve, steel plate, or steel clip not less than 1.6 mm (1/ 16 in.) in thickness shall be used to protect the cable or tubing.
Exception: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(C) Cables and Raceways Parallel to Framing Members and Furring Strips. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed parallel to framing members, such as joists, rafters, or studs, or is installed parallel to furring strips, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (1-1/ 4 in.) from the nearest edge of the framing member or furring strips where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1.6 mm (1/ 16 in.) thick.
Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: For concealed work in finished buildings, or finished panels for prefabricated buildings where such supporting is impracticable, it shall be permissible to fish the cables between access points.
Exception No. 3: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(D) Cables and Raceways Installed in Shallow Grooves. Cable- or raceway-type wiring methods installed in a groove, to be covered by wallboard, siding, paneling, carpeting, or similar finish, shall be protected by 1.6 mm (1/ 16 in.) thick steel plate, sleeve, or equivalent or by not less than 32-mm (1-1/ 4-in.) free space for the full length of the groove in which the cable or raceway is installed.
Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
Substantiation: The wiring methods typically installed in wooded frame structures are Article 320 (Type AC), Article 330 (Type MC), Article 334 (Types NM, NMC, and NMS), and Article 362 (ENC). Insofar as Article 340 (Type UF) is installed in lieu of Article 334 wiring methods, its installation must meet the requirements of Article 334 Parts II and III, and also subject to the same installation restrictions.
Since the 1975 Edition of the NEC, there has been a requirement in Section 300.4 that steel plates or bushings be installed to provide protection of certain wiring method against damage from ordinary nails or screw-nails when they pass through wooden members or laid in notches or grooves and the distance from the nail direction could not be the required 1-1/4 inch (32 mm).
This restriction placed in Article 300 has prevented those CMP's most knowledgeable in application of these products from using any other protection schemes or technology for this purpose. During the 2005 ROP/ROC stage, fact-finding reports were presented to CMP 3 highlighting the steel plates called for provide little or no protection against nails or screw-nails larger than #8 or equivalent trade designation. Since Section 300.4 first paragraph was changed in 2005 ROP to emphasize conductors are to be protected against physical damage, it is obvious that such protection is to be provided by the wiring method in which they are contained, as spelled out in Section 300.3(A). Because the Scopes of Section 320.1, 330.1, 334.1, 340.1 and 362.1 state they govern the installation of those wiring methods which, by Section 300.3(A), contain the conductors that are to be protected, as stated in Section 300.4 first paragraph.
Sections 320.12(1), 330.12(1), 340(10), and 362.12(10) state those wiring methods are not to be exposed to physical damage, therefore the contained conductors are inherently protected against damage which meets the intent of Section 300.4 first paragraph, and Section 300.3(A) is satisfied.
This would allow Article 300 to set the general guidelines and allow CMP 7 and CMP 8 to set rules deemed necessary to protect appropriate wiring methods.

Separate proposals are being made to CMP 3 and CMP 8 to address the text to be deleted from Article 300. Coordination between all affected CMP's will be essential in order for this to be accomplished in one ROP/ROC cycle.

Panel Meeting Action: Reject

Panel Statement: Section 300.4 specifies requirements for protection against physical damage. Article 320 references those portions of 300.4 that Code-Making Panel 7 requires to be applicable to type AC cable. Code-Making Panel 7 can, at any time, include additional protection requirements to supplement those in 300.4 or modify the 300.4 requirements. It is not necessary to repeat the 300.4 requirements in multiple cable articles when the appropriate requirements in 300.4 can simply be referenced as appropriate in each cable article. Addition of 320.13 would unnecessarily increase the size of the Code without providing additional clarity.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-5 Log #330 NEC-P07 **Final Action: Reject**

(320.15)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"...Exposed runs shall also be permitted to be installed on the underside of joists where supported at each joist and located so as not to be subject to ~~physical~~ damage.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-6 Log #1403 NEC-P07 **Final Action: Reject**

(320.23, 320.23(A))

Submitter: George Stolz, II, Pierce, CO

Recommendation: Revise text to read:

320.23 In Accessible Attics. ~~Type AC cables~~ Cables in accessible attics or roof spaces that are suitable for storage shall be installed as specified in 320.23(A) and (B). Spaces that have no floor installed shall be considered unsuitable for storage in applying the requirements of this section.

(A) Where Run Across the Top of Floor Joists. Where run across the top of floor joists, or within 2.1 m (7 ft) vertically of floors installed across the top of rafters or studding ~~of floor or floor joists across the face of rafters or studding, in attics and roof spaces that are accessible, the~~ cable shall be protected by substantial guard strips that are at least as high as the cable. Where this space is not accessible by permanent stairs or ladders, protection shall only be required within 1.8 m (6 ft) of the nearest edge of the scuttle hole or attic entrance.

Substantiation: Under the 2005 NEC, cables in attic spaces that are unusable for storage spaces are being needlessly protected against damage that will not likely occur. Revising this text to apply only to attic spaces with flooring installed will be as effective, while relieving installers from the requirement to protect cables where no such protection is necessary. In addition, the removal of the reference to AC cable in 320.23 will provide clarity in relation to other articles that reference this code, such as 334.23. The term "AC cable" is unnecessary in this context, as it is located in the article by the same name.

Panel Meeting Action: Reject

Panel Statement: Section 320.23 is specific to type AC cable and that wording should remain. Section 334.23 refers to 320.23 as an additional requirement for that application and eliminates the need to repeat the text in 320.23. The panel does not accept the revisions proposed for 320.23, since occupants can place storage items (Christmas decorations, summer outdoor furniture, boxes of clothing or housewares, etc.) on top of the floor joists when the attic or roof space is accessible by any means. Section 320.23 provides relief when the space is not accessible by permanent stairs or ladders.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-7 Log #2252 NEC-P07 **Final Action: Reject**

(320.23(A))

Submitter: Bryan P. Holland, Holland Electric

Recommendation: Relocate all the text in 320.23(A) to 300.4 - Between "where" and "run", add the terms Type AC, MC, and NM - Change 320.23, 330.23, and 334.23 to reference the new section in 300.4.

Substantiation: This requirement is in a poor location as currently placed. This rule applies to more than one cable type and, therefore, should be relocated to the general requirements of 300.4 and not be placed in one of the three cable articles. Each cable method that must comply with this rule can reference this section in their respective articles instead of referring them to another cable article.

Panel Meeting Action: Reject

Panel Statement: Article 300 applies to all cable types, and relocation of the proposed rules to 300.4 would then make the requirements applicable to all cable types with no substantiation for such a broad change. The present Code includes the additional requirements for attics and roof spaces in only those articles where the requirement is applicable.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-8 Log #2944 NEC-P07 **Final Action: Reject**

(320.23(A))

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Revise the existing 320.23(A) as follows:

320.23 In Accessible Attics. Type AC cables in accessible attics or roof spaces shall be installed as specified in 320.23(A) and (B).

(A) Where Run Across the Top of Framing Members ~~Floor Joists~~ . In attics and roof spaces that are accessible, cables that are installed within 2.1 m (7 ft) above the framing members such as ceiling or floor joists shall be protected by substantial guard strips that are at least as high as the cable where the cable is: ~~Where~~

(1) run across the top of framing members ~~floor joists, or within 2.1 m (7 ft) of floor or floor joists~~

(2) across the face of rafters or studding, ~~in attics and roof spaces that are accessible, the cable shall be protected by substantial guard strips that are at least as high as the cable.~~

Where this space is not accessible by permanent stairs or ladders, protection shall only be required within 1.8 m (6 ft) of the nearest edge of the scuttle hole or attic entrance.

(B) Cable Installed Parallel to Framing Members. Where the cable is installed parallel to the sides of rafters, studs, or framing members such as ceiling or floor joists, neither guard strips nor running boards shall be required, and the installation shall also comply with 300.4(D).

Substantiation: This proposal intends editorial improvements rather than substantive changes. The term "framing members" is being used in some locations as often, the joists that serve as the lower level of the attic are referred to as ceiling joists and not floor joists.

In addition, the sentence is proposed to be restructured for ease of reading and understanding.

Panel Meeting Action: Reject

Panel Statement: The existing wording is specific and adequate.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

SCHUMACHER, D.: This should have been accepted, it clears up any misunderstanding as to the definition of floor joists, and ceiling joists, by calling them framing members.

7-9 Log #3603 NEC-P07 **Final Action: Reject**

(320.23(A))

Submitter: Douglas Hansen, Code Check

Recommendation: Add the following text: For purposes of this section, a folding or pull down ladder is not considered permanent.

Substantiation: Homeowners often replace attic hatches with pull-down ladders to eliminate the need for a portable ladder. The installation of these pull-down ladders does not change the functional use of the accessible unfinished attic space, and the electrical wiring requirements should not change because of the presence of such a ladder.

Panel Meeting Action: Reject

Panel Statement: Addition of a pull-down ladder provides almost the same convenience as a permanent ladder and the occupant is more likely to utilize the space for storage. In fact, installation of a pull-down ladder would indicate that the space is intended to be used for storage.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-10 Log #2203 NEC-P07 **Final Action: Reject**
(321 (New))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Add a new article to read as follows:
ARTICLE 3XX Polymeric Armor Cable: Type PA
I. General
3XX.1 Scope. This article covers the use, installation, and construction specification of polymeric armor cable, Type PA.
3XX.2 Definition.
Polymeric Armor Cable, Type PA. A factory assembly of one or more insulated circuit conductors with a ground conductor, with or without optical fiber members enclosed in an armor sheath of suitable polymeric materials with an overall flame-retardant jacket.
II. Installation
3XX.10 Uses Permitted.
(A) General Uses. Type PA cables shall be permitted as follows:
(1) For services, feeders, and branch circuits
(2) For power, lighting, control, and signal circuits
(3) Indoors or outdoors
(4) Where exposed or concealed
(5) Direct buried where identified for such use
(6) In cable tray where identified for such use
(7) In any raceway
(8) As aerial cable on a messenger
(9) In dry locations and embedded in plaster finish on brick or other masonry except in damp or wet locations
(10) In wet locations where any of the following conditions are met;
a. A moisture-impervious jacket is provided over the armor sheath.
b. The insulated conductors under the polymeric covering are listed for use in wet locations.
(B) Specific uses. Type PA cable shall be installed in compliance with Parts II and III of Article 725 as applicable and in accordance with 330.10(B)(1) through (B)(4).
(1) Type PA cable shall be installed in cable tray and shall comply with 392.3, 392.4, 392.6 and 392.8 through 392.13.
(2) Direct Buried. Direct-buried cable shall comply with 300.5 or 300.50, as appropriate.
(3) Installed as Service-Entrance Cable. type PA cable installed as service-entrance cable shall be permitted in accordance with 230.43.
(4) Installed Outside of Buildings or as Aerial Cable. Type PA cable installed outside of buildings or as aerial cable shall comply with 225.10, 396.10 and 396.12.
FPN: The "Uses permitted" is not an all-inclusive list.
3XX.12 Uses Not Permitted. Type PA cable shall not be used where exposed to the following destructive corrosive conditions, unless the cable is protected by material suitable for the conditions:
(1) Where subject to physical damage
(2) Direct burial in the earth
(3) In concrete.
FPN to (3): PA Cable that is identified for direct burial applications is suitable for installation in concrete.
3XX.17 Through or Parallel to Framing Members. Type PA cable shall be protected in accordance with 300.4(A), (B), (C) and (D) where installed through or parallel to framing members.
3XX.23 In Accessible Attics. The installation of Type PA cable in accessible attics or roof spaces shall also comply with 320.23.
3XX.24 Bending Radius. Bends in Type PA cable shall be so made that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than 12 times the external diameter.
3XX.30 Securing and Supporting.
(A) General. Type PA Cable shall be supported and secured by staples, cable ties, straps, hangers, or similar fittings or other approved means designed and installed so as not to damage the cable.
(B) Securing. Unless otherwise provided, cables shall be secured at intervals not exceeding 1.8 m (6 ft). Cables containing four or fewer conductors sized no larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination.
(C) Supporting. Unless otherwise provided, cables shall be supported at intervals not exceeding 1.8 m (6 ft). Horizontal runs of Type PA cable installed in wooden or metal framing members or similar supporting means shall be considered supported and secured where such support does not exceed 1.8 m (6 ft) intervals.
(D) Unsupported Cables. Type PA cables shall be permitted to be unsupported where the cable:
(1) Is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical; or
(2) Is not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to a luminaire (lighting fixture) or other piece of electrical equipment and the cable and point of connection are within an accessible ceiling. For the purpose of this section, Type PA cable fittings shall be permitted as a means of cable support.
3XX.40 Boxes and Fitting. Fittings used for connecting Type PA cable to boxes, cabinets, or other equipment shall be listed and identified for such use.
3XX.80 Ampacity. The ampacity of Type PA cable shall be determined in accordance with 310.15 or 310.60 for 14 AWG and larger conductors and in accordance with Table 402.5 for 18 AWG and 16 AWG conductors. The installation shall not exceed the temperature ratings of terminations and equipment.
(A) Type PA Cable Installed in Cable Tray. The ampacities for Type PA cable installed in cable tray shall be determined in accordance with 392.11 and 392.13.
(B) Single Type PA Conductors Grouped Together. Where single Type PA conductors are grouped together in a triangular or square configuration and installed on a messenger or exposed with a free maintained airspace of not less than 2.15 times one conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities in the following tables:
(1) Table 310.20 for conductors rated 0 through 2000 volts.
(2) Table 310.67 and Table 310.68 for conductors rated over 2000 volts.
III. Construction Specifications.
3XX.104 Conductors. The conductors shall be of copper, aluminum, or copper-clad aluminum, solid or stranded. The minimum conductor size shall be 18 AWG copper and 12 AWG aluminum or copper-clad aluminum.
3XX.108 Equipment Grounding. In addition to the insulated conductor, the cable shall have an insulated or bare conductor for equipment grounding purposes only.
3XX.112 Insulation. Insulated conductors shall comply with 329.112(A) or (B).
(A) 600 Volts. Insulated conductors in sizes 18 AWG and 16 AWG shall be of a type listed in Table 402.3, with a maximum operating temperature of not less than 90°C (194°F) and as permitted by 725.27. Conductors larger than 16 AWG shall be of a type listed in Table 310.13 or of a type identified for use in Type PA cable.
(B) Over 600 Volts. Insulated conductors shall be of a type listed in Table 310.61 thorough Table 310.64.
3XX.116 Sheath. Sheath shall be continuous and polymeric in nature. Polymeric armor components shall be one or more of the following types: polyolefin, PVC or nylon; either formed or unformed. A metallic foil between layers may be permitted. Supplemental protection of an outer covering shall be permitted and shall be required where such protection is necessary.
Substantiation: Statement of Problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection, i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.
Substantiation for Proposal: Type PA cable offers enhanced mechanical protection over Type MC cable. See test data provided. A UL Fact-Finding Study comparing the subject cable to Type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: This cable construction is currently permitted as Type TC-ER and Type MV and, based on the construction details proposed, should comply with the Uses Permitted, Uses Not Permitted, and installation requirements for these existing cable types. Armor, as used in Chapter 3, refers to a metallic interlocking tape armor or a continuous metallic sheath. A non-metallic outer covering is a jacket.
A fact finding report is required before an article can be included in the Code for this new cable type.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 322 — FLAT CABLE ASSEMBLIES: TYPE FC

7-11 Log #319 NEC-P07 **Final Action: Reject**
(322.10(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(3) In Locations where they will not be subjected to ~~physical damage~~ <u>blows or abrasion.</u>
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this unnecessary.
The proposed rewording is an attempt at precision. Furthermore, if you retain "damage," I would then have to fall back to arguing that in that case the term "physical" should be eliminated.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two

reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: The word “physical” is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-12 Log #320 NEC-P07 **Final Action: Reject**
(322.40)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Fittings to be installed with flat cable assemblies shall be designed and installed to prevent ~~physical~~ damage to the cable assemblies.
Substantiation: Use of the word “physical” is superfluous– the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Let’s take care of that for good: for our purposes, “damage” means “physical damage.”
Panel Meeting Action: Reject
Panel Statement: The word “physical” is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 324 — FLAT CABLE CONDUCTOR: TYPE FCC

7-13 Log #198 NEC-P07 **Final Action: Reject**
(324 and 382)

NOTE: The following proposal consists of Comment 7-33 on Proposal 7-30 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 7-30 was:
Proposed Article 324, NEC 2005

FLAT CONDUCTOR CABLE

Type: FCC

I. General

1.1 Scope. This article covers a field-installed wiring system for branch circuits incorporating Type FCC cable and associated accessories as defined by the article. The wiring system is designed for installation under carpet squares or for installation on the surface of interior walls and ceilings.

324.2 Definitions.

Active Safety Device System. A comprehensive safety system for Type FCC installations. The Active Safety Device System includes a means for interrupting current flow to the Type FCC cable if a fault is detected in the FCC system. Faults detected by the Active Safety Device System include ground faults in the Type FCC cable or in equipment connected to the FCC system (ground-fault circuit-interrupter), faults between conductors in the Type FCC Cable, improper connection of the Type FCC cable, and improper wiring supplying the FCC system. ~~Active Safety Device SystemSystem. A comprehensive safety systemsystem for Type FCC installations. The Active Safety Device System includes a Ground Fault Circuit Interrupter (GFCI) and a means of disconnecting when a short occurs between FCC conductors.~~

Bottom Shield. A protective layer that is installed between the floor and Type FCC flat conductor cable to protect the cable from physical damage and may or may not be incorporated as an integral part of the cable.

Cable Connector. A connector designed to join Type FCC cables without using a junction box.

FCC System. A complete wiring system for branch circuits that is designed for installation under carpet squares or on the interior surface of walls and ceilings. - The FCC system includes Type FCC cable, Active Safety Device Systems, and ~~an active safety system~~ associated shielding, connectors, terminators, adapters, boxes, and receptacles.

Insulating End. An insulator designed to electrically insulate the end of a Type FCC cable.

Metal Shield Connections. Means of connection designed to electrically and mechanically connect a metal shield to another metal shield, to a receptacle housing or self-contained device, or to a transition assembly.

Top Shield. A grounded metal shield covering under-carpet components of the FCC system for the purposes of providing protection against physical damage.

Transition Assembly. An assembly to facilitate connection of the FCC system to other wiring systems, incorporating (1) a means of electrical interconnection and (2) a suitable box or covering for providing electrical safety and protection against physical damage.

Type FCC Cable. Three or more flat copper conductors placed edge-to-edge and separated and enclosed within an insulating assembly.

II. Installation

324.10 Uses Permitted.

(A) Branch Circuits. Use of FCC systems shall be permitted both for general-purpose and appliance branch circuits and for individual branch circuits.

(B) Branch Circuit Ratings.

(1) Voltage. Voltage between ungrounded conductors shall not exceed 300 volts. Voltage between ungrounded conductors and the grounded conductor shall not exceed 150 volts.

(2) Current. General-purpose and appliance branch circuits shall have ratings not exceeding 20 amperes. Individual branch circuits shall have ratings not exceeding 30 amperes.

(C) Floors. Use of FCC systems shall be permitted on hard, sound, smooth, continuous floor surfaces made of concrete, ceramic, or composition flooring, wood, and similar materials.

(D) Walls and Ceilings. Use of FCC systems shall be permitted on interior wall and ceiling surfaces, on hard, sound, continuous surfaces made of composite, concrete, gypsum, plaster, wood, and similar materials when used with an A~~a~~ctive S~~s~~afety Device S~~s~~ytem or when contained in surface metal raceways.

(E) Damp Locations. Use of FCC systems in damp locations shall be permitted.

(F) Heated Floors. Materials used for floors heated in excess of 30°C (86°F) shall be identified as suitable for use at these temperatures.

(G) System Height. Any portion of an FCC system with a height above floor level exceeding 2.3 mm (0.090 in.) shall be tapered or feathered at the edges to floor level.

(H) Coverings. Floor-mounted Type FCC cable, cable connectors, and insulating ends shall be covered with carpet squares not larger than 914 mm (36 in.) square. Those carpet squares that are adhered to the floor shall be attached with release-type adhesives.

(I) Corrosion Resistance. Metal components of the system shall be corrosion resistant, coated with corrosion-resistant materials, or insulated from contact with corrosive substances.

(J) Metal-Shield Connectors. Metal shields shall be connected to each other and to boxes, receptacle housings, self-contained devices, and transition assemblies using metal-shield connectors.

324.12 Uses Not Permitted. FCC systems shall not be used:

(1) Outdoors or in wet locations
(2) Where subject to corrosive vapors
(3) In any hazardous (classified) location
(4) In residential, school, and hospital buildings, except when used with an active safety ~~system~~ device system.
(5) On suspended or dropped ceilings.

324.18 Crossings of more than two flat cables shall not be permitted at any one point.

30.30 Securing and Supporting. All FCC system components shall be firmly anchored to the floor, ceiling, or wall using an adhesive or mechanical anchoring system identified for this use. Floors shall be prepared to ensure adherence of the FCC system to the floor until the carpet squares are placed.

324.40 Boxes and Fittings.

(A) Cable Connections and Insulating Ends. All Type FCC cable connections shall use connectors identified for their use, installed such that electrical continuity, insulation, and sealing against dampness and liquid spillage are provided. All bare cable ends shall be insulated and sealed against dampness and liquid spillage using listed insulating ends.

(B) Polarization of Connections. All receptacles and connections shall be constructed and installed so as to maintain proper polarization of the system.

(C) Shields.

(1) Top Shield. A metal top shield shall be installed over all floor-mounted Type FCC cable, connectors, and insulating ends. The top shield shall completely cover all cable runs, corners, connectors, and ends.

(2) Bottom Shield. A bottom shield shall be installed beneath all floor-mounted Type FCC cable, connectors, and insulating ends.

(D) Connection to Other Systems. Power feed, grounding connection, and shield system connection between the FCC system and other wiring systems shall be accomplished in a transition assembly identified for this use.

324.42 Devices.

(A) Receptacles. All receptacles, receptacle housings, and self-contained devices used with the FCC system shall be identified for this use and shall be connected to the Type FCC cable and metal shields. Connection from any grounding conductor of the Type FCC cable shall be made to the shield system at each receptacle.

(B) Receptacles and Housings. Receptacle housings and self-contained devices designed either for floor mounting or for in-wall or on-wall mounting shall be permitted for use with the FCC system. Receptacle housings and self-contained devices shall incorporate means for facilitating entry and termination of Type FCC cable and for electrically connecting the housing or device with the metal shield, where used. – Receptacles and self-contained devices shall comply with 406.3. Power and communications outlets installed together in common housing shall be permitted in accordance with 800.52(A)(1)(c), Exception No. 2.

324.56 Splices and Taps.

(A) FCC Systems Alterations. Alterations to FCC systems shall be permitted. New cable connectors shall be used at new connection points to make alterations. It shall be permitted to leave unused cable runs and associated cable connectors in place and energized. All cable ends shall be covered with insulating ends.

(B) Transition Assemblies. All transition assemblies shall be identified for their use. Each assembly shall incorporate means for facilitating entry of the Type FCC cable into the assembly, for connecting the Type FCC cable to grounded conductors, and for electrically connecting the assembly to the metal cable shields and to equipment grounding conductors.

324.60 Grounding. All metal shields, boxes, receptacle housings, and self-contained devices shall be electrically continuous to the equipment-grounding conductor of the supplying branch circuit. All such electrical connections shall be made with connectors identified for this use. The electrical resistivity of such shield system shall not be more than that of one conductor of the Type FCC cable used in the installation.

III. Construction

324.100 Construction

(A) Type FCC Cable. Type FCC cable shall be listed for use with the FCC system and shall consist of three, four, or five flat copper conductors, one of which shall be an equipment grounding conductor.

(B) Shields.

(1) Materials and Dimensions. All top and bottom shields shall be of designs and materials identified for their use. Top shields shall be metal. Both metallic and nonmetallic materials shall be permitted for bottom shields.

(2) Resistivity. Metal shields shall have cross-sectional areas that provide for electrical resistivity of not more than that of one conductor of the Type FCC cable used in the installation.

~~324.112 Insulation.~~324.112 Insulation. The insulating material of the cable shall be moisture resistant and flame retardant. All insulating materials in the FCC system shall be identified for their use.

~~324.120 Markings~~324.120 Markings.

(A) Cable Marking. Type FCC cable shall be clearly and durably marked on both sides at intervals of not more than 610 mm (24 in.) with the information required by 310.11(A) and with the following additional information:

(1) Material of conductors
(2) Maximum temperature rating
(3) Ampacity

(B) Conductor Identification. Conductors shall be clearly and durably identified on both sides throughout their length as specified in 310.12.
Submitter: Robert J. Sexton, De Corp Americas Inc.
Recommendation: DeCorp Americas, Inc., considering Panel 7 comments and in consultation with Underwriters Laboratories, has made dramatic improvements in AC FlatWire design since Proposal 7-30-(324) was submitted. The revised wire design has a layered construction (see Substantiation for additional description). This construction creates an inherently safe wire and wiring method when protected by a standard circuit breaker or other standard circuit protection.

The panel statement on Proposal 7-30-(324) commented that installation on walls and ceilings was not in the intended scope of Article 324. Considering the revised wire design and the panel comments and in consultation with representatives of Underwriters Laboratories, DeCorp believes that FlatWire wiring technology better fits within the scope of Article 382. As a result, DeCorp, as submitter, proposes to transition from Article 234 and modify Article 382 rather than Article 324.

The panel statement also commented that the electronic circuit protection features in the proposal would need to be reviewed by Panel 10. The revised FlatWire wiring technology eliminates the need for an Active Safety Device as originally proposed. Therefore, the Active Safety Device has been removed from the proposal, and a review by Panel 10 will not be necessary.

Proposed revisions to Article 382 are as follows:

Revise 382.1 as follows:

382.1 Definition.

Nonmetallic Extension. An assembly of ~~two~~ insulated conductors within a nonmetallic jacket of ~~an extruded~~ thermoplastic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings.

Revise 382.10 as follows:

382.10 Uses Permitted. Nonmetallic extensions shall be permitted only where all the conditions in 382.10(A), (B), and (C) are met.

(A) From an Existing Outlet. The extension is from an existing outlet on a 15- or 20-ampere branch circuit.

(B) Exposed and in a Dry Location. The extension is run exposed and in a dry location.

Exception: Extensions with an earthed metal shield or a grounding conductor covering the ungrounded conductor(s) may be blended into the surface by plaster finish, finishing compound, paint, or similar methods.

(C) Residential or Offices. For nonmetallic surface extensions mounted directly on the surface of walls or ceilings, the building is occupied for residential or office purposes and does not exceed three floors above grade.

FPN No. 1: See 310.10 for temperature limitation of conductors.

FPN No. 2: See 362.10 for definition of first floor.

Revise 382.30 as follows:

382.30 Securing and Supporting. Nonmetallic surface extensions shall be secured in place by approved means at intervals not exceeding 200 mm (8 in.), with an allowance for 300 mm (12 in.) to the first fastening where the connection to the supplying outlet is by means of an attachment plug. There shall be at least one fastening between each two adjacent outlets supplied. An extension shall be attached to ~~only~~ woodwork , ~~or~~ plaster finish , gypsum wallboard, masonry, or similar building surfaces and shall not be in contact with any metal work or other conductive materials other than with metal plates on receptacles.

Substantiation: DeCorp Americas, Inc., has made dramatic improvements in AC FlatWire design since Proposal 7-30-(324) was submitted. The revised wire design is inherently safe when protected by a standard circuit breaker. Any puncture of the wire results in the circuit breaker tripping. This eliminates the need for an Active Safety Device (enhanced GFCI) as originally proposed.

The revised wire design is a multi-layer design> the design consists of layers of insulation and flat conductors with the following configuration:

-------------------------Insulation-------------------------
flat grounding conductor (ground)
-------------------------Insulation-------------------------
flat grounded conductor (neutral)
-------------------------Insulation-------------------------
flat ungrounded conductor (hot)
-------------------------Insulation-------------------------
flat grounding conductor (neutral)
-------------------------Insulation-------------------------
flat grounding conductor (ground)
-------------------------Insulation-------------------------

Connector for the FlatWire tie the grounded (neutral) connectors together and tie the grounding (ground) connectors together at each end of a run of wire.

Rationale or Changes to Article 382:

382.1 Definition – The FlatWire design has, when connected, the equivalent of two current carrying conductors meeting the intent of the definition. The word “two” should be removed from the definition to avoid varying interpretations and provide maximum design flexibility under this article. This wording was most likely put in place before grounding conductors were required. The word “extruded” should also be removed to allow maximum design flexibility.

382.10 Uses Permitted – The FlatWire design protects the ungrounded (hot) conductor with both the grounded (neutral) conductor and the grounding (ground) conductor. This enhances the level of inherent safety well beyond conventional two or three wire cables. The protection from electrical shock is comparable to Type MC Cable. This high level of safety should allow constructions of this type to be blended into the surface of walls and ceilings by plaster finish or similar methods.

382.30 Securing and Supporting – The intent of this section appears to be to allow installation on interior non-conducting surfaces. Additional building surface materials should be added to reflect modern construction techniques.

Additional Discussion of FlatWire and the Proposed Changes to Article 382.

FlatWire’s extremely flat profile differentiates it visually from conventional wire and cable; whereas, the layered construction of FlatWire differentiates it in terms of safety from conventional wire and cable. These two aspects, flat profile and enhanced safety, provide opportunities and advantages not available with conventional wire and cable.

FlatWire’s flat profile makes it possible for it to be easily installed using adhesive to the interior surfaces of buildings. This basic installation method meets the requirements of Article 382. The flat profile also creates the opportunity for FlatWire to be painted to match the wall or ceiling. This aesthetic enhancement also remains within the requirements of Article 382. The flat profile further makes it possible to cover the FlatWire with finishing compound prior to painting. This makes FlatWire an appealing method for providing power to devices without destruction of interior surfaces or the use of unsightly and unsafe extension cords. DeCorp proposes that Article 382 be changed to clearly allow the use of finishing compound to blend FlatWire (or similar constructions) into the surface of the wall or ceiling.

The proposed change to Article 382 allows cables to be blended into the wall or ceiling surface if the hot conductor is protected by an earthed metal shield or a grounding conductor. FlatWire is constructed such that the hot conductor is covered by both the neutral conductor and the ground conductor. This construction provides a level of safety far exceeding conventional unshielded cables. In fact, the protection from electrical shock provided by this construction is most comparable to metal-clad cable. It is the FlatWire’s high level of safety that makes it suitable for it to be covered by finishing compound on walls and ceilings.

Covering FlatWire with finishing compound provides several safety related attributes. The finishing compound encloses the FlatWire in nonflammable material. The FlatWire does not propagate flame due to the insulating material and the large heat dissipating copper surfaces. Covering it with finishing compound further enhances the fire safety.

Finishing compound provides additional protection from physical damage to the FlatWire. FlatWire is very resistant to damage other than direct penetration. Although, the outer insulation is relatively thin, the first layer of copper is the safe grounding layer and is very resistant to abrasive type of abuse. Additionally, the flat copper conductors cannot be additionally thinned by impact in the way that round conductors may be. Covering the FlatWire with finishing compound provides an additional safety barrier to physical abuse. This is further enhanced when fiberglass mesh drywall tape is used over the FlatWire prior to applying the finishing compound.

Blending FlatWire into the wall surface with finishing compound removes the visual temptation for children to play with it. Conventional wisdom says that it is better for cables and cords to be visible so that a person will avoid penetrating them with an object such as a nail. However, this logic does not apply to small children or pets, which are attracted to what they can see; including cables and cords. Covering the FlatWire with finishing compound removes the visual attraction for a child or pet making it less likely that they will damage the FlatWire.

FlatWire Application Note.

FlatWire will be provided with connections and terminations Listed to applicable standards. FlatWire will be supplied from an existing outlet on a branch circuit. A FlatWire source connector will plug into an existing receptacle to supply the FlatWire. The FlatWire will be terminated with a connector and receptacles appropriate for the application. Initial FlatWire products will be supplied by a single receptacle and provide a single receptacle at the termination. Later products may allow provide multiple receptacles similar to standard current taps or special purpose terminations for specific device applications.

FlatWire Testing.

DeCorp is working with Underwriters Laboratories to develop a comprehensive test program for FlatWire. The goal of this test program is to demonstrate the safety of the FlatWire and lead to Listing. This test program will address all of the relevant safety issues as they apply to FlatWire and Article 382.

DeCorp believes that FlatWire systems meet the conceptual requirements of Article 382 and may be Listed without changes to Article 382. The proposed changes to Article 382 are for clarification and to clearly allow FlatWire to be blended into the surface of a wall or ceiling using various methods including the use of finishing compound.

DeCorp is continuing internal testing of FlatWire. I have submitted a test report on the initial penetration testing performed on prototype FlatWire.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The proposal does not include adequate protection for load side extensions and devices.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

Comment on Affirmative:

BROWN, H.: We recommend that this proposal continue to be rejected.

Article 324, flat cable conductor, governs the scope, definitions, listing requirements, installation, and construction requirements of a very specific wiring method. Due to the specialized application of this wiring method, Article 324 should remain isolated with no commingling of any other wiring method.

7-14 Log #323 NEC-P07 **Final Action: Reject**
(324.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

Top shield. “...protection against ~~physical~~ damage.”

Substantiation: Use of the word “physical” is superfluous– the purpose is obvious. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)

Let’s take care of that for good: for our purposes, “damage” means “physical damage.”

Panel Meeting Action: Reject

Panel Statement: The word “physical” is appropriate, since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-15 Log #324 NEC-P07 **Final Action: Reject**
(324.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Transition Assembly. "...protection against ~~physical~~ damage."
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate, since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-16 Log #326 NEC-P07 **Final Action: Reject**
(324.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Bottom Shield. A protective layer that is installed between the floor and Type FCC flat conductor cable to protect the cable from ~~physical~~ damage and may or may not be incorporated as an internal part of the cable.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Let's take care of that for good: for our purposes, "damage" means "physical damage."**Panel Meeting Action: Reject**
Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-17 Log #1904 NEC-P07 **Final Action: Accept**
(324.10(H))

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: Delete the text in 324.10(H) as follows:
~~(H) Coverings. Floor mounted Type FCC cable, cable connectors, and insulating ends shall be covered with carpet squares not larger than 914 mm (36 in.) square. Carpet squares that are adhered to the floor shall be attached with release type adhesive.~~
Substantiation: The same exact text exists in in a much more visible section in this article. This additional text is not necessary to be covered in two different sections within this article but should be kept as 324.41 with the title "Floor Coverings".
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-18 Log #3190 NEC-P07 **Final Action: Accept**
(324.10(I))

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete 324.10(I) completely.
Substantiation: The text currently located in 324.10(I) related to corrosion resistance, is duplicated in 324.101. The 324.101 location is under Part III, that includes construction requirements and seems more suited for this requirement rather than 324.10(I) which includes the Part II installation requirements.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-19 Log #3665 NEC-P07 **Final Action: Accept**
(324.10(J))

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete section 324.10(J) completely.
Substantiation: The text currently located in 324.10(J) related to metal-shield connectors, is duplicated in 324.40(E). The 324.40(E) location includes requirements for boxes and fittings and seems more suited for this requirement rather than 324.10(j) which includes the uses permitted requirements.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 328 — MEDIUM VOLTAGE CABLE: TYPE MV

7-20 Log #2588 NEC-P07 **Final Action: Accept in Principle**
(328.10(4))

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Revise the following text from the list of uses permitted:
(4) Direct buried <u>when identified for the use and installed</u> in accordance with 300.50.
Substantiation: The text as written in the 2005 NEC is redundant. By adopting this language in the uses permitted, it will help clarify when it is and is not permissible to bury MV cables. This will allow condition 310.12(3) to then be deleted.
Panel Meeting Action: Accept in Principle
The panel accepts the proposal in principle but does not accept the revised wording to 328.10(4).
In addition, delete 328.12(3).
Panel Statement: Section 300.50 requires that "underground conductors shall be identified for the voltage and conditions under which they are installed." So it is not necessary to repeat the requirement in 328.10(4).
The panel agrees to delete 328.12(3) because it is already addressed in 328.10(4).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-21 Log #2257 NEC-P07 **Final Action: Reject**
(328.11.xx)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
328.xx Medium voltage cable shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 600-2003, Recommended Practice for Installing and Maintaining Medium-Voltage Cable, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 328. However, safety would be improved by offering more detailed installation guidance for medium voltage cable.
Panel Meeting Action: Reject
Panel Statement: This reference should not be included in the NEC since the NEC is not a design, installation, or maintenance manual. It specifically states in 90.1(C): "This Code is not intended as a design specification or an instruction manual for untrained persons." These standards are also covered by a fine print note in 110.12.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-22 Log #199 NEC-P07 **Final Action: Accept in Principle**
(328.12)

NOTE: The following proposal consists of Comment 7-52 on Proposal 7-52 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 7-52 was:

328.12 Uses Not Permitted.

Unless identified for the use , Type MV cable shall not be used as follows:

(1) Where exposed to direct sunlight

(2) In cable trays, unless specified in 392.3(B)(1)

(3) Direct buried, unless in accordance with 300.50

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Accept the proposal in principle. In (2), revise the wording to say: "(2) In cable trays, unless installed in accordance with 392.3(B)" Add a new (4) as follows: "(4) As exposed wiring outside of raceways, or cable trays where permitted by 392.3(B), unless in an area accessible to qualified persons only".
Substantiation: 392.3(B)(2) does not "specify" Type MV cable. The bottom line is that MV cable is only installable in cable trays under the conditions given in 392.3(B) in their entirety. This includes the industrial occupancy and qualified supervision provisions in the parent rule, and then the specific mention of Type MV cable. Even that provision [392.3(B)(2)] sends the reader back to 392.3(B)(1) that has the rest of the requirements. The reference will be misleading unless it points to all of 392.3(B).
The second change correlates the traditional permission for this wiring method [former 328.10(2)] with the rule in 300.37. NEC users should not assume that the outcome of Proposal 7-52 means that now Type MV cable is eligible for unprotected use in areas accessible to the public. This issue was addressed in comparable Proposal 7-172 for tray cable at 336.12(8) and this wiring method should carry a similar restriction.
Panel Meeting Action: Accept in Principle
Revise existing Code text as follows:
"(2) In cable trays, unless specified in 392.3(B)(2)" to read "(2) In cable trays in accordance with 392.3".
Revise proposed (4) to read as follows and add as 328.10(6)
"(6) As exposed wiring in locations accessible to qualified persons only as permitted in 300.37".
Delete 328.10(3).
Renumber 328.10(4), (5), and (6) as (3), (4), and (5).
Panel Statement: The addition of "Unless identified for the use" is not necessary, since that phrase already appears in the Code. The panel agrees with the substantiation that the reference to 392.3(B)(2) is too limited and does not include additional provisions in other parts of 392.3(B) and 392.3 and agrees that the reference should be to 392.3, not just 392.3(B).
328.12 requires "Unless identified for the use...". MV cables are not identified for exposed runs; 300.37 applies. Locating this requirement in 328.10 is more appropriate.
Since installation in cable tray is addressed in 328.12(2), it is not necessary to repeat a similar rule in 328.10(3).
The panel action on Proposal 7-20 will modify the action taken on this proposal.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 330 — METAL-CLAD CABLE: TYPE MC

7-23 Log #3297 NEC-P07 **Final Action: Accept in Principle**
(330.10(A)(11))

Submitter: David Mercier, Southwire Co.
Recommendation: Add text to read as follows:
330.10(A)
(11) In wet locations where any of the following conditions are met:
a. The metallic covering is impervious to moisture.
b. A lead sheath or moisture-impervious jacket is provided under the metal covering.
c. The insulated conductors under the metallic covering are listed for use in wet locations with a corrosion-resistant material over the metallic covering .
Substantiation: MC Cables installed in wet locations can become corrosive such as when installed in contact with concrete. Aluminum and galvanized steel in contact with concrete or mortar can result in corrosion to the uncovered metallic covering. For aluminum, a reaction may occur that forms aluminum hydroxide and hydrogen gas when in contact with wet concrete. For galvanized steel, a reaction may occur with moisture and chlorides in concrete or mortar to produce zinc oxide. The reaction rates increases with the dampness of the concrete. These reactions can deteriorate the metallic sheath or armor over time.
Panel Meeting Action: Accept in Principle
Revise the proposed text to read as follows:
330.10(A)
(11) In wet locations where any of the following conditions are met:
a. The metallic covering is impervious to moisture.
b. A lead sheath or moisture-impervious jacket is provided under the metal covering.
c. The insulated conductors under the metallic covering are listed for use in wet locations and a corrosion-resistant jacket is provided over the metallic sheath.
Panel Statement: The revised wording defines the construction requirements for this cable to be used in wet locations.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-24 Log #2970 NEC-P07 **Final Action: Accept in Principle**
(330.10(A), Item 11c.)

Submitter: Philip Simmons, National Armored Cable Manufacturers Associatin
Recommendation: Revise text as follows:
330.10 Uses Permitted
11. In wet locations where any of the following conditions are met.
a. The metallic covering is impervious to moisture.
b. A lead sheath or moiture-impervious jacket is provided under the metal covering.
c. The insulated conductors under the metallic covering with an overall moisture impervious jacket are listed for use in wet locations.
Substantiation: The requirements of (11)(a) and (11)(b) of 330.10 keep water from entering the cable core of MC Cable. The requirement of (12)(c) permits water to enter the cable core of the interlocked armor type MC cable. This section should be revised to require an overall moisture impervious jacket over the metal covering to prevent water from entering the cable core where it could migrate to conductor terminations.
Jacket MC Cable is readily available and is recommended by manufacturers where MC Cable is installed in wet locations.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 7-23.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-25 Log #3295 NEC-P07 **Final Action: Reject**
(330.10(A)(7))

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Add text to read as follows:
(7) In any raceway installation where the cable can be terminated in a fitting that provides grounding of the metal sheath.
Substantiation: Without the additional text, MC cable could be installed through a metal or nonmetallic conduit that terminated to a box or enclosure. When the conduit is terminated to the box or enclosure, the cable sheath would extend through the conduit termination into the box or enclosure with no fitting available to ground the sheath of the cable.
Panel Meeting Action: Reject
Panel Statement: Sections 300.10 and 300.15 define the requirements for grounding the metallic armor or sheath.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BROWN, H.: We disagree with the panel action to reject this proposal.
This proposal addresses a grounding issue. Although 300.10 and 300.15 address this issue, infractions continue to occur in the field. The "free end" of MC cable is often left "dangling" within an enclosure as it exits a raceway, and the grounding continuity is lost.
The added provision to 330.10(A)(7) is essential to these types of installations. The additional language providing that, (when installing MC cable within a raceway, the MC cable must be terminated in a fitting that provides grounding of the metal sheath), will resolve the issue.

7-26 Log #3094 NEC-P07 **Final Action: Accept**
(330.10(B))

Submitter: Donald Hall, Corning Cable Systems
Recommendation: Revise text as follows:
(B) Specific Uses. Type MC cable shall be permitted to be installed in compliance with Part II and III of Article 725 and ~~770.52~~ 770.133 as applicable and in accordance with 330.10(B)(1) through (B)(4).
Substantiation: 770.113 is the correct reference.
Panel Meeting Action: Accept
Panel Statement: Although the proposal is accepted, the panel notes that the correct reference in the submitter's substantiation should have been 770.133.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-27 Log #928 NEC-P07 **Final Action: Accept**
(330.10(B)(4))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise (4):
"installed outside buildings or structures ..." Remainder unchanged.
Substantiation: Edit. Structures which are not "buildings" should be included.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-28 Log #2974 NEC-P07 **Final Action: Accept**
(330.12)

Submitter: Philip Simmons, National Armored Cable Manufacturers Associatin
Recommendation: Revise text as follows:
330.12 Uses Not Permitted
Type MC Cable shall not be used where subject to physical damage or where exposed to the following destructive corrosive conditions, unless the metallic sheath is suitable for the conditions or is protected by material suitable for the conditions:
~~(1) Where subject to physical damage~~
~~(2)~~ (1) Direct burial in the earth
~~(3)~~ (2) In concrete
FPN to ~~(3)~~ (2): MC cable that is identified for direct burial applications is suitable for installation in concrete.
~~(4)~~ (3) Where subject to cinder fills, strong chlorides, caustic alkalis, or vapors of chlorine or of hydrochloric acids.
Substantiation: It appears that when Uses Permitted/Not Permitted was worked on by the Code Panel last cycle (part of the user friendly activity), the provision for not subject to physical damage was moved from Uses permitted where it was misplaced but clear, to uses not permitted where it seems to be linked to a physical damage only in a corrosive environment or where direct buried. It appears that the panel went too far in trying to present the uses not permitted in a list format. Where not subject to physical damage should be moved from the list to the text of 330.12.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 2
Explanation of Negative:
BROWN, H.: We disagree with the panel action to accept this proposal.
This proposal is editorial in nature. The acceptance of this proposal will remove the provision that Type MC cable not be permitted to be used where exposed to physical danger from 330.12(1), and placed as part of the general text of 330.12.
This text, (the new language change), is not consistent with the same requirements as they appear in 320.12(1) and 336.12(1).
Consistency should remain throughout the code. The text, as it is currently written, is consistent with other cable articles, and there is no technical substantiation to warrant this change.
STEWART, H.: The proposed change does not increase safety. The present code already states that MC Cable shall be used where subject to physical damage. The MC Cable sheath must already be suitable for the conditions it is being installed in. This change only allows the opportunity to confuse the user.

7-29 Log #329 NEC-P07 **Final Action: Reject**
(330.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) Where subject to ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-30 Log #3042 NEC-P07 **Final Action: Reject**
(330.13)

Submitter: Melvin K. Sanders, TECo Inc.
Recommendation: Insert in new Section 330.13 the following.
330.13 Protection Against Physical Damage
Where subject to physical damage, wiring methods shall be protected by either, or all, in the following manner.
(A) Cables and Raceways Through Wood Members.
(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in joists, rafters, or wood members, holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/ 4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.
Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(2) Notches in Wood. Where there is no objection because of weakening the building structure, in both exposed and concealed locations, cables or raceways shall be permitted to be laid in notches in wood studs, joists, rafters, or other wood members where the cable or raceway at those points is protected against nails or screws by a steel plate at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width, installed to cover the area of the wiring. The steel plate shall be installed before the building finish is applied.
Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(B) Nonmetallic-Sheathed Cables and Electrical Nonmetallic Tubing Through Metal Framing Members.
(1) Nonmetallic-Sheathed Cable . In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings or listed grommets covering all metal edges that are securely fastened in the opening prior to installation of the cable.
(2) Nonmetallic-Sheathed Cable and Electrical Nonmetallic Tubing. Where nails or screws are likely to penetrate nonmetallic-sheathed cable or electrical nonmetallic tubing, a steel sleeve, steel plate, or steel clip not less than 1.6 mm (1/ 16 in.) in thickness shall be used to protect the cable or tubing.
Exception: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(C) Cables and Raceways Parallel to Framing Members and Furring Strips. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed parallel to framing members, such as joists, rafters, or studs, or is installed parallel to furring strips, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (1-1/ 4 in.) from the nearest edge of the framing member or furring strips where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1.6 mm (1/ 16 in.) thick.
Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: For concealed work in finished buildings, or finished panels for prefabricated buildings where such supporting is impracticable, it shall be permissible to fish the cables between access points.
Exception No. 3: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(D) Cables and Raceways Installed in Shallow Grooves. Cable- or raceway-type wiring methods installed in a groove, to be covered by wallboard, siding, paneling, carpeting, or similar finish, shall be protected by 1.6 mm (1/ 16 in.) thick steel plate, sleeve, or equivalent or by not less than 32-mm (1-1/ 4-in.) free space for the full length of the groove in which the cable or raceway is installed.

Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.

Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.

Substantiation: The wiring methods typically installed in wooded frame structures are Article 320 (Type AC), Article 330 (Type MC), Article 334 (Types NM, NMC, and NMS), and Article 362 (ENC). Insofar as Article 340 (Type UF) is installed in lieu of Article 334 wiring methods, its installation must meet the requirements of Article 334 Parts II and III, and also subject to the same installation restrictions.

Since the 1975 Edition of the NEC, there has been a requirement in Section 300.4 that steel plates or bushings be installed to provide protection of certain wiring method against damage from ordinary nails or screw-nails when they pass through wooden members or laid in notches or grooves and the distance from the nail direction could not be the required 1-1/4 inch (32 mm).

This restriction placed in Article 300 has prevented those CMP's most knowledgeable in application of these products from using any other protection schemes or technology for this purpose. During the 2005 ROP/ROC stage, fact-finding reports were presented to CMP 3 highlighting the steel plates called for provide little or no protection against nails or screw-nails larger than #8 or equivalent trade designation. Since Section 300.4 first paragraph was changed in 2005 ROP to emphasize conductors are to be protected against physical damage, it is obvious that such protection is to be provided by the wiring method in which they are contained, as spelled out in Section 300.3(A). Because the Scopes of Section 320.1, 330.1, 334.1, 340.1 and 362.1 state they govern the installation of those wiring methods which, by Section 300.3(A), contain the conductors that are to be protected, as stated in Section 300.4 first paragraph.

Sections 320.12(1), 330.12(1), 340(10), and 362.12(10) state those wiring methods are not to be exposed to physical damage, therefore the contained conductors are inherently protected against damage which meets the intent of Section 300.4 first paragraph, and Section 300.3(A) is satisfied.

This would allow Article 300 to set the general guidelines and allow CMP 7 and CMP 8 to set rules deemed necessary to protect appropriate wiring methods.

Separate proposals are being made to CMP 3 and CMP 8 to address the text to be deleted from Article 300. Coordination between all affected CMP's will be essential in order for this to be accomplished in one ROP/ROC cycle.

Panel Meeting Action: Reject

Panel Statement: Section 300.4 specifies requirements for protection against physical damage. Article 320 references those portions of 300.4 that Code-Making Panel 7 requires to be applicable to Type AC cable. Code-Making Panel 7 can, at any time, include additional protection requirements to supplement those in 300.4 or modify the 300.4 requirements. It is not necessary to repeat the 300.4 requirements in multiple cable articles when the appropriate requirements in 300.4 can simply be referenced as appropriate in each cable article. Addition of 330.13 would unnecessarily increase the size of the Code without providing additional clarity.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-31 Log #2955 NEC-P07 **Final Action: Accept in Part**
(330.30)

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Revise existing 330.30 as follows:

330.30 Securing and Supporting.

(A) General. Type MC cable shall be supported and secured by staples, cable ties, straps, hangers, or similar fittings or other approved means, designed and installed so as not to damage the cable.

(B) Securing. Unless otherwise provided, cables shall be secured at intervals not exceeding 1.8 m (6 ft) where installed on or across framing members . Cables containing four or fewer conductors sized no larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination.

(C) Supporting. Unless otherwise provided, cables shall be supported at intervals not exceeding 1.8 m (6 ft).

Horizontal runs of Type MC Cable installed in wooden or metal framing members or similar supporting means shall be considered supported ~~and secured~~ where such support does not exceed 1.8 m (6 ft) intervals.

(D) Unsupported Cables. Type MC cable shall be permitted to be unsupported where the cable complies with any of the following :

(1) It i s fished between access points through concealed spaces in finished buildings or structures and supporting is impracticable ~~; or~~

(2) It is not more than 600 mm (2 ft) in length at terminals where flexibility is necessary

(3) It i s not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to a luminaire (s) [lighting fixture (s)] or other ~~piece of~~ electrical equipment and the cable and point of connection are within an accessible ceiling. For the purpose of this section, Type MC cable fittings shall be permitted as a means of cable support.

Substantiation: Changes are proposed to this section that are editorial in nature. The changes proposed are primarily to bring this section on securing and supporting Type MC cable into harmony with that for Type AC cables in 320.30.

Changes were made to both 320.30 and 330.30 for the 2005 NEC. It was intended that identical rules apply to installation of the cables other than the 4 1/2 ft. rule for securing Type AC cables.

Panel Meeting Action: Accept in Part

The panel accepts proposed 330.30(D)(3) renumbered as (2) and revised to read as follows:

" (2) Is not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to luminaires (lighting fixtures) or other electrical equipment and the cable and point of connection are within an accessible ceiling. For the purpose of this section, Type MC cable fittings shall be permitted as a means of cable support."

The panel rejects the remainder of the proposal.

Panel Statement: MC cables must be secured at intervals not exceeding 1.8 m (6 ft) in all applications, not just when installed "on or across framing members."

330.30(A) requires MC cable to be "supported and secured". The second paragraph of 330.30(C) provides one method of compliance.

Except for the deletion of the words "piece of" in 330.30(D), the proposed revisions do not enhance clarity. No technical substantiation has been provided to support the addition of the new (2).

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-32 Log #3116 NEC-P07 **Final Action: Reject**
(330.30)

Submitter: James M. Imlah, City of Hillsboro Building Department

Recommendation: Revise text as follows:

330.30 Securing and Supporting

(A) General. Type MC cable shall be supported and secured by staples, cable ties, straps, hangers, or similar fittings or other approved means designed and installed so as not to damage the cable.

Type MC cable that runs horizontally through or on framing members or racks (spaced less than 6 ft apart) without additional securing is considered supported. Cable ties are not required as the cable passes through or on these members. However, the MC cable must be secured (fastened in place) within 12 in. of the outlet box.

330.30(A) contains the general support requirements for Type MC cable, that is, supported and secured at least every 6 ft.

(B) Securing Unless otherwise provided, cables shall be secured at intervals not exceeding 1.8 m (6 ft). Cables containing four or fewer conductors sized no larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination.

According to 330.30(B), MC cable containing four of fewer conductors of size 10 AWG or less is required to be secured within 12 in. from every box, cabinet, or fitting. Both requirements are illustrated in Exhibit 330.2.

(C) Supporting. Unless otherwise provided, cables shall be supported at intervals not exceeding 1.8 m (6 ft).

(1) Horizontal runs of Type MC cable installed in wooden or metal framing members or similar supporting means shall be considered supported and secured where such support does not exceed 1.8 m (6 ft) intervals.

(2) At terminals where installed for flexibility, support of M/C shall not exceed the following:

(A) 900 mm (3 ft) for #14 AWG to #4 AWG stranded conductors

(B) 1200 mm (4 ft) for #3 AWG to 4/0 AWG conductors

(C) 1500 mm (5 ft) for 250 kcmil and larger conductors

(D) Unsupported Cables Type MC cable shall be permitted to be unsupported where the cable:

(1) Is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical; or

(2) Is not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to a luminaire (lighting fixture) or other piece of electrical equipment and the cable and point of connection are within an accessible ceiling. For the purpose of this section, Type MC cable fittings shall be permitted as a means of cable support. Section 330.30(D) permits Type MC cable to be fished, as shown in Exhibit 330.3.

Substantiation: The use of M/C cable use has expanded dramatically and is not restricted for connection to most electrical equipment, motors, transformers and panels. Because of the expanded use of M/C and the larger sizes of conductors it becomes increasingly difficult to meet the minimum support requirements of within 12 inches of a termination (#10 conductors and smaller) and for larger cables allowing up to six feet (if not subject to physical damage). Where cable installation requires flexibility, only stranded conductors shall be installed. The graduated table allows the bends required for larger conductor M/C cables to meet the minimum wire bending radius of 330.24.

Panel Meeting Action: Reject

Panel Statement: Type MC is a general-purpose wiring method in accordance with 330.10 and 330.12 and is not limited to installations where flexibility is required. Section 330.30 currently defines the rules for securing and supporting

Type MC cable, and no technical justification has been provided to support any change in those requirements.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-33 Log #396 NEC-P07 **Final Action: Reject**
(330.30(C))

Submitter: Lawrence Long, DCCC
Recommendation: Revise text to read as follows:
(C) Supporting. Unless otherwise provided, cables shall be supported at intervals not exceeding 1.8 m (6 ft). Horizontal runs of Type MC cable installed in wooden or metal framing members or similar supporting means shall be considered supported and ~~secured~~ where such support does not exceed 1.8 m (6 ft) intervals.
Substantiation: As outlined in 320.30, type AC cable is not required to be secured when installed in horizontal runs through framing members. (i.e., (C) Supporting. Unless otherwise provided, Type AC cable shall be supported at intervals not exceeding 1.4 m (4 1/2 ft)). Horizontal runs of Type AC cable installed in wooden or metal framing members or similar supporting means shall be considered supported where such support does not exceed 1.4 m (4 1/2 ft) intervals.
Panel Meeting Action: Reject
Panel Statement: Section 330.30(A) requires that "Type MC cable shall be supported and secured...". Section 330.30(C) provides one method of compliance.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-34 Log #437 NEC-P07 **Final Action: Reject**
(330.40)

Submitter: Joseph Lopez, Ludvik Electric
Recommendation: Revise text to read as follows:
~~Fittings used for connecting type M.C. cable to boxes, cabinets or other equipment shall be listed and identified for use.~~ At all points where the armor of MC cable terminates, a fitting shall be provided to protect wires from abrasion, unless the design of the outlet boxes or fittings is such as to afford equivalent protection and, in addition an insulating bushing or its equivalent protection shall be provided between the conductors and the armor. The connector or clamp by which the type MC cable is fastened to boxes or cabinets shall be of such design that the insulating bushing or its equivalent will be visible for inspection. Where change is made from type MC cable to other cable or raceway wiring methods, a box, fitting, or conduit body shall be installed at junction points as required in 300.15.
Substantiation: AC cable and MC cable are identical types of cable, except for the bare internal wire enclosed in the AC cables sheath. Per code, 320.40 AC cable requires an additional insulating bushing therefore MC cable should require the same.
Panel Meeting Action: Reject
Panel Statement: Fittings approved for use with Type MC cable are designed so that the fitting provides the protection to the emerging conductors. An insulating bushing is not required in Type MC cable fittings. Section 300.15 already is applicable to Type MC cable.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-35 Log #523 NEC-P07 **Final Action: Accept**
(330.40)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
330.40 Boxes and Fitting s . Fittings used for connecting Type MC cables to boxes, cabinets, or other equipment shall be listed and identified for such use.
Substantiation: The proposal is an editorial correction to revise the word "fitting" to the word "fittings" for consistency between the other wiring method articles.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-36 Log #2988 NEC-P07 **Final Action: Reject**
(330.80(B)(1))

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Change section 330.80(B)(1) from Table 310.20 to 310.17 as shown below.
(B) Single Type MC Conductors Grouped Together.
Where single Type MC conductors are grouped together in a triangular or square configuration and installed on a messenger or exposed with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 X OD) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities in the following tables;
(1) Table 310. ~~30~~ 17 for conductors rated 0 to 2000 volts
(2) Table 310.67 and 310.68 for conductors rated over 2000 volts.
Substantiation: This would make 330.80(B)(1) the same as 332.80(B) for MI cables. If the ampacity in Table 310.17 is acceptable for MI cable, it should be acceptable for MC cable.
Panel Meeting Action: Reject
Panel Statement: The insulation on the conductors in Type MC cable is normally rated 90ºC, whereas the mineral oxide insulation used in Type MI cable can withstand significantly higher temperatures.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-37 Log #2989 NEC-P07 **Final Action: Accept**
(330.104)

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add allowance for nickel and nickel-coated copper conductors to 330.104 as shown below:
330.104 Conductors shall be of copper, aluminum, copper-clad aluminum, nickel, or nickel-coated copper, solid or stranded. The minimum conductor size shall be 18 AWG copper, nickel or nickel coated copper and 12 AWG aluminum or copper-clad aluminum.
Substantiation: MC singles can be from Table 310.13, which could use nickel or nickel-coated copper. Some fire rated MC cables require nickel or nickel coated copper conductors. This harmonizes with the allowance of nickel and nickel coated copper in 332.104 for MI cable.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-38 Log #2332 NEC-P07 **Final Action: Reject**
(330.108)

Submitter: Lee Perry, Service Wire Company
Recommendation: Add a second sentence to read:
Equipment grounding conductor included in a listed multiconductor interlocked metal tape-type MC cable shall be permitted to be either a single conductor, or multi-part segmented conductors, with a minimum cross section area as required under 250.122.
Substantiation: UL standard 1569 allows equipment grounding conductors to be segmented to facilitate a round construction but it is not specifically mentioned in the Code or Article 250 (segmented conductors are mentioned in NEC Handbook). Adding this second sentence in the construction will clarify that listed MC cables with segmented grounding conductors are permissible in compliance with the Code.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: UL 1569, Metal-clad Cable, stipulates that the equipment grounding conductor may be sectioned so the Listing already permits the use of cables as addressed in the proposal. It is not necessary to add the proposed text into the Code.
Sectioned equipment grounding conductors are not considered paralleled in a multiconductor cable.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 332 — MINERAL-INSULATED, METAL-SHEATHED CABLE

7-39 Log #325 NEC-P07 **Final Action: Reject**
(332.10(10))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(10) In underground runs where suitably protected against ~~physical~~ mechanical threats and corrosive conditions.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary. Here, on the other hand, the objection is a bit different. Corrosion is itself a type of physical damage.
Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate, since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference. The term "mechanical threats" is vague.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 334 — NONMETALLIC-SHEATHED CABLE: TYPE NM, NMC, AND NMS

7-40 Log #2538 NEC-P07 **Final Action: Reject**
(334)

Submitter: Timothy D. Curry, Curry Electric, Inc.
Recommendation: Delete all references throughout the article to ~~NM-C~~ .
Substantiation: I do not believe that NM-C is made anymore.
Panel Meeting Action: Reject
Panel Statement: NMC is still listed in the 2005 UL Electrical Construction Equipment Directory.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-41 Log #2539 NEC-P07 **Final Action: Reject**
(334.2)

Submitter: Timothy D. Curry, Curry Electric, Inc.
Recommendation: Revise text to read:
Type NM -B Insulated conductors...
Substantiation: Due to changes in UL requirements and code changes, NM cable has been upgraded to become NM-B. We should be using the nomenclature of the industry.
Panel Meeting Action: Reject

Panel Statement: Article 334 recognizes NM cable as a wiring method. NM cable with the suffix "-B" is identified as having 90 degree C insulated conductors. See 334.112, FPN.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-42 Log #109 NEC-P07 **Final Action: Reject**
(334.10)

Submitter: Jeffrey Hudecek, Owosso, MI
Recommendation: Add the reference to three floors above grade to the beginning of the second sentence of 334.10(3) to read as follows:
" In any building exceeding three floors above grade, cables shall be concealed within walls, floors, or ceilings...".
Also, add a new fine print note to call attention to the definition of the first floor in 362.10 to read as follows:
"FPN: See 362.10 for definition of first floor of a building. "
Substantiation: There are thousands of nondwelling buildings where nonmetallic sheathed cable is an acceptable wiring method where it is not concealed within 15-minute fire rated construction. There are thousands of commercial and farm buildings where there are no concealed spaces for wiring, and surface installed cable is perfectly acceptable. In agricultural buildings for example, Type UF, which is installed using the rules in Article 334, is the preferred wiring method. It certainly seems as though 334.10(3) is saying that Type UF cable is not permitted to be installed in an agricultural building unless concealed within a fire rated wall, ceiling or floor. concealing cables in agricultural and some commercial buildings is not recommended because of potential rodent damage, yet surface installed cable is preferred.
Panel Meeting Action: Reject
Panel Statement: The substantiation provides only a description of installations where there are no concealed spaces and agriculture installations where Type UF cable is preferred. No substantiation has been submitted to address why the 15 minute finish rating for these and other commercial and non-residential installations in buildings lower than three stories should not be required.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-42a Log #CP700 NEC-P07 **Final Action: Accept**
(334.10)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the Affirmative Comment relative to conformance to the NEC Style Manual, as expressed in the voting. This action will be considered by the Panel as a Public Comment.
Submitter: Code-Making Panel 7,
Recommendation: Add a new Fine Print Note to the end of 334.10 to read as follows:
"FPN No. 2 to (2), (3), and (4): NM Cable shall be permitted in any Type of construction in buildings if the building code permits the building to be Type III, IV, or V construction."
The existing unnumbered Fine Print Note is to become FPN No. 1 to (1), (2), (3), and (4).
Substantiation: To provide clarity regarding the types of construction where NM cable is permitted.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BROWN, H.: We disagree with the panel action to Accept this Proposal. The Fine Print Note is not necessary. It is already permissible to make the installation in Type I or Type II constructed buildings that are permitted by the building code to be Type III, IV or V construction.
Comment on Affirmative:
DALY, J.: The Proposal should be accepted, however, the text should be modified to comply with 3.1.3 of the NEC Style Manual which states "Fine print notes contain explanatory information. They shall not contain requirements and shall not be written in mandatory language."
The phrase "shall be permitted" should be changed to "may be installed" so the new FPN added to the end of 334.10 reads as follows:
"FPN No. 2 to (2), (3), and (4): NM cable may be installed in any Type of construction in buildings if the building code permits the building to be Type III, IV, or V construction."
The remainder of the Panel Action remains unchanged.

7-43 Log #1496 NEC-P07 **Final Action: Reject**
(334.10(1))

Submitter: Chris MacCreery, Battle Creek Electrical JATC
Recommendation: Revise text to read as follows:
II. Installation
334.10 Uses Permitted.
Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:
(1) For feeders and branch circuits in one- and two-family dwellings.
Substantiation: Some cable articles (MI cable, MC cable, IGS cable, FCC, etc.) stipulate that the cable can be used for feeders, branch circuits and sometimes service entrance. NM cable is not so stipulated. What type of circuits can it be used on? Shouldn't all the articles be similar in uses permitted and uses not permitted? All the cable articles should be reviewed for uniformity.
Panel Meeting Action: Reject
Panel Statement: Addition of this proposed text would limit the use to feeders and branch circuits in one- and two-family dwellings only.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-44 Log #3163 NEC-P07 **Final Action: Reject**
(334.10(2))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Deleted text as indicated by strikethrough type as follows;
(2) Multifamily dwellings ~~permitted to be~~ of Types III, IV, and V construction except as prohibited in 334.12.
Substantiation: These dwellings will already be "permitted" by other Codes to be of the types indicated. The present wording may lead to confusion as to just whom dictates the construction Type.
Panel Meeting Action: Reject
Panel Statement: The provision is intended to allow NM cable in all types of construction with the option that the building be limited to the criteria permitted for Types III, IV, and V construction.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-45 Log #3087 NEC-P07 **Final Action: Reject**
(334.10(3))

Submitter: Joseph A. Hertel, Safety and Buildings
Recommendation: Substitute the following wording for 334.10 (intro)(3):
Other structures permitted to be of Types III, IV and V construction except as prohibited in 334.12.
Substantiation: The language requiring that "cables shall be concealed within walls, floors, or ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating" is not complied with and largely ignored in practice. Compliance would require that all installations in detached garages (Type V structures) where NM cables are installed, dairy and horse facilities (Type V structures) where UF cable is used and many other stand alone structures of Types III, IV or V construction would require gypsum wallboard to provide the 15-minute finish rating.
Panel Meeting Action: Reject
Panel Statement: Violations of the NEC requirements are not reason for changing requirements of the Code. The present text is inclusive of all "Other Structures". The substantiation addresses only unfinished garages and agriculture installations where Type UF cable is preferred. No substantiation has been submitted to address why the 15- minute finish rating for these and other commercial and non-residential installations should not be required. The panel advises the submitter that these installations might be more appropriately addressed under the Type UF Cable Article.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

DALY, J.: The Proposal should have been Accepted in Principle with the following additional text added into the existing 334.10(3):

Add an Exception immediately following 334.10(3) to read: "Exception: A thermal barrier of material that has at least a 15-minute finish rating shall not be required when Type UF cable is installed as nonmetallic- sheathed cable in animal housing facilities classified as storage occupancies."

Add a Fine Print Note after FPN No. 2 to read: "FPN No. 3 to Exception: Classification of animal housing facilities as storage occupancies is defined in NFPA 1-2006, Uniform Fire Code, NFPA 101-2006, Life Safety Code, and NFPA 5000-2006, Building Construction and Safety Code."

Revise existing "FPN No. 1" to "FPN No. 1 to (3)" and "FPN No. 2" to "FPN No. 2 to (3)".

The three NFPA Codes classify any type of animal housing facility as a storage occupancy, defined as an "occupancy used for the storage or sheltering of goods, merchandise, products, vehicles, or animals." A storage occupancy is typically characterized by the presence of few people, usually only owners and employees. If members of the public enter the building, the building can no longer be considered simply a storage occupancy. Additional information is contained in the NFPA Journal, November/December 2004 issue, page 22.

At its July 2004 meeting, the NFPA Standards Council approved an expansion of NFPA 150, Racetrack Stables, to include life and fire safety requirements for both humans and animals in all types of animal housing facilities and it changed the name of the committee to the Technical Committee on Animal Housing Facilities.

7-46 Log #2906 NEC-P07 **Final Action: Reject**
(334.10(4))

Submitter: Julian R. Burns, Quality Power Solutions, Inc./Burns Electrical Contractors
Recommendation: Add new text to read as follows:

<u>(4) Exposed runs in single story warehouses or similar types of buildings where run above 9', except as prohibited in 334.12.</u>

Renumber section to reflect change of deleted text.
Substantiation: The utilization of NM cable for branch circuit wiring of lights, receptacles and similar loads in an open warehouse, poses no hazard. The installation of exposed NM cable in combination office/warehouse buildings was a common practice for many years without any substantiated problems.
Panel Meeting Action: Reject
Panel Statement: The panel accepted the decision of the NFPA Standards Council, in accepting Proposal 7-137 of the NEC 2001 Report on Proposals, which was subsequently upheld by the NFPA Board of Directors.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-47 Log #552 NEC-P07 **Final Action: Reject**
(334.10(5) (New))

Submitter: Neal Dorenkott, City of Eastlake Ohio Building Department / Rep. B.O.C.O.N.E.O
Recommendation: Add new text to read:

(5) In residential air returns, where cables pass through the joists or studs perpendicular to the long dimension, cables shall be fire rated by a metallic raceway, such as rigid metal conduit, electrical metal conduit or flexible metal conduit. The connectors used with such material shall effectively close any openings in the connection.
Substantiation: Although 300.21 address the issue of not increasing the spread of fire or products of combustion, it is not addressed in 334.10 Uses Permitted. To further define 300.21, with the addition of this wording, the proposal will specify in Article 334 of the Code that applies to NM, NMC, and NMS.
Panel Meeting Action: Reject
Panel Statement: The exception to 300.22(C) applies in general and it is unnecessary to repeat the requirement in 334.10.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:

BROWN, H.: We disagree with the panel action to reject this proposal.

This is a very important safety issue that needs to be addressed within the confines of Article 334. Every possible preventable measure to stop the spread of fire is essential to good code.

Article 334 addresses the installation requirements of a wiring method primarily used in dwelling units.

Throughout the event of a fire, residential air returns contribute to the fueling and spreading of the fire. The submitter of this proposal is recognizing a need to provide prescriptive language within334.10(New) that states: "In residential air returns, where cables pass through the joists or studs perpendicular to the long dimension, cables shall be protected by a metallic raceway, such as rigid metal conduit, electrical metallic conduit, or flexible metal conduit. The connectors used with such material shall effectively close any openings in the connection.

Although 300.21 addresses the spread of fire or products of combustion, the additional language appearing in Article 334 that clarifies the intent of the code will give guidance for a proper installation that may save a life.

7-48 Log #424 NEC-P07 **Final Action: Reject**
(334.10(A))

Submitter: Mario Mumfrey, Inspection Bureau Inc.
Recommendation: Revise text to read as follows:

Type NM cable shall be permitted as follows:

(1) For exposed normally dry locations <u>except as not permitted elsewhere in this code.</u>

(2) For concealed normally dry locations <u>of areas in habitable spaces</u> except as prohibited by 334.10(3)

<u>(3) Formally number 2 (unchanged)</u>

<u>FPN: Habitable spaces is defined for this purpose as designed or able to be lived in.</u>
Substantiation: Type NM cable commonly referred to as "Romex" is the wiring method preferred by professionals to use in dwellings units. Respectively, it is also the wiring method of choice used by untrained and unskilled individuals who also work in dwelling units that undergo changes. Such changes include room additions and/or basement finishes. NM cable "Romex" is a fragile wiring method that often requires some form of protection surrounding it even under normal conditions where it is deemed the wiring is subjected to physical damage. Oftentimes either by design or by unforeseen financial circumstances the wiring in areas known to be habitable spaces (lived in) are not concealed. Article 334 is vague in this matter permitting the installation of its wiring method to be installed in both exposed and concealed locations only saying that structures that are not dwellings and of types III, IV, and V construction must be concealed. Compliance to conceal the wiring as well as complete the project is often accomplished through local building ordinances. This simple definition and change will ensure that NM cable, as installed and inspected, will safely be protected and last as the wiring manufacturer intended.

NOTE: It is not the intent for NM cable to be concealed in usual unfinished areas.
Panel Meeting Action: Reject
Panel Statement: Section 334.10(1) and (2) permit NM cable to be installed exposed or concealed in one- and two-family dwellings and multifamily dwellings permitted to be of Types III, IV, and V construction. Section 334.10(3) requires NM cable installed in other structures to be concealed. No technical substantiation has been provided to support the requirement that the cable be concealed in dwellings. NM cable can be protected from physical damage without concealing the cable.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-49 Log #200 NEC-P07 **Final Action: Accept in Principle**
(334.12)

NOTE: The following proposal consists of Comment 7-102 on Proposal 7-115 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 7-115 was:
Change the existing text to the following:

334.12 Uses Not Permitted. Type NM, NMC, and NMS cables shall not be used <u>under the following conditions or in the following locations:</u>

<u>(1) For multifamily dwellings of other than Types III, IV, and V construction.</u>

<u>(2) For non-dwelling structures of other than Types III, IV, and V construction, and where</u>
<u>the cables are not concealed within walls, floors, and ceilings that provide a thermal</u>
<u>barrier of material that has at least a 15-minute finish rating as identified in listings of</u>
<u>fire-rated assemblies.</u>

<u>FPN No. 1: Building constructions are defined in NFPA 220-1999, *Standard on Type of Building Construction* , or the applicable building code, or both.</u>

<u>FPN No. 2: See Annex E for determination of building types [NFPA 220, Table 3.11.</u>

<u>(3) For cable tray installations unless the cable is identified for the use.</u>

(4) For open run installations in dropped or suspended ceilings in other than one- and two
-family and multifamily dwellings.

(5) <u>For installation</u> as service entrance-cable.

(6) <u>For use</u> in commercial garages having hazardous (classified) locations, except in accordance with 511.3(B).

(7) <u>For use</u> in theaters and similar locations, except where permitted in 518.4.

(8) <u>For use</u> in motion picture studios.

(9) <u>For use</u> in storage battery rooms.

(10) <u>For use</u> in hoistways, or on elevators or escalators.

(11) For installations embedded in poured cement, concrete, or aggregate.
(12) For use in hazardous (classified) locations, except where permitted in the following:
Submitter: David H. Kendall, Carlon
Recommendation: The Panel's revised wording should be revised further under Part B to state the following:
(4) Where exposed or subject to ~~excessive~~ moisture or dampness.

Substantiation: NM and NMS Cable is only permitted to be used in normally dry locations per 334.10(A)(1) and 334.10(C)(1). The 1999 NEC (336-4(a) and (b)) permitted NM and NMS Cable to be fished in voids of masonry block or tile walls where such walls were not subject to excessive moisture or dampness. The proposed language expands the use of NM and NMS cable into areas of dampness that could include under roofed open porches. See Locations in Article 100 for Damp.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel contends that "not subject to excessive moisture" conflicts with the definitions of Dry and Damp Locations.
See panel action on Proposal 7-50.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-50 Log #201 NEC-P07 **Final Action: Accept**
(334.12)

TCC Action: The Technical Correlating Committee directs the panel to clairfy the action on this proposal. This action will be considered by the panel as a public comment.
NOTE: The following proposal consists of Comment 7-104 on Proposal 7-115 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 7-49 (Log#200)]
Submitter: Noel Williams, Noel Williams Consulting
Recommendation: This proposal should be rejected or accepted in principle with the additional change:
Revise 334.12(B)(4) to read "In wet or damp locations."
Substantiation: This proposal will create more problems than it will solve. The comments on Negative by Mr. Brown, Mr. Schumacher, and Mr. Stewart should be more carefully considered. The explanation of negative by Gotham (ROP 7-8) is also applicable here. The idea could work, but it must first be coordinated with UL listing information, which currently refers to Article 334. In particular, the language about "normally dry locations" has been completely lost, and the remaining language "where exposed to excessive moisture or dampness" is too vague to be useful in enforcement. Wet and damp locations are well defined.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-51 Log #202 NEC-P07 **Final Action: Accept in Principle**
(334.12 Exception (New))

NOTE: The following proposal consists of Comment 7-105 on Proposal 7-115 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 7-49 (Log#200)]
Submitter: Robert C. Duncan, Duncan Consulting, Inc.
Recommendation: Add Exception under 334-12.
Exception: Type NM cable installed in a raceway system are permitted in Type I or II construction.
Substantiation: There is presently a listed NM Hybrid Cable on the market consisting of power, communications and signaling conductors under a common jacket. Without the Code permitting the use of this new type cable to be installed in raceways, the provisions of 780.6, 725.55 and 800.52 cannot be utilized.
Panel Meeting Action: Accept in Principle
Add an Exception following 334.12(A)(1) to read as follows:
"Exception: Type NM, NMC, and NMS cable shall be permitted in Types I and II construction when installed within raceways permitted to be installed in Types I and II construction."
Panel Statement: The addition of the exception will permit the installation of NM, NMC, and hybrid NMS cables in Type I and II construction when installed in a raceway. The panel notes that 725.55 addresses conductor separation between conductors and does not mention hybrid cables.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BROWN, H.: We feel that this proposal should be rejected.
Type NM cable is not designed to be routinely installed within a conventional raceway system.
Raceways are designed to contain building wire. Raceway systems are allowed to contain as much as 360 degrees of total bend between pull points. Damage to the outer sheath of NM cable will occur when installed within the confines of the raceway articles.
Technical Substantiation should be closely reviewed by CMP 6 as this very important issue is not entirely under the purview of CMP 7. We have reasonable concerns relating to the "safe dissipation" of heat of conductors contained within a cable sheath that are further subjected to the confinement of a raceway. This heat would contribute to conductor insulation degradation that could ultimately lead to ground faults and short circuits.... CLEARLY SOMETHING THAT THE CODE REQUIRES THAT WE AVOID.
Raceway fill is another concern. Cables that are elliptical in shape are not typically designed to be installed within a raceway. They are required, on occasion, to be protected using short sections of raceway. For example: Table 1, Chapter 9, barely makes reference to cables that are elliptical in shape. Why? Because Type NM cables should not be routinely installed in raceway systems.
There are other safe and affordable wiring methods in the market place that meet industry needs, without sacrificing the integrity of the code.

7-57 Log #3041 NEC-P07 **Final Action: Reject**
(334.12(11))

Submitter: Melvin K. Sanders, TECo Inc.
Recommendation: Insert new Section 334.12(11) as follows.
" (11) Where subject to physical damage. "
Substantiation: Article 334 wiring methods are not inherently self protecting against physical damage, and this is in line with other typical wring methods installed in wooden structure as stated in 320.12(1), 330.12(1), and 362.12(10) and subject to the same concerns.

Panel Meeting Action: Reject
Panel Statement: Section 300.4 addresses protection against physical damage for all wiring methods, and it is not necessary to repeat the requirements in 334.12.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BROWN, H.: We disagree with the panel action to reject this proposal.
The submitter's substantiation states that the wiring methods in 320.12(1), 330.12(1), and 362.12(10) have the requirement that: The wiring method not be permitted where exposed to physical damage.
We agree with the submitter of this proposal. Should consistency remain throughout the code?
In addition to accepting the language that the submitter is requesting, we suggest the addition of a (FPN) to refer code users back to (300.4). This will further the endeavors of making the code more user friendly, and insure that the requirements of 300.4 are followed.

7-52 Log #3090 NEC-P07 **Final Action: Reject**
(334.12(2))

Submitter: Joseph A. Hertel, Safety and Buildings
Recommendation: Revise to read:
"Unsupported in dropped or suspended ceilings in other than one- and two-family and multifamily dwellings."
Substantiation: The current language prohibits the installation of NM cable above a suspended ceiling where the cable is fastened to the structural ceiling or installed through bored holes in joists because removal of the ceiling tile will expose it. "Exposed" is defined in Article 100. The prohibition it would seem was intended to prohibit the use of NM cable where it would be used in an unsupported manner such as fixture whip.
Panel Meeting Action: Reject
Panel Statement: The expectation is that NM would be subject to damage any where it is exposed, with the exception provided for residential wiring. Issues of concern are retrofit wiring, other services, and remodeling in commercial applications. Section 300.11 already addresses securing and supporting in dropped or suspended ceilings.
Section 334.12 is worded correctly. It is not limited to fixture whips.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-53 Log #2903 NEC-P07 **Final Action: Reject**
(334.12(A)(2))

Submitter: Julian R. Burns, Quality Power Solutions, Inc./Burns Electrical Contractors
Recommendation: Delete the following text:
~~(2) Exposed in dropped or suspended ceilings in other than one and two family and multifamily dwellings.~~
Substantiation: There are many types of buildings constructed with the same type of construction as single and multifamily dwellings, which NM cable should be allowed. These types consist of, but not limited to; office condos, retail spaces, medical offices etc. If NM cable is a hazard above a lay-in or suspended ceiling, then it should not be used in dwellings where suspended ceilings are used.

Panel Meeting Action: Reject
Panel Statement: The number of cables, and as a result the fuel load, is significantly greater in the occupancies listed in the proposal than in the occupancies permitted in 334.12(A)(2). Also, see the panel statement on Proposal 7-52.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-54 Log #553 NEC-P07 **Final Action: Reject**
(334.12(A)(11) (New))

Submitter: Neal Dorenkott, City of Eastlake Ohio Building Department / Rep. B.O.C.O.N.E.O
Recommendation: Add new text to read:
(11) In residential air returns without approved fire rated protection.
Substantiation: Although 300.21 address the issue of not increasing the spread of fire or products of combustion, it is not addressed in 334.12(A) Uses Not Permitted. To further define 300.21, with the addition of this wording, this proposal will specify in the Article 334 of the Code that applies to NM, NMC, and NMS.
Panel Meeting Action: Reject
Panel Statement: Section 300.22 addresses wiring in ducts, plenums, and other air-handling spaces and, therefore, applies to all wiring methods. The reference in 334 is not needed.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BROWN, H.: We disagree with the panel action to Reject this proposal. Every attempt should be made to stop the spread of fire. Although 300.21 addresses the issue of not increasing the spread of fire or products of combustion, there is a need for prescriptive text within the confines of Article 334 to address this very important safety issue.
The issue could be resolved with the addition of a Fine Print Note, however, the prescriptive text suggested in Proposal 7-47 would be preferable.
Please see our comments on Proposal 7-47.

7-55 Log #203 NEC-P07 **Final Action: Accept in Principle**
(334.12(B)(4))

NOTE: The following proposal consists of Comment 7-114 on Proposal 7-115 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 7-49 (Log#200)]
Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise 334.12(B)(4) as revised by the Panel to read:
(4) In other than normally dry locations.
Substantiation: Because the text in the 2002 NEC in Uses Permitted has been deleted, 334.10(A) and (C) that permit NM and NMS to be used in normally dry locations, has been inadvertently changed. The Panel text in proposed (334.12(B)(4)) is insufficient.
In the 2002 NEC only NMC is permitted to be used in dry, damp, or moist locations (334.10(B)(1).
The specific use permitted for NM and NMS by the 2002 NEC, as well as previous codes, is "exposed or concealed in normally dry locations". In uses not permitted of the 2002 NEC, 334.12(a)(10)(d) does state "Where exposed or subject to excessive moisture or dampness," but that was used in conjunction with the normally dry permitted use, and actually emphasizes that NM and NMS are not to be used in other than dry installations.
NM has always been a dry location wiring method. The text accepted by the Panel changes that meaning without substantiation for doing so. The proposed text above corrects this oversight.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 7-49.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-56 Log #3040 NEC-P07 **Final Action: Reject**
(334.13)

Submitter: Melvin K. Sanders, TECo Inc.
Recommendation: Insert in new Section 334.13 the following.
334.13 Protection Against Physical Damage
Where subject to physical damage, wiring methods shall be protected by either, or all, in the following manner.
(A) Cables and Raceways Through Wood Members.
(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in joists, rafters, or wood members, holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/ 4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.
Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(2) Notches in Wood. Where there is no objection because of weakening the building structure, in both exposed and concealed locations, cables or raceways shall be permitted to be laid in notches in wood studs, joists, rafters, or other wood members where the cable or raceway at those points is protected against nails or screws by a steel plate at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width, installed to cover the area of the wiring. The steel plate shall be installed before the building finish is applied.
Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(B) Nonmetallic-Sheathed Cables and Electrical Nonmetallic Tubing Through Metal Framing Members.
(1) Nonmetallic-Sheathed Cable . In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings or listed grommets covering all metal edges that are securely fastened in the opening prior to installation of the cable.
(2) Nonmetallic-Sheathed Cable and Electrical Nonmetallic Tubing. Where nails or screws are likely to penetrate nonmetallic-sheathed cable or electrical nonmetallic tubing, a steel sleeve, steel plate, or steel clip not less than 1.6 mm (1/ 16 in.) in thickness shall be used to protect the cable or tubing.
Exception: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(C) Cables and Raceways Parallel to Framing Members and Furring Strips. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed parallel to framing members, such as joists, rafters, or studs, or is installed parallel to furring strips, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (1-1/ 4 in.) from the nearest edge of the framing member or furring strips where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1.6 mm (1/ 16 in.) thick.
Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: For concealed work in finished buildings, or finished panels for prefabricated buildings where such supporting is impracticable, it shall be permissible to fish the cables between access points.
Exception No. 3: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
(D) Cables and Raceways Installed in Shallow Grooves. Cable- or raceway-type wiring methods installed in a groove, to be covered by wallboard, siding, paneling, carpeting, or similar finish, shall be protected by 1.6 mm (1/ 16 in.) thick steel plate, sleeve, or equivalent or by not less than 32-mm (1-1/ 4-in.) free space for the full length of the groove in which the cable or raceway is installed.
Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.
Substantiation: The wiring methods typically installed in wooded frame structures are Article 320 (Type AC), Article 330 (Type MC), Article 334 (Types NM, NMC, and NMS), and Article 362 (ENC). Insofar as Article 340 (Type UF) is installed in lieu of Article 334 wiring methods, its installation must meet the requirements of Article 334 Parts II and III, and also subject to the same installation restrictions.
Since the 1975 Edition of the NEC, there has been a requirement in Section 300.4 that steel plates or bushings be installed to provide protection of certain wiring method against damage from ordinary nails or screw-nails when they pass through wooden members or laid in notches or grooves and the distance from the nail direction could not be the required 1-1/4 inch (32 mm).
This restriction placed in Article 300 has prevented those CMP's most knowledgeable in application of these products from using any other protection schemes or technology for this purpose. During the 2005 ROP/ROC stage, fact-finding reports were presented to CMP 3 highlighting the steel plates called for provide little or no protection against nails or screw-nails larger than #8 or equivalent trade designation. Since Section 300.4 first paragraph was changed in 2005 ROP to emphasize conductors are to be protected against physical damage, it is obvious that such protection is to be provided by the wiring method in which they are contained, as spelled out in Section 300.3(A).

Because the Scopes of Section 320.1, 330.1, 334.1, 340.1 and 362.1 state they govern the installation of those wiring methods which, by Section 300.3(A), contain the conductors that are to be protected, as stated in Section 300.4 first paragraph.

Sections 320.12(1), 330.12(1), 340(10), and 362.12(10) state those wiring methods are not to be exposed to physical damage, therefore the contained conductors are inherently protected against damage which meets the intent of Section 300.4 first paragraph, and Section 300.3(A) is satisfied.

This would allow Article 300 to set the general guidelines and allow CMP 7 and CMP 8 to set rules deemed necessary to protect appropriate wiring methods.

Separate proposals are being made to CMP 3 and CMP 8 to address the text to be deleted from Article 300. Coordination between all affected CMP's will be essential in order for this to be accomplished in one ROP/ROC cycle

Panel Meeting Action: Reject

Panel Statement: Section 300.4 specifies requirements for protection against physical damage. Article 320 references those portions of 300.4 that Code-Making Panel 7 requires to be applicable to Type AC cable. Code-Making Panel 7 can, at any time, include additional protection requirements to supplement those in 300.4 or modify the 300.4 requirements. It is not necessary to repeat the 300.4 requirements in multiple cable articles when the appropriate requirements in 300.4 can simply be referenced as appropriate in each cable article. The addition of 334.13 would unnecessarily increase the size of the Code without providing additional clarity.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-58 Log #2399 NEC-P07 **Final Action: Accept**

(334.15)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise text to read:

334.15 Exposed Work. In exposed work, except as provided in 300.11(A), cable shall be installed as specified in 334.15(A) through (C).

(A) Remain unchanged.

(B) Remain unchanged.

(C) In Unfinished Basements <u>and Crawl Spaces</u> . Where cable is run at angels with joists in unfinished basements <u>and crawl spaces</u> , it shall be permissible to secure cables not smaller than two 6 AWG or three 8 AWG conductors directly to the lower edges of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. NM cable used on a wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing. Conduit or tubing shall utilize a nonmetallic bushing or adapter at the point the cable enters the raceway. Metal conduit and tubings and metal outlet boxes shall be grounded.

Substantiation: The code differentiates between an unfinished basement in different areas of the code, such as in 210.8(A). This code section, however, does not give any direction as to the requirements for a crawl space. Because the same dangers exist in both unfinished basements and crawl spaces, this subsection should be changed to include both locations.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

BROWN, H.: We disagree with the panel action to accept this proposal.

This proposal will allow for cables not smaller than two 6 AWG or three 8 AWG conductors to become fastened directly to the lower edges of joists (in a crawl space).

A "crawl space" is not defined in the code. Without placing "height restrictions" or defining a "crawl space" this provision will quickly become a safety issue.

For example: A crawl space may exist beneath a building on a conventional foundation. An individual would have to navigate under surface mounted wiring, (possibly in a "tight" space), while attempting to move around under the building. The individual could "snag" the wiring, and pull it away from its fastening. "Tight spaces" are already an impediment to performing work. Surface mounted cables should not be located in these types of spaces.

Without defining "crawl space", there are no guidelines or restrictions for allowing a lessening of the current rules. The existing installation requirements provide that the cables must pass through bored holes. This has been an accepted practice for many years, as it provides for a safe installation of the product. Are we becoming too lazy to bore holes to protect our wiring method? Let's continue to give the consumer, the service technicians, and everyone else (pest control, etc.) a safe and efficient electrical installation.

7-59 Log #2467 NEC-P07 **Final Action: Reject**

(334.15(A) Exception (New))

Submitter: David Zinck, Newburyport Wiring Inspector

Recommendation: Add:

Exception: Stacker devices designed for the purpose shall be allowed to secure the cable where installed in accordance with (a) and (b) below:

(a) the stacker devices are installed at intervals no greater than 600 mm (2 ft) and,

(b) the wire enters the stacker device from the top or the side.

Substantiation: Stacker devices provide a very handy, safe, and neat way to do home runs in a house. With the cable supported at a maximum of 2 ft the support is equivalent to running through holes in studs. The purpose of (b) is to ensure that the wire snaps down into the device. If the devices were installed with the openings to the bottom, not much cable would have to fall out before the weight of the cable would pull the wire out of the others. Also, there is at least one manufacturer that has a device that the wires snap into on both sides. On such a device only the top half could be used on horizontal runs. I submitted this proposal in 2002 (see ROP 7-131 Log #1827 NEC-P07). The panel action was that the use of the stackers was allowed by 334.30.

The outer section that holds the cables is 1 1/2 in. or greater off of the surface that the cable is parallel to. The question becomes how far off of the joist can you be and still qualify as "closely follows the surface..." as required by 334.15(A). If a contractor cut 2 in. blocks and nailed them on 4 1/2 ft centers and then ran his Romex across them like giant guitar strings over frets would they pass inspection? The answer has to be YES if the Stackers are to qualify. How about 3 in. blocks? How about 4 in. blocks? I am resubmitting my previous proposal as food for thought.

Panel Meeting Action: Reject

Panel Statement: "Stacker device" is covered in 334.30 by the words "…or similar fittings designed and installed so as not to damage the cable." It is not necessary to list in the Code every possible means of securing and supporting Type NM cable.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-60 Log #328 NEC-P07 **Final Action: Reject**

(334.15(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"(B) Protection from ~~Physical~~ Damage. The cable shall be protected from ~~physical~~ damage...".

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-61 Log #1905 NEC-P07 **Final Action: Accept in Principle**

(334.15(B))

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Recommendation: In the second paragraph of 334.15(B), delete the word "Where" as the first word, delete "is" as the fifth word, the phrases "the cable" and "against nails or screws by a steel plate at least 1.59 mm (1/16 in.) thick and covered with plaster, adobe, or similar finish". Insert the phrase "in accordance with the requirements in 300.4(E) and covered with plaster, adobe, or similar finish". To read as follows:

~~Where~~ Type NMC cable ~~is~~ installed in shallow chases in masonry, concrete, or adobe, ~~the cable~~ shall be protected ~~against nails or screws by a steel plate at least 1.59 mm (in.) thick and covered with plaster, adobe, or similar finish;~~ <u>in accordance with the requirements in 300.4(E) and covered with plaster, adobe, or similar finish.</u>

Substantiation: Shallow is not defined anywhere in the NEC so complying with the requirements in 300.4(E) is certainly permissible. For example, if the one and a quarter in. spacing is maintained, then installing nail plates are not required. If the spacing is not maintained, then one of the other protection means in 334.15(B), paragraph one would be permissible but nail plates would not be necessary as stated in 300.4(E), Exception No. 1. Since 300.4(E), Exception No. 2 now permits plates less than a sixteenth of an in. that are listed and case hardened so by rewording this text would recognize this new method of protection where dealing with NM cable.

Panel Meeting Action: Accept in Principle

The panel accepts the proposal, but changes "in shallow chases" to "in shallow chases or grooves".

Panel Statement: The change in the wording to "in shallow chases or grooves" provides correlation with the wording in 300.4(E).

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-62 Log #1918 NEC-P07 **Final Action: Accept in Part**
(334.15(B))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for Comment.

Submitter: William Wagner, Certification Solutions

Recommendation: Revise 334.15(B) as follows:

334.15(B) Protection from Physical Damage. Cable shall be protected from physical damage where necessary by rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 <u>rigid</u> PVC ~~rigid nonmetallic~~ conduit, or other approved means. Where passing through a floor, the cable shall be enclosed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 <u>rigid</u> PVC ~~rigid nonmetallic~~ conduit, or other approved means extending at least 150 mm (6 In.) above the floor.
Where Type NMC cable is installed in shallow chases in masonry, concrete, or adobe, the cable shall be protected against nails or screws by a steel plate at least 1.59 mm (1/16 in.) thick and covered with plaster, adobe, or similar finish.

Substantiation: This is a companion proposal for the definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC Conduit and results in the use of consistent terminology for these products throughout the Code.

Panel Meeting Action: Accept in Part

The panel does not accept the inclusion of the word "rigid" in two places in the recommendation of the proposal, and accepts the remainder of the proposal.

Panel Statement: This action was taken to correlate with the action taken by Code-Making Panel 8 on Proposal 8-53.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-63 Log #344 NEC-P07 **Final Action: Accept in Principle in Part**
(334.15(C))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and correlate with action taken on Proposal 7-58. This action will be considered by the panel as a public comment.

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

(C) In Unfinished Basements. Where the cable is run at angles with joists in unfinished basements, it shall be permissible to secure cables not smaller than two 6 AWG or three 8 AWG conductors directly to the lower edges of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. NM cable installed on the walls of an unfinished basement shall be protected from physical damage. <u>Where</u> NM cable <u>is</u> used on a wall of an unfinished basement <u>it</u> shall be permitted to be installed in a listed conduit <u>or tubing or protected by other approved means.</u> Conduit or tubing shall ~~utilize~~ be provided with a ~~nonmetallic~~ <u>suitable</u> bushing or adapter at the point the cable enters the raceway. <u>The NM cable sheath shall extend through the conduit or tubing and into the outlet or device box not less than 6 mm (1/4 in.). The cable shall be secured within 300 mm (12 in.) of the point where the conduit enters the conduit or tubing.</u> Metal conduit and tubings and metal outlet boxes shall be grounded.

Substantiation: The proposed revisions are intended to provided needed clarification and direction for installers and enforcement officials. The added requirements are consistent with provisions that already exist in the Code (312.5(C) Exception) where NM cable is permitted to be installed in similar fashion. The missing elements in the 2005 NEC were the part about the length of the sheath of the cable and the securing distance from the point where the cable enters the conduit or tubing. The bushing could be metallic or nonmetallic types. The other revisions are editorial in nature.

Panel Meeting Action: Accept in Principle in Part

Revise the proposed text to read as follows:

"(C) In Unfinished Basements. Where the cable is run at angles with joists in unfinished basements, it shall be permissible to secure cables not smaller than two 6 AWG or three 8 AWG conductors directly to the lower edges of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. NM cable installed on the wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing or protected in accordance with 300.4. Conduit or tubing shall be provided with a suitable insulating bushing or adapter at the point the cable enters the raceway. The NM cable sheath shall extend through the conduit or tubing and into the outlet or device box not less than 6 mm (1/4 in.). The cable shall be secured within 300 mm (12 in.) of the point where the cable enters the conduit or tubing. Metal conduit, tubing, and metal outlet boxes shall be grounded.

Panel Statement: "Installed" is more descriptive than "used". Reference to 300.4 provides several methods of protection that may or may not be approved. The change to "insulated bushing" was made to correlate with 300.16(B). The change from "conduit" to "cable" and the revisions in the last sentence were editorial.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-64 Log #1393 NEC-P07 **Final Action: Reject**
(334.15(C))

Submitter: George Stolz, II, Pierce, CO

Recommendation: NEC-2005 334.15(C) has the following added after the existing 2002 text:

~~NM cable use don a wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing Conduit or tubing shall utilize a nonmetallic bushing or adapter at the point this cable enters the raceway. Metal conduit and tubings and metal outlet boxes shall be grounded.~~

Substantiation: The statement "NM cable used on a wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing" is redundant, as it is already stated in 300.18 and 300.15(C).

The statement "Conduit or tubing shall utilize a nonmetallic bushing or adapter at the point this cable enters the raceway" is overly restrictive, as a bushing is already required by 300.15(C). A properly installed metallic connector can be used anywhere except in an unfinished basement? That isn't logical or reasonable.

The statement "Metal conduit and tubings and metal outlet boxes shall be grounded" is in direct contradiction to 250.86 Exception No. 2, which rightly assumes that cables being protected from outward physical damage are going to be intact on the interior of that protection.

Panel Meeting Action: Reject

Panel Statement: The revisions made in Proposal 7-63 define the requirements for the installation of NM cable in unfinished basements.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-65 Log #1646 NEC-P07 **Final Action: Reject**
(334.15(C))

Submitter: Gerald Horn, Spencer Research & Development dba/J-Horn Electric Inc.

Recommendation: Add text to read as follows:

Smaller cables shall be run either through bored holes in joist or on running boards, or <u>installed in a commercially available UL approved plastic block with bored holes and a 1/16 in. metal bottom plate. This block is nailed or screwed to the bottom of the joist and eliminates boring the joist.</u>

Substantiation: This plastic block eliminates bored holes in joist and does not have rough edges to tear the sheath of the NM cable that is predominate with bored holes in wood. Also, it does not compromise the integrity or weaken the wood joist.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: "Stackers" are covered by the words "…or similar fittings designed and installed so as not to damage the cable" in 334.30. It is not necessary to list in the Code every possible means of securing and supporting Type NM cable.

Stackers are permitted to be used within the cavity between joists, installed so that the cables are parallel to the joist, but not below the joist.

Smaller cable sizes are more susceptible to physical damage than the larger sizes. Accordingly, the Code specifies the requirements for additional physical protection required for the smaller cables, and requires that any cables approved by the Code to be run at angles with joists shall be secured directly to the bottom of the joist or to a running board.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-66 Log #2468 NEC-P07 **Final Action: Reject**
(334.15(C))

Submitter: David Zinck, Newburyport Wiring Inspector

Recommendation: Revise text to read as follows:

Where cable is run at angles with joists in unfinished basements, it shall be permissible to secure cables ~~not smaller than two 6 AWG or three 8 AWG conductors~~ directly to the lower edges of the joists. ~~Smaller cables shall be run either through bored holes in joints or on running boards.~~

Substantiation: In 2002 I sent in a proposal to regulate and allow "Stackers" to be used for exposed work in unfinished basements (See ROP 7-131 Log #1827 NEC P07). The panel action was that the Stackers were permitted in 334.30. It really comes down to a definition of what constitutes "closely follows the surface of the building finish or of running boards" found in 334.15(A). How close to the surface does the cable have to maintain to qualify as "closely follows the surface"? The outer "holding section" of many stackers is about 1 1/2 in. or better from the surface. Would the same panel allow Romex to be stapled to a series of blocks holding the cable out the same distance? If the answer is YES, than what is the difference between having up to 4 1/2 ft of unsupported Romex running block to block, hanging in free air in between except for the point where it is stapled, and going joist to joist? And we have all heard the argument that it will be an enticing spot to hangs things off of (such as laundry). But the truth is, anyone who is so inclined to hang things off of the Romex stapled to the bottom of the joist will be equally inclined to do it a mere 3 in. higher if the Romex is run through bored holes which is accepted.

Panel Meeting Action: Reject

Panel Statement: Smaller cable sizes are more susceptible to physical damage than the larger sizes. Accordingly, the Code specifies the requirements for additional physical protection required for the smaller cables.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-67 Log #2916 NEC-P07 **Final Action: Accept in Part**
(334.15(C))

Submitter: Marcus Sampson, Lysistrata Electric

Recommendation: Revise as follows:

(C) In Unfinished Basements, <u>Crawl Spaces and Similar Areas</u> . Where cable is run at angles with joists in unfinished basements, <u>crawl spaces and similar areas</u> , it shall be permissible to secure cables not smaller than two 6 AWG or three 8 AWG conductors directly to the lower edges of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. NM cable used on a wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing. Conduit or tubing shall utilize a nonmetallic bushing or adapter at the point the cable enters the raceway. Metal conduit and tubings and metal outlet boxes shall be grounded.

Substantiation: Cable sizes 6 AWG and larger are often installed through unfinished areas such as crawl spaces, but the term “unfinished basements” restricts this allowance to basement areas.

Panel Meeting Action: Accept in Part

The proposed wording “and similar areas” is rejected. The remainder of the proposal is accepted.

Panel Statement: The term “in unfinished basements and crawl spaces” adequately addresses the appropriate areas applicable to 334.15(C). See panel action on Proposal 7-58.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

BROWN, H.: We disagree with the panel action to accept this proposal.

This proposal should be rejected, and our negative comments on Proposal 7-58 serve to punctuate our opposition to this proposal.

This proposal, if accepted, will allow cables not smaller than two 6 AWG or three 8 AWG conductors to be fastened directly to the lower edges of joists in “Crawl spaces” and “similar areas.”

The panel accepted the language to include “Crawl spaces” and rejected the language to include “and similar areas”.

The point is: <u>CRAWL SPACES ARE NOT NOT DEFINED</u> . Inspectors, installers, or anyone else must have a clear definition of a “Crawl space”, or a “Crawl space” quickly becomes the (SIMILAR AREA THAT THE CODE MAKING PANEL REJECTED).

We are making an attempt to be objective as it relates to this proposal and Proposal 7-58. “Define (Crawl Space), and then make the determination if less wiring restrictions should apply to the “defined” area.

7-68 Log #2574 NEC-P07 **Final Action: Reject**
(334.30)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 9 for Information.

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read as follows:

334.30 Securing and Supporting.

Exception: Where nonmetallic-sheathed cable...”.

Substantiation: The information in 314.17(C) Exception belongs in 334.30 to be useful and relevant.

Panel Meeting Action: Reject

Panel Statement: The rules in 314.17(C) Exception are more applicable to the use of the box rather than the cable. This proposal and panel action should be referred to Code-Making Panel 9 for information.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

SCHUMACHER, D.: I believe it would clear up a lot of confusion in the field if this were here instead of 314.17(C), it should be added as text rather than an exception.

7-69 Log #3347 NEC-P07 **Final Action: Reject**
(334.30)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Revise 334.30 as follows [(A), (B), and (C unchanged]:

334.30 Securing and Supporting. Nonmetallic-sheathed cable shall be secured by staples, cable ties, straps, or similar fittings so designed and installed as to not damage the cable. Where staples are used for cable sizes smaller than three 8 AWG conductors, they shall be of the insulated type, or listed noninsulated staples driven by staple guns shall be permitted. Cable shall be secured in place at intervals not exceeding 1.4 m (4½ ft) and within 300 mm (12 in.) from every cabinet, box, or fitting. For other than within 300 mm (12 in.) of a cable termination at a cabinet, box, or fitting, cables passing through successive holes in adjacent framing members no more than 600 mm (24 in.) apart shall be considered to be secured.

Sections of cable protected from physical damage by raceway shall not be required to be secured within the raceway.

Substantiation: This proposal raises anew the insulated staple requirement for smaller sizes of Type NM cable. Where applied locally, the requirement has proved to be inexpensive and forgiving of somewhat overenthusiastic hammer blows, the force of which is difficult to calibrate at times. Remember that the density of wood varies based on the positioning of knots and growth rings that cannot always be seen. Even skilled electricians occasionally overdrive staples, and the damage may not show up for years because plasticized polyvinyl chloride will flow over time under constant pressure.

This proposal is particularly pertinent because changes in the product standard have resulted in NM cables with far less robust construction than those that prevailed in years past. This proposal also includes an allowance for the listed staple gun/staple combinations that are now available for smaller sizes of NM cables.

Panel Meeting Action: Reject

Panel Statement: The present Code does not preclude the use of insulated staples or listed noninsulated staples driven by staple guns. No technical substantiation was submitted to justify mandating insulated staples only.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-70 Log #880 NEC-P07 **Final Action: Accept in Part**
(334.80)

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Add the following to the end of the second paragraph:

“... shall be adjusted in accordance with 310.15(B)(2)(a) and the provisions of 310.15(A)(2), Exception, shall not apply.”

Substantiation: Since the length of a bundle of cables passing through framing is likely to be short relative to the overall length of the cables, the exception to 310.15(A)(2) would often allow the reduced ampacity determined by this section to be disregarded. If heating is an issue in this case, the adjusted ampacity must be used.

Panel Meeting Action: Accept in Part

The panel accepts the addition of the phrase “and the provisions of 310.15(A)(2), Exception, shall not apply”.

Panel Statement: The first phrase in the proposal already exists in the Code.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-71 Log #1344 NEC-P07 **Final Action: Reject**
(334.80)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete adherence requirement to 310.15(B)(2)(a)

334.80 Ampacity.

The ampacity of Types NM, NMC, and NMS cable shall be determined in accordance with 310.15. The ampacity shall be in accordance with the 60°C (140°F) conductor temperature rating. The 90°C (194°F) rating shall be permitted to be used for ampacity derating purposes, provided the final derated ampacity does not exceed that for a 60°C (140°F) rated conductor. The ampacity of Types NM, NMC, and NMS cable installed in cable tray shall be determined in accordance with 392.11.

~~Where more than two NM cables containing two or more current-carrying conductors are bundled together and pass through wood framing that is to be fire- or draft-stopped using thermal insulation or sealing foam, the allowable ampacity of each conductor shall be adjusted in accordance with Table 310.15(B)(2)(a).~~

Substantiation: The exception to section 310.15(A)(2) makes this requirement moot. Generally speaking, the portion of cable that is surrounded by sealing foam will only be 3” in length, assuming conventional 2” x 4” construction. This means that if the total circuit length is greater 30”, this rule is nullified by the aforementioned exception. Considering the fact that 300.14 requires not less than 6 inches of free conductor at each outlet point, that makes for a circuit length not to exceed 18 inches before this rule applies. CMP 7 should recognize the fact that a typical NM installation will not consist of an 18” circuit that is engulfed in sealing foam. Considering the fact that ampacity adjustments for type NM cable only make a difference in ampacity when more than 9 current carrying conductors in bundled, this rule makes even less sense.

To summarize: This rule applies ONLY when the total length of NM cable is less than 18" in length, AND is passed through at least 3" of fire stopping foam, AND has more than nine current carrying conductors.

This code requirement serves no purpose, and therefore should be removed.

Panel Meeting Action: Reject

Panel Statement: Technical substantiation submitted during the 2005 Code cycle supported the addition of the second paragraph in 334.80. While the cable is only bundled for a short distance within the fire- or draft-stopped wood framing, it is long enough that the insulated conductors exceed their allowable temperature rating.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-72 Log #1770 NEC-P07 **Final Action: Accept in Principle**
(334.80)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered based on the action taken on Proposal 1-19. This action will be considered by the panel as a public comment.

Submitter: Danny Thomas, Durham City-County Inspections

Recommendation: Revise text to read as follows:

Where more than two NM cables, containing two or more current-carrying ~~conductors are bundled together and~~ pass through wood framing members together that is to be fire or draft-stopped using thermal insulation of sealing foam, the allowable ampacity of each conductor shall be adjusted in accordance with Table 310.15(B)(2)(a).

Substantiation: This alleviates having to have a definition for "bundled" which causes a lot of controversy over this particular code section. Many users want to argue that these cables are not bundled based on any code language or definition.

Panel Meeting Action: Accept in Principle

Revise the proposed wording to read as follows:

"Where more than two NM cables, containing two or more current-carrying conductors, pass through the same opening in wood framing that is to be fire- or draft-stopped using thermal insulation or sealing foam, the…".

Panel Statement: The panel agrees that "bundled" is not defined, and the revised wording more accurately describes the installation.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-73 Log #2737 NEC-P07 **Final Action: Accept in Part**
(334.80)

Submitter: Jim Pauley, Square D Company

Recommendation: Revise 334.80, second paragraph as shown:

Where more than two NM cables containing two or more current-carrying conductors are bundled together and pass through wood framing that is to be fire- or draft-stopped using thermal insulation, caulk, or sealing foam, the allowable ampacity of each conductor shall be adjusted in accordance with Table 310.15(B)(2)(a).

Exception: The ampacity adjustment shall not be required where the wood framing is fire or draft stopped only on the bottom side of the framing member.

Substantiation: Questions have been coming from AHJ's on this new provision in the 2005 NEC. This proposal is an effort to address those questions. The first revision involves adding the word "caulk" in the list of items used to seal around the opening. As written today, the rule would not be applicable if caulk were used because the text is specific to thermal insulation and sealing foam.

The second revision is to add an exception to clarify when the rule applies. It appears that it is not uncommon for caulk or a similar material to be placed on some of these openings only on the underside of the framing member. This is particularly true where cables penetrate the plate above a panelboard. Given that the study presented in the 2005 NEC focused on closing up the penetration completely (either by filling the hole itself or by putting material on both top and bottom of the plate), there would not appear to be justification for requiring the derating when a material is placed only on the bottom side of the framing member. The exception has been limited to the bottom side only because it would seem that putting the material on the top side would trap any heat generated by the cables and the rule should apply. If the panel rejects the exception, the implication would be that the rule would apply when a penetration has material placed around the opening in any manner and not necessarily in the opening or on both sides of the opening.

Panel Meeting Action: Accept in Part

The panel accepts the addition of the word "caulk", and rejects the addition of the exception.

Panel Statement: The exception is rejected, since building codes require that openings be properly filled to a level that matches the fire rating of the material prior to the penetration when fire- or draft-stopped.

The panel action on this proposal will modify the panel action on Proposal 7-72.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-74 Log #3152 NEC-P07 **Final Action: Accept**
(334.80)

Submitter: Travis Lindsey, Travis Lindsey Consulting Services

Recommendation: Add an additional third paragraph to 334.80 to read:

Where more than two NM cables containing two or more current-carrying conductors are installed in contact with thermal insulation without maintaining spacing between cables, the allowable ampacity of each conductor shall be adjusted in accordance with Table 310.15(B)(2)(a).

Substantiation: Recent field experimentation shows that NM cables which are grouped or bundled together for varying lengths and installed in contact with thermal insulation in walls and ceilings can exceed the maximum allowable design temperatures of the insulation. Even when the circuit currents were limited to eight percent or less, temperature exceeded 90°C (194°F).

Full details are contained in the test report entitled *NM Cable Bundles Installed on or In Thermal Insulation, November 2005.*

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

ADAMS, M.: NECA believes this proposal is too restrictive. "In contact with thermal insulation" is not the same concept as in the present second paragraph, which envisions completely surrounding bundled NM cables with thermal insulation or sealing foam. Also, since "bundled" is not a term defined in the NEC, accepting this proposal could preclude use of standoff type cable clamps. While intended to maintain space between adjacent NM cables, multiple cables installed in standoff clamps still touch in places, and might also touch thermal insulation. We do not believe that NM cables should be derated under this installation circumstance.

7-75 Log #3348 NEC-P07 **Final Action: Reject**
(334.80)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Revise the first paragraph to read as follows:

334.80 Ampacity. Type NM, NMC, and NMS cable shall have conductors rated at 90°C (194°F). Where installed in thermal insulation, the ampacity of conductors shall be that of 60°C (140°F) conductors. The ampacity of Types NM, NMC, and NMS cable installed in cable tray shall be determined in accordance with 392.11.

Substantiation: Thermal insulation severely degrades the ampacity of conductors. Mid-length conductor derating, whether as a consequence of the ambient temperature notes to Table 310.16, etc., or mutual conductor heating issues covered in 310.15(B)(2)(a), assumes free dissipation of heat from the raceway or cable assembly involved. If that assumption is invalid, then the calculations are invalid. This is true for all wiring methods.

We recommend that CMP 7 review the NEMA research for the 1987 cycle (Proposal 4-97), which showed the cable jacket of 2/3 AWG SEU cable "completely charred" as well as adjacent "charred wood members" when embedded in thermal insulation (specifically, when covered with 7 inches of cellulose insulation) and subjected to currents corresponding to their Table 310.16 ampacities. Similar cables exceeded their temperature ratings when drawing only two-thirds of their table ampacities. The term "final derated ampacity" in this context is meaningless. Ampacity is the continuous current carrying ability of a wire under conditions of use. It is determined by thermodynamics. If the use impedes free circulation of air, then the ampacity is reduced to whatever it is.

If there are no thermal impediments to air circulation, then it is appropriate to allow the 90°C number for derating purposes. If installed in thermal insulation, start with the 60°C number, just as was the case for armored cable prior to the 2005 NEC.

The data in the 1987 NEMA proposal illustrates this principle nicely, since the experimental parameters allow for a very close inference as to the actual effect of thermal insulation on ampacity, at least for 2 AWG aluminum cable assemblies with nonmetallic sheaths. From that experimental data, it is obvious that the true ampacity of 2 AWG XHHW Aluminum made up as Type SE cable is about 60 amperes when it is embedded in cellulose insulation. In fact, the ampacity is even lower because the test set-up used only two current-carrying conductors and comparable table listings are based on three conductors. The table ampacity of the 90°C (XHHW) individual conductors of the SE cable make-up, starting in the 60°C column is 75 amperes. Even this number is much higher than the actual ampacity as determined by test under the specified conditions of use.

The current NEC does not account for this hazard because it allows code users to start their derating calculations in the 90°C column, and bundle many conductors together or run through high-temperature ambients, all apparently valid according to traditional procedures. Suppose, for example, cables accounting for nine 12 AWG current-carrying conductors are bundled through attic floor joists with an assigned design temperature of 45°C. The resulting ampacity (assuming THHN conductors) would appear to be 30A x 0.7 x 0.87 = 18A. The 60°C ampacity of 12 AWG conductors is 25A. Since the calculation result (18A) does not exceed 25A, it appears to be allowed by the NEC, but is it technically correct?

This conclusion is, in fact, incorrect. This calculation does not take into account the effect of thermal insulation. The more technically correct answer is given by the armored cable rules in the 2002 and prior editions of the NEC: Begin with the 60°C column: 25A x 0.7 x 0.71 = 12A. There is no consistent percent multiplier that can be applied to correct for thermal insulation. Because heat dissipation has to account for I 2 R losses, which are usually much higher for larger cables expected to carry much more current, one can't confidently predict the exact ampacity of a given application. However, one can predict with confidence that the thermal insulation effect will be significant. The 60°C rule provides a prescriptive approximation of how to counteract the effects of thermal insulation. It probably overstates the result in the smallest sizes of conductors, and understates it in the larger sizes, but it is the only readily available option at this time.

Panel Meeting Action: Reject

Panel Statement: The conductors in NM, NMC, and NMS cables are already required to be rated at 90 degrees C per 334.112.

With the actions taken on Proposal 7-74, it is not necessary to begin derating the conductors at the 60 degree C ampacity.

The thermal insulation issue has been addressed by the action on Proposal 7-74.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-76 Log #1725 NEC-P07 **Final Action: Reject**
(334.100)

Submitter: Richard P. Owen, City Of St. Paul Electrical Inspection

Recommendation: Revise as follows:

334.100 Construction. The outer cable sheath of nonmetallic-sheathed cable shall be a nonmetallic material. <u>The outer sheath shall be color-coded to indicate the AWG sizing of the current-carrying conductors in the cable. The colors shall be as follows: size 14 AWG-white, size 12 AWG-yellow, size 10 AWG-orange, size 8 AWG and larger- black.</u>

Substantiation: Even though there is a manufacturer that already color codes their cable sheath, this proposal is not to endorse that particular brand of nonmetallic-sheathed cable, it is to introduce the requirement of color-coding for better identification of NM cables before and after installation. I would invite the panel to accompany an electrical inspector into a building under construction that contains very little, if any, lighting and identify the sometimes poorly stamped identification mark on a piece of NM Cable. To verify the size of each individual run of cable, possibly into the hundreds in a single residence is beyond the time any inspector can spend on a job. If this color-coding requirement was instituted with the standardized colors, the inspector could more easily verify that all the individual runs of NM cable are correctly sized and be able to spend more time on other parts of the installation. Since the electrician installing this cable is working under these same poor conditions, it is easy for them to accidentally use the wrong sized cable, especially when using short, separate pieces rather than out of a marked box. This small change could help eliminate inadvertent installation of an undersized cable causing a potential safety hazard.

This color coding is intended to supplement, not replace, the stamped marking on the cables.

Panel Meeting Action: Reject

Panel Statement: Section 310.11 covers marking requirements for cables and conductors and specifies the location and frequency of the markings to facilitate identification and inspection of the cable. Coloring the cable to assist in identification of conductor size in poorly lit buildings is contradictory, as distinguishing color in dark areas is difficult. Additionally, dependence on the jacket color may preclude thorough inspection of the cable type, number of conductors, and UL listing by not looking at the required cable marking.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-77 Log #881 NEC-P07 **Final Action: Accept**
(334.108)

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Revise as follows:

"In addition to the insulated conductors, the cable shall have an insulated, <u>covered</u> , or bare conductor for equipment grounding purposes only."

Substantiation: This change is intended to more accurately reflect the actual construction of NM cable, much of which includes a covered equipment grounding conductor that is neither insulated nor bare.

Panel Meeting Action: Accept

Panel Statement: The panel notes that the paper wrap over the bare conductor does not meet the definition of a covered conductor in Article 100.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-78 Log #34 NEC-P07 **Final Action: Accept in Principle in Part (334.116 and 334.117 (New))**

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

334.116 Sheath. The outer sheath of nonmetallic-sheathed cable shall comply with 334.116(A), (B), and (C).

(A) Type NM. The overall covering shall be flame retardant and moisture resistant.

(B) Type NMC. The overall covering shall be flame retardant, moisture resistant, fungus resistant, and corrosion resistant.

(C) Type NMS. The overall covering shall be flame retardant and moisture resistant. The sheath shall be applied so as to separate the power conductors from the communications and signaling conductors. The signaling conductors shall be permitted to be shielded. An optional outer jacket shall be permitted.

~~**FPN: For composite optical cable, see 770.9 and 770.133.**~~

<u>**334.117 Optical Fibers. Optical fibers shall be permitted in the construction of Nonmetallic-Sheathed Cables**</u>

Substantiation: Article 770 scope states:

770.1 Scope. The provisions of this article apply to the installation of optical fiber cables and raceways. This article does not cover the construction of optical fiber cables and raceways.

Section 770.9(C) states:

(C) Composite. These cables contain optical fibers and current-carrying electrical conductors, and shall be permitted to contain non-current-carrying conductive members such as metallic strength members and metallic vapor barriers. <u>Composite optical fiber cables shall be classified as electrical cables in accordance with the type of electrical conductors.</u>

Requirements for the construction of electrical cables are outside the scope of Article 770. Article 334 should simply be amended to permit optical fibers in the construction of nonmetallic-sheathed electrical cables. Section 770.133 covers the <u>installation</u> of optical fibers along with electrical conductors. It does not cover the construction of the composite electrical/optical fiber cable.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the deletion of the FPN in 334.116(C), and accepts 334.117 in principle by adding 334.104(C).

Section 334.104 will now read as follows:

"334.104 Conductors. The 600 volt insulated conductors shall be sizes 14 AWG through 2 AWG copper conductors or sizes 12 AWG through 2 AWG aluminum or copper-clad aluminum conductors.

(A) Signaling Conductors. Signaling conductors shall comply with 780.5.

(B) Communications Conductors. Communication conductors shall comply with Part V of Article 800.

(C) Optical Fibers. Optical fibers shall be permitted in Type NMS cable as permitted in 770.9(C) and 770.113."

Panel Statement: The definition of NMS cable in 334.2 permits optical fiber conductors within NMS cable rather than NM cable. The permitted use of fiber optic conductors in NMS cable is more appropriate in 334.104 rather than added as a new section. Section 334.104 was revised to list format in accordance with 3.3.2 of the NEC Style Manual.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

ARTICLE 336 — POWER AND CONTROL TRAY CABLE: TYPE TC

7-79 Log #229 NEC-P07 **Final Action: Reject**
(336.10(7))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"In ~~industrial establishments~~ <u>premises</u> where <u>the Authorities Having Jurisdiction are satisfied that the</u> conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the cable is continuously supported and protected against ~~physical~~ damage...".

Substantiation: Industrial establishments are not the only ones where AHJs are wont to accept this; warehousing operations are another example. Formal 90.4 documentation is not always provided, and given that there is no substantiation for differentiating the ill-defined "industrial" operation from other establishments that may have well-trained-in-house electricians, why not ease the liability picture for such inspectors? Also, why not use the more-common Code term "premises"?

Next, use of the word "physical" is superfluous–the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but here and elsewhere context makes the intended sense quite clear, rendering it completely unnecessary. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject

Panel Statement: The term "industrial establishment" is well understood and used throughout the Code. Not all locations that use the Code have an authority having jurisdiction. The word "physical" is appropriate, since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual.

Natural disasters render damage that also negatively impact electrical installations. These types of damage are oftentimes uncontrollable and beyond the scope of the NEC.

Physical damage, however, is controllable to a large degree and is within the scope of the NEC.

The NEC gives guidance to its users and installers to avoid placing electrical installations in areas with materials that could fail due to physical (acted upon forceably under adverse conditions that are likely to be present) damage.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-80 Log #1720 NEC-P07 **Final Action: Accept in Principle**
(336.10(7))

Submitter: Dennis A. Nielsen, Lawrence Berkeley National Laboratory

Recommendation: Revise as follows:

In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation and, where the cable is continuously supported and protected against physical damage using mechanical protection, such as struts, angles, or channels, Type TC tray cable that complies with the crush and impact requirements of Type MC cable and is identified for such use with the marking Type TC-ER shall be permitted to transition between cable trays , a cable tray and the utilization equipment or device a distance not to exceed 1.8 m (6 ft). The cable shall be secured at intervals not exceeding 1.8 m (6 ft) and be mechanically supported where exiting the cable tray to assure that the minimum bending radius is not exceeded. Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable. In cables containing conductors sized 6 AWG or smaller, the equipment grounding conductor shall be provided within the cable or, at the time of installation, one or more insulated conductors shall be permanently identified as an equipment grounding conductor in accordance with 250.119(B).

Substantiation: This will ensure a proper installation, but will allow for proper exiting of the cable tray to any piece of electrical equipment. It provides for the requirement of mechanical support where exiting the cable tray. It establishes a 6 foot limit on how far you can route the cable. This is plenty of length to get out of the tray to the equipment, but still prevents the TC-ER to be just run anywhere.

Panel Meeting Action: Accept in Principle

Add a new Exception to the end of 336.10(7) to read as follows:

"Exception: Where not subject to physical damage, Type TC-ER shall be permitted to transition between cable trays and between cable trays and utilization equipment or devices for a distance not to exceed 1.8 m (6 ft) without continuous support. The cable shall be mechanically supported where exiting the cable tray to ensure that the minimum bending radius is not exceeded."

Panel Statement: The addition of the exception provides clarification for proper installation.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

STEWART, H.: The new Exception would better read as follows for clarification:

"Exception: Where not subject to physical damage, Type TC-ER shall be permitted to transition from cable trays to utilization equipment or devices for a distance not to exceed 1.8 m (6 ft) without continuous support. The cable shall be mechanically supported from where it leaves the cable tray in order to ensure the minimum bending radius is not exceeded."

7-81 Log #2701 NEC-P07 **Final Action: Reject**
(336.10(7))

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Revise text to read:

In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the cable is ~~continuously supported and protected against~~ not subject to physical damage ~~using mechanical protection, such as struts, angles, or channels~~ , Type TC tray cable that complies with the crush and impact requirements of Type MC cable and is identified for such use with marking Type TC-ER shall be permitted ~~between a cable tray and the utilization equipment or device~~ to be exposed . The cable shall be supported and protected against physical damage using mechanical protection, such as struts, angles, or channels . The cable shall be secured at intervals not exceeding 1.8 m (6 ft). Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable. In cables containing conductors sized 6 AWG or smaller, the equipment grounding conductor shall be provided within the cable or, at the time of installation, one or more insulated conductors shall be permanently identified as an equipment grounding conductor in accordance with 250.119(B).

Substantiation: There are three different installation methods for Type TC, Type PLTC and Type ITC. All of these cables are permitted to be installed as Exposed Routing (ER) when the cable is listed as ER. The installation requirements should be similar to reduce confusion in field. A similar proposal is being submitted for Articles 725 and 727 in an effort to align the installation methods.

There are no technical reasons to limit this installation method to only between a cable tray and utilization equipment or device. Cables listed for ER installations are a stronger cable, capable of withstanding more abuse than cables not listed for use in ER installations.

Panel Meeting Action: Reject

Panel Statement: TC cables are designed for installation in cable trays. They have nonmetallic outer jackets to facilitate installation without damage to the cabled insulated conductors within. The cables are not designed for exposed installations. A specific construction of TC was developed with enhanced overall cable mechanical performance to enable the cable to meet the crush and impact requirements of MC cable. The enhanced cable is permitted for specific applications to be installed outside of a cable tray. Expansion of the use of TC beyond those specific applications will expose the cable to damage that it is not designed to withstand. The differences in the physical properties nonmetallic and metallic outer coverings are very different. The tensile strength of steel and aluminum is typically 72,000 and 42,000 psi, respectively. The tensile strength of a nonmetallic covering is typically 2,000 psi. Simply meeting a crush and impact requirement does not encompass the abilities of a metallic outer covering on the cable.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

RUNYON, G.: The panel should have Accepted in Principal this proposal to allow type TC-ER cable to be installed between utilization equipment. Panel 3 recognized that there is no reason not to allow PLTC cable and ITC cable that meets the crush and impact requirements of MC cable to be used as exposed wiring when properly supported and secured, by their Accept in Principal vote on Proposals 3-179 and 3-205.

7-82 Log #228 NEC-P07 **Final Action: Reject**
(336.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

(1) Where subject to ~~physical damage~~ blows or abrasion.

Substantiation: Use of the word "physical" generally is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from, e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Here, though, at the very least the third item refers to a form of physical damage - deterioration by ultraviolet radiation. The proposed rewording is an attempt at precision. If you don't care to reword (1), theoretically its present form eliminates the need for (3) and possibly the other items as well.

Furthermore, I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing – look at William Zinsser's classic, On Writing Well – but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone rasing an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from nonphysical injury?" (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject

Panel Statement: The word "physical" is appropriate, since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-83 Log #2987 NEC-P07 **Final Action: Reject**
(336.104)

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add allowance for nickel and nickel-coated copper conductors to 336.104 as shown below.

336.104 Conductors. The insulation conductors of Type TC cables shall be in sizes 18 AWG to 1000 kcmil copper, nickel , or bucket-coated copper, and sizes 12 AWG through 1000 kcmil insulated conductors of sizes 14 AWG and larger copper, nickel-coated copper and sizes 12 AWG through 1000 kcmil aluminum or copper-clad aluminum shall be one of the types listed in Table 310.13 or Table 310.62 that is suitable for branch circuit and feeder circuits or one that is identified for such use.
Substantiation: TC singles can be from Table 310.13, which could use nickel or nickel-coated copper. Some fire rated TC cables require nickel or nickel coated copper conductors. This harmonizes with the allowance of nickel and nickel-coated copper in 332.104 for MI cable.
Panel Meeting Action: Reject
Panel Statement: The insulation used on the conductors in Type TC cable is normally rated 90ºC whereas the magnesium oxide insulation used on the conductors in Type MI cable can withstand significantly higher temperatures.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 338 — SERVICE-ENTRANCE CABLE: TYPES SE AND USE

7-84 Log #2636 NEC-P07 **Final Action: Accept**
(338.10 and 338.12)

Submitter: James M. Daly, Upper Saddle River, NJ
Recommendation: Revise 338.10 and add 338.12 as shown below:
338.10 Uses Permitted.
(A) Service-Entrance Conductors. Service-entrance cable shall be permitted to be used as service-entrance conductors and shall be installed in accordance with 230.6, 230.7, and Parts II, III, and IV of Article 230.
~~Type USE used for service laterals shall be permitted to emerge from the ground outside at terminations in meter bases or other enclosures where protected in accordance with 300.5(D).~~
(B) Branch Circuits or Feeders.
(1) Grounded Conductor Insulated. Type SE service-entrance cables shall be permitted in wiring systems where all of the circuit conductors of the cable are of the rubber-covered or thermoplastic type.
(2) Grounded Conductor Not Insulated. Type SE service-entrance cable shall be permitted for use where the insulated conductors are used for circuit wiring and the uninsulated conductor is used only for equipment grounding purposes.
Exception: Uninsulated conductors shall be permitted as a grounded conductor in accordance with 250.32, 250.140, ~~250.140, 250.32,~~ and 225.30 through 225.40.
(3) Temperature Limitations. Type SE service-entrance cable used to supply appliances shall not be subject to conductor temperatures in excess of the temperature specified for the type of insulation involved.
(4) Installation Methods for Branch Circuits and Feeders.
(a) *Interior Installations* . In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of ~~Parts I and~~ Part II of Article 334, excluding 334.80.
FPN: See 310.10 for temperature limitation of conductors.
(b) *Exterior Installations* . In addition to the provisions of this article, service-entrance cable used for feeders or branch circuits, where installed as exterior wiring, shall be installed in accordance with Part I of Article 225. The cable shall be supported in accordance with 334.30 . ~~, unless used as messenger-supported wiring as permitted in Part II of Article 396~~ . Type USE cable installed as underground feeder and branch circuit cable shall comply with Part II of Article 340. ~~Where Type USE cable emerges from the ground at terminations, it shall be protected in accordance with 300.5(D). Multiconductor service-entrance cable shall be permitted to be installed as messenger-supported wiring in accordance with 225.10 and Part II of Article 396.~~
338.12 Uses Not Permitted.
(A) Service-Entrance Cable. Service-Entrance Cable (SE) shall not be used under the following conditions or in the following locations.
(1) Where subject to physical damage unless protected in accordance with 230.50(A)
(2) For underground use unless identified for the purpose
(3) For exterior branch circuits and feeder wiring unless the installation complies with the provisions of Part I of Article 225 and is supported in accordance with 334.30 or is used as messenger supported wiring as permitted in Part II of Article 396
(B) Underground Service-Entrance Cable. Underground Service-Entrance Cable (USE) shall not be used under the following conditions or in the following locations
(1) For interior wiring
(2) For above ground installations except where USE cable emerges from the ground and is terminated in an enclosure at an outdoor location and the cable is protected in accordance with 300.5(D)
(3) As aerial cable unless it is a multiconductor cable identified for use above ground and installed as messenger supported wiring in accordance with 225.10 and Part II of Article 396
Substantiation: This proposal was developed by a Task Group appointed by Gaylen D. Rogers, Chair of CMP-7, to consider adding Section 338.12 into the 2008 NEC. The Task Group consisted of the following CMP-7 members: Jim Daly (Chair), Harry Brown, Chris Fahrenthold, James Hinrichs, and Thomas Wood.
The addition of Section 338.12 was considered necessary to add uniformity to all the Articles for which Panel 7 is responsible.
Section 338.10 was revised to correlate with the new Section 338.12.
334 Part I was deleted in 338.10 (B)(4)(a) since it is not applicable for Type SE and USE cables.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-85 Log #2638 NEC-P07 **Final Action: Accept**
(338.10(B)(1))

Submitter: James M. Daly, General Cable
Recommendation: Change the word "rubber-covered" to "thermoset".
Substantiation: Rubber insulation as such is no longer used. Thermoset is more accurate since it includes XLPE and EPR which are the insulations currently in use.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-86 Log #848 NEC-P07 **Final Action: Reject**
(338.10(B)(2))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(2) Grounded Conductor Not Insulated. Type SE service-entrance cable shall be permitted for use where the insulated conductors are used for circuit wiring and the uninsulated conductor is used only for equipment grounding purposes.
Exception: Uninsulated conductors shall be permitted as a grounded conductor in accordance with 250.140, 250.32 where the uninsulated grounded conductor of the cable originates in service equipment, and 225.30 through 225.40.
Substantiation: The additional wording proposed is an effort to clarify that compliance with 250.24(A)(5) must be maintained. The current wording in the exception does not restrict this, and situations involving inappropriate grounding connections that could develop where those using the provisions in 250.32(B)(2) and the SE cable feeding another structure originates from a distribution panelboard or other equipment on the downstream side of the service equipment creating undesired objectionable current over equipment grounding conductors as well as other conductive paths.
Panel Meeting Action: Reject
Panel Statement: The panel will reconsider this proposal if Code-Making Panel 5 accepts the proposal to delete 250.32(B)(2). This proposal and panel action should be forwarded to Code-Making Panel 5 for information and comment.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-87 Log #2400 NEC-P07 **Final Action: Reject**
(338.10(B)(2))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
338.10 Uses Permitted.
(B) Branch Circuits or Feeders.
(2) Grounded Conductor Not Insulated. Type SE service-entrance cable shall be permitted for use where the insulated conductors are used for circuit wiring and the uninsulated conductor is used only for equipment grounding purposes.
Exception: Uninsulated conductors shall be permitted as a grounded conductor in accordance with 250.140, ~~250.32,~~ and 225.30 through 225.40.
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Reject
Panel Statement: The panel will reconsider this proposal if Code-Making Panel 5 accepts the proposal to delete 250.32(B)(2). This proposal and panel action should be forwarded to Code-Making Panel 5 for information and comment.
Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BROWN, H.: We disagree with the panel action to Reject this proposal. We understand the panel's decision was conditional on what Code-Making Panel 5 ruled on the proposal, however, we also feel that we should support any proposed text that would discontinue the practice of using the grounding conductor as an equipment grounding conductor in an electrical circuit.

7-88 Log #2639 NEC-P07 **Final Action: Accept**
(338.10(B)(4)(a))

Submitter: James M. Daly, General Cable
Recommendation: Delete the phrase "excluding 334.80" and change the comma after "Article 334" to a period.
Substantiation: When Type SE conductors are used for interior wiring, as a replacement for Type NM cable, the ampacity of the conductors should be the same as permitted for NM cable since the insulations used are the same both NM and SE conductors.
Panel Meeting Action: Accept
Panel Statement: This action will modify the action taken on Proposal 7-84.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-89 Log #3124 NEC-P07 **Final Action: Accept**
(338.10(B)(4)(a))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Delete the reference to Part 1 of Article 334 with the sentence to read as follows:
(a) Interior Installation. In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Part ~~s I and~~ II of Article 334, excluding 334.80.
Substantiation: There is nothing in Article 334, Part I that applies to Type SE cable.
Panel Meeting Action: Accept
Panel Statement: The action on this proposal is modified by the panel actions taken on Proposals 7-88 and 7-90 and modifies the panel action on Proposal 7-84.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-90 Log #3349 NEC-P07 **Final Action: Accept**
(338.10(B)(4)a.)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Delete the phrase "excluding 334.80".
Substantiation: This is a companion proposal to one submitted to correct the requirements in 334.80 so the 60°C starting point only applies, but always applies, to cables run embedded in thermal insulation. Ironically, this wiring method is the very one that NEMA selected in the 1987 cycle to study the affects of thermal insulation, and those affects proved a dramatic decrease in ampacity when this wiring ran through insulation. The present NEC wording that eliminates the 60°C column ampacity calculation recreates the very hazard documented in the NEMA testing. The solution is to apply 334.80 to SE cable applications, but first, to correct 334.80 (see companion proposal) so the 60°C start point only applies where the cable runs through thermal insulation.
Panel Meeting Action: Accept
Panel Statement: The action on this proposal modifies the action taken on Proposal 7-84.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-91 Log #1719 NEC-P07 **Final Action: Accept in Principle**
(338.12)

Submitter: Dennis A. Nielsen, Lawrence Berkeley National Laboratory
Recommendation: Revise as follows:
338.12 Uses Not Permitted. Type SE and USE cable shall not be used under the following conditions or in the following locations:
(A) SE Cable
(1) Where subject to physical damage unless protected in accordance with 230.50(A).
(2) For underground use unless identified for the purpose.
(3) Branch Circuits and Feeders.
a. For branch circuit and feeder wiring unless protected in accordance with 230.50(A).
b. For interior branch circuit and feeder wiring unless the installation complies with the requirements of Part II of Article 334, excluding 334.80.
c. For exterior branch circuit and feeder wiring unless the installation complies with the provisions of Part I of Article 225 and is supported in accordance with 334.30, unless used as messenger supported wiring as allowed by Part II of Article 396.
d. Where the uninsulated conductor is used as a grounded conductor except as permitted by 250.140.
(B) USE Cable.
(1) For interior wiring.
(2) For exterior feeders and branch circuits unless the installation complies with the requirements of Part II of Article 340.
(3) For above ground installations except where USE cable terminates in an enclosure at an outdoor location where the cable emerges from the ground.
(4) Above ground unless protected in accordance with 300.5(D).
(5) As aerial cable unless it is a multi-conductor cable installed as messenger supported wiring in accordance with 225.10 and Part II of Article 396.
Substantiation: This will provide Article 338 Section II Installaton with a "338.12 Uses not permitted" for Service-Entrance Cable: Types SE and USE. It is much easier for users, installers, engineers and inspectors to have included both uses Permitted and Uses Not Permitted. The NEC Style Manual condones the use of Uses Not Permitted by reference and it makes the NEC very "user friendly."
Panel Meeting Action: Accept in Principle
The panel accepts 338.12(B)(1) and accepts in Principle the balance of the proposal as rewritten by the action taken on Proposal 7-84.
Panel Statement: See panel action on Proposal 7-84. Proposed 338.12(A)(3)(a) is addressed in existing 338.10(A).
Proposed 338.12(A)(3)(b) is addressed in existing 338.10(B)(4)(a).
Proposed 338.12(A)(3)(c) is addressed in existing 338.10(B)(4)(b), and 338.12(B)(3) in Proposal 7-84.
Proposed 338.12(A)(3)(d) is addressed in existing 338.10(B)(2) Exception.
Proposed 338.12(B)(2) is addressed in existing 338.10(B)(4)(b).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-92 Log #2537 NEC-P07 **Final Action: Accept in Principle**
(338.12 (New))

Submitter: Timothy D. Curry, Curry Electric, Inc.
Recommendation: I would propose that the following section be created.
Article 338.12 Uses Not Permitted.
(A) Type SE cable shall not be permitted as follows:
(1) In any dwelling or structure not specifically permitted in 334.10(1), (2), and (3). Cables shall not be required to be concealed within walls, floors, or ceilings that provide a thermal barrier of material that has at least a 15 minute finish rating as identified in listings of fire-rated assemblies. Short lengths (for services only) are allowed in building types that do not allow NM cable
(2) In commercial garages having hazardous (classified) locations as defined in 511.3
(3) In theaters and similar locations, except where permitted in 518.4(B)
(4) In motion picture studios
(5) In storage battery rooms
(6) In hoistways or on elevators or escalators
(7) Embedded in poured cement, concrete, or aggregate
(8) In hazardous (classified) locations, except where permitted by the following:
(a) 501.10(B)(3)
(b) 502.10(B)(3)
(c) 504.20
(B) Type SE cable shall not be used under the following conditions or in the following locations:
(1) Where exposed to corrosive fumes or vapors
(2) Where embedded in masonry, concrete, adobe, fill, or plaster
(3) In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar
Substantiation: Article 388 includes a listing of areas where it is allowed to be used, with 338.10 defining the areas. However, unlike Article 334, it does not contain a list of prohibited locations.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 7-84.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-93 Log #3486 NEC-P07 **Final Action: Accept in Principle**
(338.12)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Add new text to read:
338.12 Uses Not Permitted. Types SE and SER shall not be used as follows:
(1) Underground with or without a raceway.
Substantiation: This type of installation is often attempted because it is not addressed in the Code. A section 338.12 is sorely needed and this will clear up the issue.
Panel Meeting Action: Accept in Principle
Revise 338.12(A)(2) in the panel action on Proposal 7-84 to read: "(2) Underground with or without a raceway."
Panel Statement: See panel action on Proposal 7-84. Section 338.12(A)(2) in the panel action on Proposal 7-84 specifies the requirements for SE cable in underground installations. The panel does not agree with the designation of Type SER cable.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 340 — UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE: TYPE UF

7-94 Log #327 NEC-P07 **Final Action: Reject**
(340.12(10))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(10) Where subject to ~~physical damage~~ blows or abrasion.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Here, though,the immediately preceeding item, (9), refers to a form of physical damage–deterioration by ultraviolet radiation. The proposed rewording is an attempt at precision. If you don't care to reword (10), theoretically its present form eliminates the need for (9) and probably (3) and (5) as well.
Furthermore, I would then have to fall back to arguing that in that case the term "physical" should be eliminated.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate, since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-95 Log #1143 NEC-P07 **Final Action: Reject**
(340.12(2) and (7))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise (2):
In commercial garages having hazardous (classified) locations as described in 500.5.
Revise (7):
In hazardous (classified) locations described in 500.5 except where installed for nonincendive field wiring in accordance with 340.10(4), 501.10(B)(3), and 502.10(B)(3).
Substantiation: Type UF cable may also be installed as NMSC per 340.10(4). 501.10(B)(3) and 502.10(B)(3) permit any suitable wiring method for unclassified locations.
Panel Meeting Action: Reject
Panel Statement: The restriction in 340.12(2) applies to all commercial garages, not just those with hazardous locations. Section 90.3 states "Chapters 1, 2, 3, and 4 apply generally; Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions. These latter chapters supplement or modify the general rules. Chapters 1 through 4 apply except as amended by Chapters 5, 6, and 7 for the particular conditions."
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-96 Log #1171 NEC-P07 **Final Action: Reject**
(340.12(2) and (7))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
(2) In commercial garages having hazardous (classified) locations .
(7) In hazardous (classified) locations except as otherwise permitted in this Code.
Substantiation: All garages do not have classified areas. (Section 511.3(A)).
310.10(4) permits multicondutor UF cable installed as NMSC. 501.10(B)(3), 502.10(B)(3) and 503.10(B)(3) permit any wiring method suitable for unclassified locations.
Panel Meeting Action: Reject
Panel Statement: The restriction in 340.12(2) applies to all commercial garages, not just those with hazardous locations. Section 90.3 addresses the Code arrangement; see panel statement on Proposal 7-95.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-97 Log #1019 NEC-P07 **Final Action: Reject**
(340.12(7))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
Except as permitted in 501.10(B)(3); 502.10(B)(3); and 503.10(A)(3).
Substantiation: Type UF cable is permitted to be installed as NMSC by 340.10(4). Nonincendive field wiring is permitted using any wiring method suitable for unclassified locations. The proposal would be helpful to code users, though covered by 90.3.
Panel Meeting Action: Reject
Panel Statement: Section 90.3 addresses the Code arrangement; see panel statement on Proposal 7-95.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 342 — INTERMEDIATE METAL CONDUIT: TYPE IMC

8-3 Log #3454 NEC-P08 **Final Action: Reject**
(342.xx)

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Add new text to read:
342.xx IMC shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in the National Electrical Installation Standards (NEIS) NECA-101, "Standard for Installing Steel Conduit (Rigid, IMC, EMT) and other NEIS installation methods.
Substantiation: NECA 101, *Standard for Installing Steel Conduit (Rigid, IMC, EMT)* has been used for several years. This standard provides best practices for safe steel conduit installations and should be referenced in the conduit and EMT articles, similar to the reference that is now included in the FPN to 110.12.
Panel Meeting Action: Reject
Panel Statement: As 90.1(C) states: This Code is not intended as a design specification or instruction manual for untrained persons.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: I believe there is value and precedence for providing a reference to installation methods. CMP-8 has added a FPN referencing a able tray installation manual in Article 392, also CMP-1 added a FPN referencing an installation manual for workmanship in 110.12 in the 2005 NEC.
The need for trained manpower is at an all time high. This reference would provide a tool to assist untrained electricians to make safer and better installations.

8-4 Log #336 NEC-P08 **Final Action: Reject**
(342.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
"342.2 Intermediate Metal Conduit (IMC). A steel threadable raceway of circular cross section designed for the ~~physical~~ protection...".
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The word "physical" isn't superfluous and includes, but is not limited to, mechanical and thermal damage. Deleting the word "physical" could lead one to believe that any likelihood of damage in any environment would prohibit the use of this product, which is not the intent of the Code.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-5 Log #2239 NEC-P08 **Final Action: Reject**
(342.6 Exception (New))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:
342.6 Listing Requirements. IMC, factory elbows, and couplings, and associated fittings shall be listed.
Exception: Raceway support fittings and accessories shall not be required to be listed .
Substantiation: The Article 100 definition of "fitting" seems to include raceway supports. Many of the commonly used raceway support straps, clamps, and other items are not listed.
Panel Meeting Action: Reject
Panel Statement: Conduit support accessories are not considered "Fittings". Sections 300.6 and 300.6(A) require support hardware to be constructed of materials suitable for the environment for which they are to be installed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

(Note: Sequence 8-6 was not used)

9-81a Log #1677 NEC-P09 **Final Action: Reject**
(342.10(D))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: This is a companion proposal to ones for 314.23(E) Exception and (F) Exception, 344.10(E) and 358.10(D).
(D) Support of Conduit Bodies. Imtermediate metal conduit shall be permitted to support metallic and non-metallic conduit bodies not larger than the largest trade size of an entering raceway, including a conduit body constructed with only one conduit entry. Where JMC is used to support metallic conduit bodies, the conduit bodies shall be permitted to support luminaries (fixtures) in accordance with 410.16(F).
Substantiation: The exceptions 314.23(E) and (F) have been a source of confusion for years. 314.23(E) and (F) refers to enclosures while the exception refers to conduit bodies. The proper place for this type of information is in the article for each type of raceway as currently found in 352.10(H).
Panel Meeting Action: Reject
Panel Statement: The companion proposals (9-48 and 9-50) have been rejected as Code-Making Panel 9 concludes the material must remain in Article 314, which contains specific requirements for support of enclosures within the scope of this article. In addition to the panel statements on Proposals 9-48 and 9-50, Code-Making Panel 9 wishes to point out that the reason the Exceptions proposed for deletion refer to conduit bodies and not enclosures is that conduit bodies, a subset of the universe of enclosures, are the only applications for which those Exceptions are appropriate. Without those Exceptions, a conduit body over 100 cu. in. would require independent support because any enclosure beyond that size, including such items as FS boxes, requires independent support under the parent rules. It was never the intent to require independent support, for example, on a trade size 4 LB conduit body (on a trade size 4 raceway system) with its typical size well over 100 cu. in.
Note also that the Exceptions are worded differently, and for good reason. The Exception in 314.23(E) includes EMT and RNC, which is appropriate for a conduit body that simply changes a raceway direction, but the one in 314.23(F) covering instances of device or luminaire support does not include these wiring methods due to their lesser mechanical strength. The information in 352.10(H) resulted from a proposal by a member of Code-Making Panel 9 to reverse an unrealistic and rarely enforced rule requiring independent support of all RNC conduit bodies. It should also be noted that both these Exceptions cover "E" fittings, and without them there would be no practical utility for those conduit bodies. These Exceptions are very tightly integrated with their parent rules and must remain in place.
Finally, Code-Making Panel 9 notes that the allowance in 410.16(F) is generic in nature, correlating in part with 300.15(B), and it does not confer the permissions granted in 314.23.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
HARTWELL, F.: For some reason, the companion proposals to this one, covering rigid metal conduit and electrical metallic tubing, ended up on CMP 8's agenda instead of the CMP 9 agenda. The actions on those proposals, docketed as 8-16 and 8-96, should be carefully reviewed by the TCC and correlated with the action on this proposal. The issues are the same and this panel statement was crafted to apply to all of the companion proposals.

8-7 Log #2258 NEC-P08 **Final Action: Reject**
(342.13.xx)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
342.xx Intermediate metal conduit shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 101-2006, Standard for Installing Steel Conduits (Rigid, IMC, EMT), and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 342. However, safety would be improved by offering more detailed installation guidance for steel intermediate metal conduit.
ANSI/NECA 101-2006 is currently under development. It will be published prior to the Public Comment deadline.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: See my comment on 8-3.

8-8 Log #828 NEC-P08 **Final Action: Reject**
(342.24)

Submitter: Craig Carroll, Las Vegas, NM
Recommendation: Revise text to read as follows:
342.24 Bends - How Made. Bends of IMC shall be so made that the conduit will not be damaged and so that the internal diameter of the conduit will not be ~~effectively~~ reduced to less than 90 percent of its original internal diameter. The radius of the curve of any field bend to the centerline of the conduit shall not be less than indicated in Table 2, Chapter 9.
Substantiation: The excessive flatness of supply house bought conduit 90s is a real problem as the inside diameter of many 90s are reduced by as much as 1/2 of the normal conduit roundness. This problem is also expanded by the fact that most contractors only use the minimum size conduit allowed by the Code for competitive reasons. In talking to our supply house owners, I found that there are no specific standards for roundness of a conduit bend even where an elbow is listed as the sales people tell them in the 90s are only listed for the normal intermediate metal conduit standard. They also state that no type of pull-through rat test or other test for maintaining a standard diameter of an elbow is required for the elbow to be listed. You only have to go to any job site or to any supply house and look at the elbows that are available to see how flat many supply house bought elbows have become. The 90 percent chosen for this proposal is not based on anything other than a best guess of how much of a reduction should be allowed before conductor covering could be damaged and replacement required. This 90-percent does assume that a full 40-percent maximum conductor fill has not been reached in the average installation. Possibly 85-87 percent would be a better allowance but I will leave that decision up the the experience of the NEC panel. This problem needs attention now as it is not getting better and in fact is seemingly getting worse. The additional words - so that - were added so that 342.24 matches the wording in 344.24.
Panel Meeting Action: Reject
Panel Statement: Determining ratios in the field is an impossible task. It would place an undue burden on the inspector to determine the amount of the reduction during the inspection process. The submitter provided no technical substantiation for the proposal.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-9 Log #1345 NEC-P08 **Final Action: Accept**
(342.30(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add the following text to 342.30
(C) Unsupported raceways: Type IMC shall be permitted to be unsupported where the raceway is not more than 900 mm (3 ft) in length and remains in unbroken lengths (without coupling). Such raceway shall terminate in an outlet box, junction box, device box, cabinet, or other termination at each end of the raceway.
Substantiation: Unsupported raceways are violations of the *Code* that occur every day. As written, a 3 inch length of conduit between enclosures is required to be supported, despite the fact that it adds little if any structural value to the system. Quite often, particularly with conduit nipples, securing and supporting a raceway shorter than 36 inches is not possible. Furthermore, securing and supporting is of little value on lengths less than 36 inches where the conduit terminates at a box on each end, where the box is installed and supported in compliance with its applicable *Code* section.
This proposal is written with the parallel effect of *Code* sections that have been strived for in chapter 3, and matches the numbering system used in the Cable Articles. It also uses existing text taken from both the Cable Articles and the Raceway Articles.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
DABE, J.: As the submitter has pointed out 3 in. of raceway is extremely difficult to fasten or support. However, without any technical substantiation 3 ft of unsupported or unfastened raceway is unjustified due to the increased

possibility of physical damage. The panel should consider a lesser distance, such as 1 ft which would meet the submitter's intent.

HUMPHREY, D.: This proposal does not address other issues that may have a direct impact on the durability of the electrical installation. The affects of weight and vibration on concentric and eccentric knockouts at each end of a three foot run between pieces of equipment, a scenario that would be frequently encountered in many electrical installations, may compromise the strength of the installation. The raceway having even a single point of support would help to mitigate these deleterious affects. In addition, the IMC installation in question may be used as an equipment grounding conductor and any loosening that could occur would serve to compromise the equipment grounding function of the raceway. 300.11 further requires that raceways be securely fastened in place. I would assert that this proposal would conflict with the requirements of 300.11. In summation, depending on connectors, double locknuts etc. to support and secure this up to 36 in. installation especially where concentric or eccentric knockouts are encountered is dubious at best. 36 in. should provide ample space in which to install normal supporting and securing hardware. A proposal involving a shorter distance and where no concentric or eccentric knockouts are encountered may be more prudent.

8-10 Log #577 NEC-P08 **Final Action: Reject**
(342.46)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information.
Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Revise as follows:

Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wire from abrasion unless the design of the box, fitting, or enclosure is such as to afford equivalent protection. <u>Where a conduit contains ungrounded conductors 4 AWG or larger, the installation shall also comply with 300.4(F) for the protection of conductors 4 AWG and larger at bushings.</u>

~~FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.~~

Substantiation: On the surface, the Fine Print Note referring the reader to 300.4(F) seems to be a good reference, that is, until you talk to a wireman who claims that 300.4(F) takes precedence over 342.46 and bushings of any kind are not required on Intermediate Metal Conduit terminations unless the contained conductors are ungrounded 4 AWG and larger - and the AHJ agrees with them.

There's a large geographical area in one of the Midwestern states where a state electrical inspector is not requiring bushings on Intermediate Metal Conduit or Rigid Metal Conduit unless the contained conductors are 4 AWG or larger.

This simple change will eliminate misinterpretations of this section.

Panel Meeting Action: Reject
Panel Statement: Article 300 is the appropriate location for this reference and does take precedence for all wiring methods. The FPN provides guidance.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 344 — RIGID METAL CONDUIT: TYPE RMC

8-11 Log #3459 NEC-P08 **Final Action: Reject**
(344.xx)

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Add new text to read:

344.xx RMC shall be installed in a neat and workmanlike manner.

FPN: Accepted industry practices are described in the National Electrical Installation Standards (NEIS) NECA-101, "Standard for Installing Steel Conduit (Rigid, IMC, EMT) and other NEIS installation methods.

Substantiation: NECA 101, *Standard for Installing Steel Conduit (Rigid, IMC, EMT)* has been used for several years. This standard provides best practices for safe steel conduit installations and should be referenced in the conduit and EMT articles, similar to the reference that is now included in the FPN to 110.12.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:

LOYD, R.: See my comment on 8-3.

8-12 Log #335 NEC-P08 **Final Action: Reject**
(344.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

"346.2 Definition. Rigid Metal Conduit (RMC). A steel threadable raceway of circular cross section designed for the ~~physical~~ protection...".

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-13 Log #3455 NEC-P08 **Final Action: Accept**
(344.2)

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Revise text to read:

344.2 Definition.

Rigid Metal Conduit (RMC). A threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and appropriate fittings. RMC is generally made of steel (ferrous) with protective coatings or aluminum (nonferrous). Special use types are <u>red brass</u> ~~silicon bronze~~ and stainless steel.

Substantiation: The UL 6A Standard for Electrical Rigid Metal Conduit – Aluminum and Stainless Steel" was changed in 2004 to "Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless Steel". Silicon bronze conduit is not being produced. Red brass conduit was added to the standard for direct burial and swimming pool applications.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-14 Log #3353 NEC-P08 **Final Action: Reject**
(344.6 Exception (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Add an exception as follows:

Exception: Rigid metal conduit made from stainless steel or from nonferrous metals other than aluminum shall be permitted to be approved.

Substantiation: This exception will prove useful for brass conduit installations, since surveys of listees under the DYWV category show that the listed material is no longer available. It will also prove to be useful in specialized industrial occupancies where stainless steel and other special alloys are used, also without listing because such relatively small quantities aren't practical to have listed. Although listing is certainly an option that the AHJ could fall back on, in many jurisdictions this will prove too expensive and cumbersome for the limited cases where this allowance is needed. Listing would be a nice feature if it were practical in all cases, but in these limited instances it does not appear to be so. There is now limited relief on this for swimming pool applications because 680.23(B)(2)(a) requires "approved" conduit, which is an intended Chapter 6 modification of this Chapter 3 rule. However, the principle should be extended to other deserving applications that don't have access to a Chapter 6 specification.

Panel Meeting Action: Reject
Panel Statement: Listed conduit of these types is available, and it is the panel's intention to require all raceways to be listed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-15 Log #3456 NEC-P08 **Final Action: Accept**
(344.10(A), (B) & (C))

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Revise text to read:

(A) ~~All~~ Atmospheric Conditions and Occupancies.

1. ~~Use of~~ Galvanized steel and stainless steel RMC shall be permitted under all atmospheric conditions and occupancies. ~~Ferrous raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors and in occupancies not subject to severe corrosive influences.~~

<u>2. Red brass RMC shall be permitted to be installed for direct burial and swimming pool applications.</u>

3. Aluminum RMC shall be permitted to be installed where judged suitable for the environment. Rigid aluminum conduit encased in concrete or in direct contact with the earth shall be provided with approved supplementary corrosion protection.

4. Ferrous raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors and in occupancies not subject to severe corrosive influences.

(B) Corrosion Environments.

1. Galvanized steel, stainless steel and red brass RMC ~~,~~ elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

2. Aluminum RMC shall be provided with approved supplementary corrosion protection where encased in concrete or in direct contact with the earth.

FPN: The galvanizing on steel (ferrous) RMC provides corrosion protection. The AHJ *may* require supplementary corrosion protection for severely corrosive environments. Where aluminum (non-ferrous) RMC is encased in concrete or direct-buried, approved supplementary corrosion protection is required. This protection can be provided in a variety of ways including factory PVC-coating, tape-wrapping, or painting with a zinc-rich paint.

(C) Cinder Fill. Galvanized steel, stainless steel and red brass RMC shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 50 mm (2 in.) thick; where the conduit is not less than 450mm (18 in.) under the fill; or where protected by corrosion protection and judged suitable for the condition.

Substantiation: UL's *Electrical Construction Equipment Directory* states that "galvanized rigid steel conduit installed in concrete does not require supplementary corrosion protection. Galvanized rigid steel conduit installed in contact with soil does not generally require supplementary corrosion protection." It also states that "Aluminum conduit used in concrete or in contact with soil requires supplementary corrosion protection".

Article 344 has not differentiated between the corrosion protection required for ferrous vs. non-ferrous metal conduit, leading to confusion among installers/users. There have also been questions concerning whether or not galvanizing provides corrosion protection. This new text will provide useful guidance and will be in line with the listing requirements.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-16 Log #1678 NEC-P08 **Final Action: Reject**

(344.10(E))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.

Recommendation: This is a companion proposal to ones for 314.23(E) Exception and (F) Exception, 342.10(D) and 358.10(D).

Add text to read as follows:

(E) Support of Conduit Bodies. Rigid metal conduit shall be permitted to support metallic and non-metallic conduit bodies not larger than the largest trade size of an entering raceway, including a conduit body constructed with only one conduit entry. Where RMC is used to support metallic conduit bodies, the conduit bodies shall be permitted to support luminaries (fixtures) in accordance with 410.16(F).

Substantiation: The exceptions to 314.23(E) and (F) have been a source of confusion for years. 314.23(E) and (F) refers to enclosures while the exception refers to conduit bodies. The proper place for this type of information is in the article for each type of raceway as currently found in 352.10(H).

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-6.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-17 Log #3457 NEC-P08 **Final Action: Reject**

(344.10(E))

Submitter: William A. Wolfe, Steel Tube Institute of North America

Recommendation: Add new text to read:

(E) Where severe physical damage is likely to occur, steel or stainless steel RMC shall be used.

Substantiation: Aluminum rigid metal conduit is more likely to be damaged from impact and should be limited to locations where it is not likely to be hit by heavy moving equipment such as fork lifts which may flatten the raceway and damage the enclosed conductors. The mechanical properties of steel and aluminum RMC are very different. This has never been recognized by the NEC but has direct bearing on the suitability of the product for certain applications. The modulus of elasticity of aluminum is 1/3 that of steel, for example, which means that it would deflect 1/3 more under the same load. The typical mechanical properties of aluminum RMC (6063 alloy, temper T1) vs. steel RMC are

Ultimate Tensile Strength:	Aluminum: 17,000psi
	Steel: 55,000psi
Yield strength:	Aluminum: 9,000psi
	Steel: 35,000psi
Modulus of Elasticity:	Aluminum: 10,000,000 lb/in 2 (psi)

Steel: 30,000,000 lb/in 2 (psi)

Panel Meeting Action: Reject

Panel Statement: Although the submitter did supply technical data, the data do not provide substantiation to restrict aluminum conduit in areas where severe physical damage is likely to occur.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

LOYD, R.: This proposal should have been accepted. There is substantial technical substantiation provided. Field testing reports are not necessary since the data provided shows that in physical damage tests aluminum would flatten and fail at much lower values than steel.

8-18 Log #2259 NEC-P08 **Final Action: Reject**

(344.13 (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)

Recommendation: Add new text to read:

344.xx Rigid metal conduit shall be installed in a neat and workmanlike manner.

FPN: Accepted industry practices are described in ANSI/NECA 101-2006, Standard for Installing Steel Conduits (Rigid, IMC, EMT), and other ANSI-approved installation standards.

Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 344. However, safety would be improved by offering more detailed installation guidance for rigid metal conduit.

ANSI/NECA 101-2006 is currently under development. It will be published prior to the Public Comment deadline.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

LOYD, R.: See my comment on 8-3.

8-19 Log #2260 NEC-P08 **Final Action: Reject**

(344.13.xx)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)

Recommendation: Add new text to read:

344.xx Rigid metal conduit shall be installed in a neat and workmanlike manner.

FPN: Accepted industry practices are described in ANSI/NECA 102-2004, Standard for Installing Aluminum Rigid Metal Conduit, and other ANSI-approved installation standards.

Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment and systems covered by Article 344. However, safety would be improved by offering more detailed installation guidance for aluminum rigid metal conduit.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

LOYD, R.: See my comment on 8-3.

8-20 Log #829 NEC-P08 **Final Action: Reject**

(344.24)

Submitter: Craig Carroll, Las Vegas, NM

Recommendation: Revise text to read as follows:

344.24 Bends - How Made. Bends of IMC shall be so made that the conduit will not be damaged and so that the internal diameter of the conduit will not be ~~effectively~~ reduced to less than 90 percent of its original internal diameter. The radius of the curve of any field bend to the centerline of the conduit shall not be less than indicated in Table 2, Chapter 9.

Substantiation: The excessive flatness of supply house bought conduit 90s is a real problem as the inside diameter of many 90s are reduced by as much as 1/2 of the normal conduit roundness. This problem is also expanded by the fact that most contractors only use the minimum size conduit allowed by the Code for competitive reasons. In talking to our supply house owners, I found that there are no specific standards for roundness of a conduit bend even where an elbow is listed as the sales people tell them in the 90s are only listed for the normal intermediate metal conduit standard. They also state that no type of pull-through rat test or other test for maintaining a standard diameter of an elbow is required for the elbow to be listed. You only have to go to any job site or to any supply house and look at the elbows that are available to see how flat many supply house bought elbows have become. The 90 percent chosen for this proposal is not based on anything other than a best guess of how much of a reduction should be allowed before conductor covering could be damaged and replacement required. This 90-percent does assume that a full 40-percent maximum conductor fill has not been reached in the average installation. Possibly 85-87 percent would be a better allowance but I will leave that decision up the the experience of the NEC panel. This problem needs attention now as it is not getting better and in fact is seemingly getting worse.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-8.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-21 Log #3458 NEC-P08 **Final Action: Reject**

(344.30(B))

Submitter: William A. Wolfe, Steel Tube Institute of North America

Recommendation: Revise text to read:

(B) Supports. RMC shall be supported in accordance with one of the following:

(1) Conduit shall be supported at intervals not exceeding 3 m (10 ft.).

(2) The distance between supports for straight runs <u>of steel and stainless steel RMC</u> ~~conduit~~ shall be permitted in accordance with Table 344.30(B)(2), provided the conduit is made up with threaded couplings, and such supports prevent transmission of stresses to termination where conduit is deflected between supports.

(3) Exposed vertical risers <u>of steel and stainless steel RMC</u> from industrial machinery or fixed equipment shall be permitted to be supported at intervals not exceeding 6 m (20 ft) if the conduit is made up with threaded couplings, the conduit is supported and securely fastened at the top and bottom of the riser, and no other means of intermediate support is readily available.

(4) Horizontal runs of RMC supported by openings through framing members at intervals not exceeding 3 m (10 ft) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Substantiation: This section was developed for rigid steel conduit. There have been field complaints concerning sagging of aluminum conduit when support distances are extended beyond 10 feet, as permitted by 344.30(B)(2) and (3). Aluminum does not provide adequate strength to extend the support distances. The mechanical properties of steel and aluminum RMC are very different. This has never been recognized by the NEC but has direct bearing on the suitability of the product for certain applications. The modulus of elasticity of aluminum is 1/3 that of steel, for example, which means that it would deflect 1/3 more under the same load. The typical mechanical properties of aluminum RMC (6063 alloy, temper T1) vs. steel RMC are

Ultimate Tensile Strength: Aluminum: 17,000psi Steel: 55,000psi
Yield strength: Aluminum: 9,000psi Steel: 35,000psi
Modulus of
Elasticity: Aluminum: 10,000,000 lb/in 2 (psi) Steel: 30,000,000 lb/in 2 (psi)

Panel Meeting Action: Reject

Panel Statement: The submitter has supplied technical data, but not the information, testing, or field reports necessary to determine if shorter support lengths are required for aluminum.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

LOYD, R.: This proposal should have been accepted. There is substantial technical substantiation provided. Field testing reports are not necessary since the data provided shows that in tests aluminum conduit would sag at lengths much shorter than RMC especially the smaller sizes.

8-22 Log #3465 NEC-P08 **Final Action: Reject**

(Table 344.30(B)(2))

Submitter: William A. Wolfe, Steel Tube Institute of North America

Recommendation: In Table 344.30(B)(2) Supports for Rigid Metal Conduit

Change the heading to read: “Maximum Distance Between Steel and Stainless Steel RMC Supports”

Substantiation: This section was developed for rigid steel conduit. There have been field complaints concerning sagging of aluminum conduit when support distances are extended beyond 10 feet, as permitted by 344.30(B)(2) and (3). Aluminum does not provide adequate strength to extend the support distances. The mechanical properties of steel and aluminum RMC are very different. This has never been recognized by the NEC but has direct bearing on the suitability of the product for certain applications. The modulus of elasticity of aluminum is 1/3 that of steel, for example, which means that it would deflect 1/3 more under the same load. The typical mechanical properties of aluminum RMC (6063 alloy, temper T1) vs. steel RMC are

Ultimate Tensile Strength: Aluminum: 17,000psi Steel: 55,000psi
Yield strength: Aluminum: 9,000psi Steel: 35,000psi
Modulus of
Elasticity: Aluminum: 10,000,000 lb/in 2 (psi) Steel: 30,000,000 lb/in 2 (psi)

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-21.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

LOYD, R.: This proposal should have been accepted. See my negative comment on 8-21.

8-23 Log #1346 NEC-P08 **Final Action: Accept**

(344.30(C))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Add the following text to 344.30

(C) Unsupported raceways: Type RMC shall be permitted to be unsupported where the raceway is not more than 900 mm (3 ft) in length and remains in unbroken lengths (without coupling). Such raceway shall terminate in an outlet box, junction box, device box, cabinet, or other termination at each end of the raceway.

Substantiation: Unsupported raceways are violations of the *Code* that occur everyday. As written, a 3 inch length of conduit between enclosures is required to be supported, despite the fact that it adds little if any structural value to the system. Quite often, particularly with conduit nipples, securing and supporting a raceway shorter than 36 inches is not possible. Furthermore, securing and supporting is of little value on lengths less than 36 inches where the conduit terminates at a box on each end, where the box is installed and supported in compliance with its applicable *Code* section.

This proposal is written with the parallel effect of *Code* sections that have been strived for in chapter 3, and matches the numbering system used in the Cable Articles. It also uses existing text taken from both the Cable Articles and the Raceway Articles.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

DABE, J.: See my comment for 8-9.

HUMPHREY, D.: This proposal does not address other issues that may have a direct impact on the durability of the electrical installation. The affects of weight and vibration on concentric and eccentric knockouts at each end of a three foot run between pieces of equipment, a scenario that would be frequently encountered in many electrical installations, may compromise the strength of the installation. The raceway having even a single point of support would help to mitigate these deleterious affects. In addition, the RMC installation in question may be used as an equipment grounding conductor and any loosening that could occur would serve to compromise the equipment grounding function of the raceway. 300.11 further requires that raceways be securely fastened in place. I would assert that this proposal would conflict with the requirements of 300.11. In summation, depending on connectors, double locknuts etc. to support and secure this up to 36 in. installation especially where concentric or eccentric knockouts are encountered is dubious at best. 36 in. should provide ample space in which to install normal supporting and securing hardware. A proposal involving a shorter distance and where no concentric or eccentric knockouts are encountered may be in order.

8-24 Log #2783 NEC-P08 **Final Action: Reject**

(344.44)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information.

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.

Recommendation: Add new text to read:

<u>344.44 Expansion Fittings. Expansion fittings shall be installed where expected length change, due to expansion and contraction due to temperature change and designed building movement is more than 12 mm (.5 in.)</u>

Substantiation: Large structures are often times designed with expansion joints to all for building movement and temperature change expansion and contraction. RMC installed across these expansion joints is subject to movement which will lead to loosened connections at couplings and connectors. The loosened connections will decrease the effectiveness of the ground fault return path and ultimately affect the safety of the electrical installation.

Panel Meeting Action: Reject
Panel Statement: Article 300 applies to all raceways generally and 300.7(B) requires expansion fittings where necessary to compensate for thermal expansion and contraction. To repeat it would be redundant. The submitter provided no technical substantiation to justify the building movement of more than 0.5 inch. Additionally, this committee suggests this issue be submitted to Panel 3, Section 300.7(B) since the subject of other types of expansion (beyond thermal) would be addressed there.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-25 Log #655 NEC-P08 **Final Action: Reject**
(344.46)

Submitter: Larry T. Smith, National Electrical Seminars
Recommendation: Revise text to read as follows:
Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wire from abrasion unless the design of the box, fitting, or enclosure is such as to afford equivalent protection. Where a conduit contains ungrounded conductors 4 AWG or larger, the installation shall also comply with 300.4(F) for the protection of conductors 4 AWG and larger at bushings.
~~FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.~~
Substantiation: On the surface, the Fine Print Note referring the reader to 300.4(F) seems to be a good reference, that is, until you talk to a wireman who claims that 300.4(F) takes precedence over 344.46 and bushings of any kind are not required on Rigid Metal Conduit terminations unless the contained conductors are ungrounded 4 AWG and larger - and their AHJ agrees with them.
There's a large geographical area in one of the Midwestern states where a state electrical inspector is not requiring bushings on Intermediate Metal Conduit or Rigid Metal Conduit unless the contained conductors are 4 AWG or larger.
This simple change will eliminate misinterpretations of this section.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-10.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 348 — FLEXIBLE METAL CONDUIT: TYPE FMC

8-26 Log #641 NEC-P08 **Final Action: Accept**
(348.12(1))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise text to read as follows:
348.12 Uses Not Permitted.
(1) FMC shall not be used in the following:
In wet locations ~~unless the conductors are approved for the specific conditions and the installation is such that liquid is not likely to enter raceways or enclosures to which the conduit is connected.~~
Substantiation: The NEC is clear that liquid shall not enter the raceways or enclosures to which Flexible Metal Conduit is connected. Flexible Metal Conduit does not have a continuous outer surface. It has an interlocking metal construction that along with its listed connectors readily permits the entrance of liquids. The present language that "the installation is such that liquid is not likely to enter raceways or enclosures", does not provide the assurance necessary that the requirement will be met. Both Liquidtight Flexible Metallic Conduit and Liquidtight Flexible Nonmetallic Conduit products and associated liquidtight connectors are common, readily available, and assure compliance with the requirement that the entrance of liquid is not permitted.
The Panel previously considered a similar proposal for the 2005 NEC. The Panel's rejection was on the basis that it was not demonstrated that the current text poses a safety issue. The present text however, is subjective for installers and inspectors and cannot assure that liquid will not enter the electrical system when used in wet locations.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 8-27.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
BURNS, J.: According to the unofficial vote taken at the CMP 8 Panel meeting in Hilton Head, SC the above proposals should have been "Accept in Principle" not "Accept" as indicated on the ballot. For this reason I am voting in the "negative".
DABE, J.: According to the unofficial vote taken at the ROP meeting for the 2008 NEC, Code-Making Panel 8 voted to "Accept in Principle" not "Accept" this proposal as indicated on the ballot. For this reason I am voting in the "negative", so the proper proposal moves forward without conflict with another proposal.
Comment on Affirmative:
DUREN, R.: I agree with the panel action, but believe the panel action at the ROP meeting was to accept in principal rather than accept.
HUMPHREY, D.: This proposal by CMP 8 was "Accept in Principle". 8-27 was the accepted proposal.

8-27 Log #2613 NEC-P08 **Final Action: Accept**
(348.12(1))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
348.12 Uses Not Permitted. FMC shall not be used in the following:
(1) In wet locations ~~unless the conductors are approved for the specific conditions and the installation is such that liquid is not likely to enter raceways or enclosures to which the conduit is connected.~~
Substantiation: Allowing FMC to be used in Wet Locations is an unsafe practice and may cause personal injuries or fire. LFMC is suitable for use in Wet Locations and is an acceptable raceway in place of the FC. Panel 8 does not allow this exception for any other type of raceway systems that are not approved for a wet location.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-28 Log #3355 NEC-P08 **Final Action: Accept**
(348.12(1))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise to read as follows:
(1) In wet locations
Substantiation: This provision has been a problem for a long time. It makes little sense to have rules focused on excluding water from wiring systems, and then allow a raceway that admits water at every convolution if used outdoors, regardless of whether or not is arranged so it will not entrain that water into enclosures. Liquidtight flexible wiring methods are readily available for this purpose. Liquidtight flexible metal conduit arrived in the Code over 50 years ago. There does not appear to be any compelling need to maintain the present allowance for a flexible wiring method in a wet location that provides no protection from water.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 8-27.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
BURNS, J.: According to the unofficial vote taken at the CMP 8 Panel meeting in Hilton Head, SC the above proposals should have been "Accept in Principle" not "Accept" as indicated on the ballot. For this reason I am voting in the "negative".
DABE, J.: According to the unofficial vote taken at the ROP meeting for the 2008 NEC, Code-Making Panel 8 voted to "Accept in Principle" not "Accept" this proposal as indicated on the ballot. For this reason I am voting in the "negative", so the proper proposal moves forward without conflict with another proposal.
Comment on Affirmative:
DUREN, R.: I agree with the panel action, but believe the panel action at the ROP meeting was to accept in principal rather than accept.
HUMPHREY, D.: This proposal by CMP 8 was "Accept in Principle". 8-27 was the accepted proposal.

8-29 Log #1973 NEC-P08 **Final Action: Accept**
(348.12(4))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 348.12(4) to read as shown:
348.12(4) In any hazardous (classified) location , except ~~other than~~ as permitted by other Articles in this Code ~~in 501.10(b) and 504.20~~ .
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for FMC within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of FMC, by an AHJ, because the FMC Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Panel Statement: The committee noted that the removal of the specific reference, avoids a "laundry list" of other locations that are also relevant. CMP continues to change the numbering, and by avoiding the citations, we are avoiding the obvious editorial upkeep.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-30 Log #311 NEC-P08 **Final Action: Reject**
(348.12(5))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(5) Where subject to ~~physical damage~~ blows or abrasion.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering this unnecessary.
The proposed rewording is an attempt at precision. Furthermore, if you retain "damage," I would then have to fall back to arguing that in that case the term "physical" should be eliminated, and in fact (2), (3) and (6) probably are unnecessary as they are there to prevent forms of physical damage.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-31 Log #1203 NEC-P08 **Final Action: Accept in Principle**
(348.22)

Submitter: James Tente, City of Naperville
Recommendation: Revise as follows:
In addition, one covered, insulated or bare equipment grounding conductor of the same size shall be permitted.
Substantiation: For conductors in the size range of 18-10 as given in Table 348.22, the difference in conductor cross sectional area for insulated as opposed to covered conductors is negligible.
Panel Meeting Action: Accept in Principle
Revise the Footnote to Table 348.22 as follows:
In addition, one insulated, covered, or bare equipment grounding conductor of the same size shall be permitted.
Panel Statement: The panel recognizes that the submitter is actually referencing the footnote to Table 348.22. The order of "insulated" and "covered" was reversed for consistency with other sections. The submitter's intent was met.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-32 Log #1459 NEC-P08 **Final Action: Reject**
(348.30(A))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
348.30 Securing and Supporting. FMC shall be securely fastened in place and supported in accordance with 348.30(A) and (B).
(A) Securely Fastened. FMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft).
Exception No. 1: Where FMC is fished.
Exception No. 2: At terminals where flexibility is required, lengths shall not exceed the following:
(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes 1/2 through 1 1/4)
(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1 1/2 through 2)
(3) 1500 mm (5 ft) for metric designators 63 (trade size 2 1/2) and larger
Exception No. 3: Lengths not exceeding 1.8 m (6 ft) from a luminaire (fixture) terminal connection for tap connections to luminaires (light fixtures) as permitted in 410.67(C).
Exception No. 4: Lengths not exceeding 1.8 m (6 ft) f ~~rom the last point where the raceway is securely fastened~~ for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or other equipment.
Substantiation: This proposal is intended to add correlation between the flexible raceway Articles and the cable articles. Panel 7 accepted changes in the 2005 cycle to the cable wiring methods to clarify that the fitting connecting the cable to the box is considered to be a support. Panel 8 should consider the same allowance for its wiring methods.
For the purposes of correlation, similar proposals will be made to Articles 348, 350, and 356.
Panel Meeting Action: Reject
Panel Statement: Flexible metal conduit in lengths of 6 feet or less may be used for equipment grounding and should be secured independent of the enclosure.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
DOLLINS, J.: Flexible Metal Conduit is required by the UL-1 product standard to withstand a 300 pound pull without opening the armor. Additionally, the UL-514B product standard for connectors used with FMC requires that the conduit and connector be subjected to a resistance test followed by a pull of 75 to 150 pounds, based on size, without pulling out of the connector, followed by a repeated resistance test. A 6 ft length of Flexible Metal Conduit within an accessible ceiling that is secured by connectors at each end at the luminaire or equipment does not require additional support to maintain the physical or grounding performance of the conduit.

8-33 Log #3331 NEC-P08 **Final Action: Accept**
(348.30(A) Exception No. 1)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read:
Where FMC is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical .
Substantiation: Edit. To correlate with similar sections where conditions for fishing are specified.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-34 Log #204 NEC-P08 **Final Action: Accept in Principle**
(348.30(A) Exception No. 2)

NOTE: The following proposal consists of Comment 8-35 on Proposal 8-43 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-43 was:
Revise text for Exception No. 2 as follows:
348.30 Securing and Supporting. FMC shall be securely fastened in place and supported in accordance with 348.30(A) and (B).
(A) Securely Fastened. FMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft).
Exception No. 1: Where FMC is fished.
Exception No. 2: Lengths not exceeding the following:
900 mm (3 ft) for sizes 16 to 35 (1/2 to 1 1/4)
1200 mm (4 ft) for sizes 41 to 53 (1 1/2 to 2)
1500 mm (5 ft) for 63 (2 1/2) and larger
at terminals where flexibility is required.
Submitter: Jerry D. Cain, Lodestar Energy Inc.
Recommendation: Exception No. 2: At terminals where flexibility is required, lengths shall not exceed
(1) 900 mm (3 ft) for metric designators 16 through 35 (trade size 1/2 through 1 1/4)
(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade size 1 1/2 through 2)
(3) 1500 mm (5 ft) for metric designators 63 (trade size 2 1/2) and larger.
Substantiation: Please change Exception No. 2 in 350.30(A) to read the same as 348.30(A). The problem mentioned in Proposal 8-43 applies to both wiring methods. This will also maintain consistency in the NEC. Note all the exhibits listed in ROP 8-43 show liquid tight flexible metal conduit. The intent was to modify Article 350, however, in retrospect both articles should be modified since they have similar uses.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel understands that the comment was held during the last cycle and is now a proposal that was intended for Section 350.30(A), Exception No. 2. The submitter's intent was met. See panel action on Proposal 8-44.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-35 Log #3110 NEC-P08 **Final Action: Reject**
(348.30(A) Exception No. 2)

Submitter: James M. Imlah, City of Hillsboro Building Department
Recommendation: Revise text as follows:
348.30 Securing and Supporting
FMC shall be securely fastened in place and supported in accordance with 348.30(A) and (B).
(A) Securely Fastened FMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or

other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft.).

Exception No. 1: Where FMC is fished.

Exception No. 2: At terminals where installed for flexibility ~~is required~~ , lengths shall not exceed the following:

(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes 1/2 through 1 1/4)

(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1 1/2 through 2)

(3) 1500 mm (5 ft) for metric designators 63 (trade size 2 1/2) and larger

Substantiation: By stating "is required" in exception 2, makes a mandatory requirement that has no substantiation and clarification of what is meant by "required." By definition "required" is a mandatory command that infers compliance by force or demanding as the essential and only method authorized. By changing the charging statement of exception 2 to "where installed" will provide clarification of the allowance for expanding the support requirements based on raceway size installed for flexibility. The use of "required" is too restrictive and by using "where installed for flexibility" provides an equal, user friendly understanding.

Panel Meeting Action: Reject

Panel Statement: The requirement for flexibility is the reason for this exception. This exception is not just an alternative wiring method from the base rule.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-36 Log #3125 NEC-P08 **Final Action: Reject**

(348.30(A) Exception No. 2)

Submitter: Truman C. Surbrook, Michigan State University

Recommendation: Revise Exception 2 to eliminate the use of the undefined term flexibility to read as follows:

Exception 2: For connection to equipment where the total ~~At terminals where flexibility is required,~~ lengths ~~shall~~ do not exceed the following: (1), (2), and (3) remain unchanged.

Substantiation: The purpose of using FMC is where flexibility is required. Since the term flexibility is not defined in the Code, there have been differences of opinion as to the meaning of this exception. This revision simply permits lengths as described in (1), (2), and (3) to be installed supported only at the termination and supporting the FMC within 300 mm (12 in.) is not a requirement. That requirement would only apply when the lengths are greater than described in (1), (2), and (3) of Exception 2.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-35.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-37 Log #3439 NEC-P08 **Final Action: Reject**

(348.30(A) Exception No. 2)

Submitter: Aaron Richter, Saranac, MI

Recommendation: Revise text to read:

At terminal ~~where flexibility is required,~~ lengths shall not exceed the following:

Substantiation: This whole section is referring to Flexible Metal Conduit. So with that being said you are told that flexibility is required and already there.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-35.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-38 Log #2241 NEC-P08 **Final Action: Reject**

(348.30(A) Exception No. 4)

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise as follows:

Exception No. 4: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or other equipment. For the purpose of this exception, FMC fittings shall be permitted as a means of cable support.

Substantiation: This permits the conduit fitting to provide the required support for fixture whips. This is already permitted for AC and MC in their respective articles.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-32.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

DOLLINS, J.: See the Aluminum Association Comment on Propsoal 8-32.

8-39 Log #3187 NEC-P08 **Final Action: Reject**

(348.30(A) Exception No. 4)

Submitter: Donald Cook, Shelby County Development Services

Recommendation: Revise text to read:

348.30(A) Exception No. 4 Lengths not exceeding 1.8m (6 ft) from the last point where the raceway is securely fastened for connections ~~within an accessible ceiling~~ to luminaire(s) [lighting fixture(s)] or other equipment.

Substantiation: Currently Exception No. 4 allows a less restrictive securing and supportting requirement to luminaires or other equipment where those items are installed within an accessible ceiling. The securing and supportting requirements in the general rule seem to minimize the chance of damage to the integrity of the wiring method. The likelihood of damage to the wiring method would seem to be greater within an accessible ceiling than it would in a non-accessible ceiling. If the connection to luminaires and other equipment is needed, it will be needed in both accessible and non-accessible ceilings. This change will allow this permission in either place and not compromise the safety of the installation.

Panel Meeting Action: Reject

Panel Statement: A raceway that closely follows the surface upon which it is installed is less likely to become damaged by penetration of screws, nails, etc. See Section 300.4.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-40 Log #882 NEC-P08 **Final Action: Accept**

(348.60)

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Revise as follows:

"Where used to connect equipment where flexibility is required after installation , an equipment grounding conductor shall be installed...Where flexibility is not required after installation . FMC shall be permitted to be..." (remainder unchanged).

Substantiation: This change is intended to make this section agree with the requirements referenced in 250.118(5) that describes the installations where FC may (and indirectly, where it may not) be used for grounding.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

GRIFFITH, M.: The IEEE believes language should be added to this code section to clarify whether and to what extent "flexibility" includes "vibration" and/or "continuous movement".

8-41 Log #1482 NEC-P08 **Final Action: Accept**

(348.60)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

348.60 Grounding and Bonding. Where used to connect equipment where flexibility is necessary after installation , an equipment grounding conductor shall be installed.

Where flexibility after installation is not required, FMC shall be permitted to be used as an equipment grounding conductor when installed in accordance with 250.118(5).

Where required or installed, equipment grounding conductors shall be installed in accordance with 250.134(B).

Where required or installed, equipment bonding jumpers shall be installed in accordance with 250.102.

Substantiation: This proposal is intended to provide correlation between this section and the 2005 change to 250.118(5)(d).

Panel Meeting Action: Accept

Panel Statement: See panel action on Proposal 8-40.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BURNS, J.: According to the unofficial vote taken at the CMP 8 Panel meeting in Hilton Head, SC the above proposals should have been "Accept in Principle" not "Accept" as indicated on the ballot. For this reason I am voting in the "negative".

DABE, J.: According to the unofficial vote taken at the ROP meeting for the 2008 NEC, Code-Making Panel 8 voted to "Accept in Principle" not "Accept" this proposal as indicated on the ballot. For this reason I am voting in the "negative", so the proper proposal moves forward without conflict with another proposal.

Comment on Affirmative:

DUREN, R.: I agree with the panel action, but believe the panel action at the ROP meeting was to accept in principal rather than accept.

GRIFFITH, M.: The IEEE believes language should be added to this code section to clarify whether and to what extent "flexibility" includes "vibration" and/or "continuous movement".

HUMPHREY, D.: This proposal by CMP 8 was "Accept in Principle". 8-40 was the accepted proposal.

8-42 Log #3111 NEC-P08 **Final Action: Reject**
(348.60)

Submitter: James M. Imlah, City of Hillsboro Building Department
Recommendation: Revise text as follows:
348.60 Grounding and Bonding
~~Where~~ LFMC used to connect equipment ~~where~~ installed for flexibility ~~is requried~~ , an equipment grounding conductor shall be installed.
~~Where~~ LFMC not installed for flexibility ~~is not required, LFMC~~ shall be permitted to be used as an equipment grounding conductor when installed in accordance with 250.118(6).
Where ~~required or~~ installed for flexibility , equipment grounding conductors shall be installed in accordance with 250.134(B).
Where ~~required or~~ installed for flexibility , equipment bonding jumpers shall be installed in accordance with 250.102.
Substantiation: By stating "is required", makes a mandatory requirement that has no substantiation and clarification of what is meant by "required." By definition "required" is a mandatory command that infers compliance by force or demanding as an essential and the only method authorized. By changing the charging statement to "where installed" will provide clarification of the allowance for the requirements of installation of an equipment grounding conductor if the LFMC is installed for flexibility. The use of "required" is too restrictive and by using "where installed for flexibility" provides an equal, user friendly understanding. This proposal is similar to proposal 348.60.
Panel Meeting Action: Reject
Panel Statement: The current text is clearer to the intent than the proposed text. Additionally, the proposal should be referencing 350.60, not 348.60.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
HUMPHREY, D.: This proposal by CMP 8 was "Accept in Principle". 8-40 was the accepted proposal.

ARTICLE 350 — lIQUIDTIGHT FLEXIBLE METAL CONDUIT: TYPE LFMC

8-43 Log #310 NEC-P08 **Final Action: Reject**
(350.12(5))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(5) Where subject to ~~physical damage~~ blows or abrasion.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering this unnecessary.
The proposed rewording is an attempt at precision. Furthermore, if you retain "damage," I would then have to fall back to arguing that in that case the term "physical" should be eliminated, and in fact (2) probably is unnecessary as it is there to prevent a form of physical damage.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-44 Log #1347 NEC-P08 **Final Action: Accept**
(350.30)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
350.30 Securing and Supporting.
~~Exception No. 2: Lengths not exceeding 900 mm (3 ft) at terminals where flexibility is necessary.~~
Exception No. 2: At terminals where flexibility is required, lengths shall not exceed the following:
(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes 1/2 through 1 1/4)
(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1 1/2 through 2)
(3) 1500 mm (5 ft) for metric designators 63 (trade size 2 1/2) and larger
Substantiation: This changes correlates the.30 rules between FMC (Art. 348) and LFMC.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-45 Log #1460 NEC-P08 **Final Action: Reject**
(350.30(A))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
350.30 Securing and Supporting.
LFMC shall be securely fastened in place and supported in accordance with 350.30(A) and (B).
(A) Securely Fastened. LFMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft).
Exception No. 1: Where LFMC is fished.
Exception No. 2: Lengths not exceeding 900 mm (3 ft) at terminals where flexibility is necessary.
Exception No. 3: Lengths not exceeding 1.8 m (6 ft) from a luminaire (fixture) terminal connection for tap conductors to luminaries (lighting fixtures) as permitted in 410.67(C).
Exception No. 4: Lengths not exceeding 1.8 m (6 ft) ~~from the last point where the raceway is securely fastened~~ for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)]or other equipment.
Substantiation: This proposal is intended to add correlation between the flexible raceway Articles and the cable Articles. Panel 7 accepted changes in the 2005 cycle to the cable wiring methods to clarify that the fitting connecting the cable to the box is considered to be a support. Panel 8 should consider the same allowance for its wiring methods.
For the purposes of correlation, similar proposals will be made to Articles 348, 350, and 356.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-32.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
DOLLINS, J.: Liquidtight Flexible Metal Conduit is required by the UL 360 product standard to withstand a 300 pound pull without opening the armor. Additionally, the UL 514B product standard for connectors used with LFMC requires that the conduit and connector be subjected to a resistance test followed by a pull of 75 to 150 pounds, based on size, without pulling out of the connector, followed by a repeated resistance test. A 6 ft length of Liquidtight Flexible Metal Conduit within an accessible ceiling that is secured by connectors at each end at the luminaire or equipment does not require additional support to maintain the physical or grounding performance of the conduit.

8-46 Log #3330 NEC-P08 **Final Action: Accept**
(350.30(A) Exception No. 1)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read:
Where L FMC is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical .
Substantiation: Edit. To correlate with similar sections where conditions for fishing are specified.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-47 Log #3112 NEC-P08 **Final Action: Reject**
(350.30(A) Exception No. 2)

Submitter: James M. Imlah, City of Hillsboro Building Department
Recommendation: Revise text as follows:
350.30 Securing and Supporting
LFMC shall be securely fastened in place and supported in accordance with 350.30(A) and (B).
(A) Securely Fastened LFMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft.).
Exception No. 1: Where LFMC is fished.
Exception No. 2: ~~Lengths not exceeding 900 (3 ft) at terminals where flexibility is necessary.~~ At terminals where installed for flexibility, lengths shall not exceed the following:

(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes 1/2 through 1 1/4)
(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1 1/2 through 2)
(3) 1500 mm (5 ft) for metric designators 63 (trade size 2 1/2) and larger

Substantiation: By stating "is required" in exception 2, makes a mandatory requirement that has no substantiation and clarification of what is meant by "required." By definition "required" is a mandatory command that infers compliance by force or demanding as the essential and only method authorized. By changing the charging statement of exception 2 to "where installed" will provide clarification of the allowance for expanding the support requirements based on raceway size installed for flexibility. The use of "required" is too restrictive and by using "where installed for flexibility" provides an equal, user friendly understanding.

The above action of allowing the extended lengths for the support of FMC done under the 2005 code cycle should be applied to LFMC also. There are many conditions where "sealtight" is used in place of FMC due to environmental conditions, classified locations and chemical conditions.**Panel Meeting Action: Reject**

Panel Statement: See panel action and statement on Proposal 8-35.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-48 Log #3438 NEC-P08 **Final Action: Accept**

(350.30(A) Exception No. 2)

Submitter: Jerry D. Cain, Charolais Coal No. 1 LLC

Recommendation: Revise text for Exception No. 2 to read:

350.30 Securing and Supporting. LFMC shall be securely fastened in place and supported in accordance with 350.30(A) and (B).

(A) Securely Fastened. LFMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft).

Exception No. 1: Where LFMC is fished.

~~Exception No. 2: Lengths not exceeding 900 mm (3 ft) at terminals where flexibility is required.~~

Exception No. 2: At terminals where flexibility is required, lengths shall not exceed:

(1) 900 mm (3 ft) for metric designators 16 through (trade sizes 1/2 through 1/4)

(2) 1200 mm (4 ft) for metric designators 41 to 53 (trade sizes 1 1/2 through 2)

(3) 1500 mm (5 ft) for metric designators 63 (trade size 2 1/2) and larger.

Substantiation: 1. Motor junction box size and location vary from one manufacture to another. The NEMA or IEC frame sizes only designate the motor footprint for mounting, shaft dimensions and location of shaft in relation to motor footprint. This is also a problem when rewind shops return repaired motors with junction boxs different from the originals. Note most manufactures locate the J-box near the center of the motor, though I have seen some located closer to the end. On several occasions modifications to the conduit and/or liquidtight length have been required when changing motors. This adds costly downtime.

2. V-Belt driven equipment requires movement of the motor to install and adjust the belts while 3 ft is more than adequate on small motors, 3 ft is not sufficient on the larger motors without causing damage to the liquid tight. It also makes it much easier to change a motor when the liquidtight is long enough to allow one to bend it into position without the use of a hoist or other means.

3. Use of longer lengths of liquidtight allows the conduit to be located out of harms way when installing conduit to equipment that requires servicing.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Panel Statement: See panel action on Proposal 8-44.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BURNS, J.: According to the unofficial vote taken at the CMP 8 Panel meeting in Hilton Head, SC the above proposals should have been "Accept in Principle" not "Accept" as indicated on the ballot. For this reason I am voting in the "negative".

DABE, J.: According to the unofficial vote taken at the ROP meeting for the 2008 NEC, Code-Making Panel 8 voted to "Accept in Principle" not "Accept" this proposal as indicated on the ballot. For this reason I am voting in the "negative", so the proper proposal moves forward without conflict with another proposal.

Comment on Affirmative:

DUREN, R.: I agree with the panel action, but believe the panel action at the ROP meeting was to accept in principal rather than accept.

HUMPHREY, D.: This proposal by CMP 8 was "Accept in Principle". 8-44 was the accepted proposal.

8-49 Log #883 NEC-P08 **Final Action: Accept**

(350.60)

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Revise as follows:

"Where used to connect equipment where flexibility is required after installation , an equipment grounding conductor shall be installed...Where flexibility is not required after installation , LFMC shall be permitted to be..." (remainder unchanged).

Substantiation: This change is intended to make this section agree with the requirements referenced in 250.118(6) that describes the installation where LFMC may (and indirectly, where it may not) be used for grounding.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

GRIFFITH, M.: The IEEE believes language should be added to this code section to clarify whether and to what extent "flexibility" includes "vibration" and/or "continuous movement".

8-50 Log #1481 NEC-P08 **Final Action: Accept**

(350.60)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

350.60 Grounding and Bonding. Where used to connect equipment where flexibility is necessary after installation , an equipment grounding conductor shall be installed.

Where flexibility after installation is not required, LFMC shall be permitted to be used as an equipment grounding conductor when installed in accordance with 250.118(6).

Where required or installed, equipment grounding conductors shall be installed in accordance with 250.134(B).

Where required, or installed, equipment bonding jumpers shall be installed in accordance with 250.102.

FPN: See 501.30(B); 502.30(B); and 503.30(B) for types of equipment grounding conductors.

Substantiation: This proposal is intended to provide correlation between this section and the 2005 change to 250.118(6)d.

Panel Meeting Action: Accept

Panel Statement: See panel action on Proposal 8-49.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BURNS, J.: According to the unofficial vote taken at the CMP 8 Panel meeting in Hilton Head, SC the above proposals should have been "Accept in Principle" not "Accept" as indicated on the ballot. For this reason I am voting in the "negative".

DABE, J.: According to the unofficial vote taken at the ROP meeting for the 2008 NEC, Code-Making Panel 8 voted to "Accept in Principle" not "Accept" this proposal as indicated on the ballot. For this reason I am voting in the "negative", so the proper proposal moves forward without conflict with another proposal.

Comment on Affirmative:

DUREN, R.: I agree with the panel action, but believe the panel action at the ROP meeting was to accept in principal rather than accept.

GRIFFITH, M.: The IEEE believes language should be added to this code section to clarify whether and to what extent "flexibility" includes "vibration" and/or "continuous movement".

HUMPHREY, D.: This proposal by CMP 8 was "Accept in Principle". 8-44 was the accepted proposal.

8-51 Log #3113 NEC-P08 **Final Action: Reject**

(350.60)

Submitter: James M. Imlah, City of Hillsboro Building Department

Recommendation: Revise text as follows:

350.60 Grounding and Bonding

~~Where~~ FMC used to connect equipment ~~where~~ installed for flexibility ~~is requried~~ , an equipment grounding conductor shall be installed.

~~Where~~ FMC not installed for flexibility ~~is not required, FMC~~ shall be permitted to be used as an equipment grounding conductor when installed in accordance with 250.118(5).

Where ~~required or~~ installed for flexibility , equipment grounding conductors shall be installed in accordance with 250.134(B).

Where ~~required or~~ installed for flexibility , equipment bonding jumpers shall be installed in accordance with 250.102.

Substantiation: By stating "is required", makes a mandatory requirement that has no substantiation and clarification of what is meant by "required." By definition "required" is a mandatory command that infers compliance by force or demanding as an essential and the only method authorized. By changing the charging statement to "where installed" will provide clarification of the

allowance for the requirements of installation of an equipment grounding conductor if the FMC is installed for flexibility. The use of "required" is too restrictive and by using "where installed for flexibility" provides an equal, user friendly understanding.
Panel Meeting Action: Reject
Panel Statement: The current text is clearer to the intent than the proposed text. Additionally, the proposal should be referencing 348.60 not 350.60.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-52 Log #2761 NEC-P08 **Final Action: Accept**
(350.60, FPN)

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: In the fine print note add a reference to 505.25(B) and 506.25(B) so it reads as follows:
FPN: See 501.30(B), 502.30(B) ~~and~~ 503.30(B), 505.25(B), and 506.25(B) for types of equipment grounding conductors.
Substantiation: The fine print note needs to be expanded to also include the references in Articles 505 and 506.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 352 — RIGID NONMETALLIC CONDUIT: TYPE RNC

8-53 Log #1919 NEC-P08 **Final Action: Accept in Principle**
(352)

TCC Action: The Technical Correlating Committee advises that Article Scope statements and Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise Article 352 to read as follows:

Article 352
Rigid ~~Nonmetallic~~ Polyvinyl Chloride Conduit: Type PVC ~~RNC~~
I. General

352.1 Scope. This article covers the use, installation, and construction specifications for rigid ~~nonmetallic~~ polyvinyl chloride conduit (PVC ~~RNC~~) and associated fittings.
352.2 Definition.
Rigid ~~Nonmetallic~~ Polyvinyl Chloride Conduit (PVC ~~RNC~~). A nonmetallic raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.
352.6 Listing Requirements. PVC conduit ~~RNC~~ , factory elbows, and associated fittings shall be listed.
II. Installation
352.10 Uses Permitted. The use of PVC conduit ~~RNC~~ shall be permitted in accordance with 352.10(A) through (H).
FPN: Extreme cold may cause some nonmetallic conduits to become brittle and, therefore, more susceptible to damage from physical contact.
(A) Concealed. PVC conduit ~~RNC~~ shall be permitted in walls, floors, and ceilings.
(B) Corrosive Influences. PVC conduit ~~RNC~~ shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicasl for which the materials are specifically approved.
(C) Cinders. PVC conduit ~~RNC~~ shall be permitted in cinder fill.
(D) Wet Locations. PVC conduit ~~RNC~~ shall be permitted in portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.
(E) Dry and Damp Locations. PVC conduit ~~RNC~~ shall be permitted for use in dry and damp locations not prohibited by 352.12.
(F) Exposed. PVC conduit ~~RNC~~ shall be permitted for exposed work where not subject to physical damage if identified for such use.
(G) Underground Installations. For underground installations, see 300.5 and 300.50.
FPN: Refer to Article 353 for High Density Polyethylene Conduit: Type HDPE and Article 3XX for Reinforced Thermosetting Resin Conduit: Type RTRC.
(H) Support of Conduit Bodies. ~~Rigid nonmetallic~~ PVC conduit shall be permitted to support nonmetallic conduit bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaires (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).
352.12 Uses Not Permitted. PVC conduit ~~RNC~~ shall not be used under the following conditions.
(A) Hazardous (Classified) Locations.
(1) In hazardous (classified) locations, except as permitted in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8
(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3)
(B) Support of Luminaires (Fixtures). For the support of luminaires (fixtures) or other equipment not described in 352.10(H).
(C) Physical Damage. Where subject to physical damage unless identified for such use.
(D) Ambient Temperatures. Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.
(E) Insulation Temperature Limitations. For conductors or cables operating at a temperature higher than the PVC conduit ~~RNC~~ listed operating temperature rating.
Exception: Conductors or cables rated at a temperature higher than the ~~RNC~~ PVC conduit listed temperature rating shall be permitted to be installed in ~~RNC~~ PVC conduit, provided they are not operated at a temperature higher than the ~~RNC~~ PVC conduit listed temperature rating.
(F) Theaters and Similar Locations. In theaters and similar locations, except as provided in 518.4 and 520.5.
352.20 Size.
(A) Minimum. PVC Conduit ~~RNC~~ smaller than metric designator 16 (trade size 1/2) shall not be used.
(B) Maximum. PVC Conduit ~~RNC~~ larger than metric designator 155 (trade size 6) shall not be used.
FPN: The trade sizes and metric designators are for identification purposes only and do not relate to actual dimensions. See 300.1(C).
352.22 Number of Conductors. The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.
Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
352.24 Bends - How Made. Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purposes. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.
352.26 Bends - Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.
352.28 Trimming. All cut ends shall be trimmed inside and outside to remove rough edges.
352.30 Securing and Supporting. PVC conduit ~~RNC~~ shall be installed as a complete system as provided in 300.18 and shall be fastened so that movement from thermal expansion or contraction is permitted. PVC conduit ~~RNC~~ shall be securely fastened and supported in accordance with 352.30(A) and (B).
(A) Securely Fastened. PVC conduit ~~RNC~~ shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) shall be permitted to be installed in accordance with the listing.
(B) Supports. PVC conduit ~~RNC~~ shall be supported as required in Table 352.30(B). Conduit listed for support at spacings other than as shown in Table 352.30(B) shall be permitted to be installed in accordance with the listing. Horizontal runs of RNC supported by openings through framing members at intervals not exceeding those in Table 352.30(B) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Table 352.30(B) Support of Rigid Polyvinyl Chloride ~~Nonmetallic~~ Condit (PVC)(~~RNC~~)

Conduit Size		Maximum Spacing Between Supports	
Metric Designator	**Trade Size**	**Mm or m**	**Ft**
16 – 27	½ – 1	900 mm	3
35 – 53	1 ¼ – 2	1.5 m	5
63 – 78	2 ½ – 3	1.8 m	6
91 – 129	3 ½ – 5	2.1 m	7
155	6	2.5 m	8

352.44 Expansion Fittings. Expansion fittings for PVC conduit ~~RNC~~ shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 352.44(~~A) or Table 352.44(B)~~ is expected to be 6 mm (1/4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

Table 352.44(A) Expansion Characteristics of ~~PVC~~ Rigid ~~Nonmetallic~~ Polyvinyl Chloride Conduit (PVC) Coefficient of Thermal Expansion = 6.084 x 10^{-5} mm/mm/°C (3.38 x 10^{-5} in./in/°F)

Temperature Change	Length Change of PVC Conduit (mm/m)	Temperature Change (°F)	Length Change of PVC Conduit (in./100 ft)	Temperature Change (°F)	Length Change of PVC Conduit (in./100 ft)
5	0.30	5	0.20	105	4.26
10	0.61	10	0.41	110	4.46
15	0.91	15	0.61	115	4.66
20	1.22	20	0.81	120	4.87
25	1.52	25	1.01	125	5.07
30	1.83	30	1.22	130	5.27
35	2.13	35	1.42	135	5.48
40	2.43	40	1.62	140	5.68
45	2.74	45	1.83	145	5.88
50	3.04	50	2.03	150	6.08
55	3.35	55	2.23	155	6.29
60	3.65	60	2.43	160	6.49
65	3.95	65	2.64	165	6.69
70	4.26	70	2.84	170	6.90
75	4.56	75	3.04	175	7.10
80	4.87	80	3.24	180	7.30
85	5.17	85	3.45	185	7.50
90	5.48	90	3.65	190	7.71
95	5.78	95	3.85	195	7.91
100	6.08	100	4.06	200	8.11

~~Table 352.44(B) Expansion Characteristics of Reinforced Thermosetting Resin Conduit (RTRC) Coefficient of Thermal Expansion = 27.10~~$^{-5}$ ~~mm/mm°C (1.5 x 10~~$^{-5}$ ~~in./in.°F)~~

~~Temperature Change~~	~~Length Change of RTC Conduit (mm/m)~~	~~Temperature Change (°F)~~	~~Length Change of RTC Conduit (in./100 ft)~~	~~Temperature Change (°F)~~	~~Length Change of RTC Conduit (in./100 ft)~~
~~5~~	~~0.14~~	~~5~~	~~0.09~~	~~105~~	~~1.89~~
~~10~~	~~0.27~~	~~10~~	~~0.18~~	~~110~~	~~1.98~~
~~15~~	~~0.41~~	~~15~~	~~0.27~~	~~115~~	~~2.07~~
~~20~~	~~0.54~~	~~20~~	~~0.36~~	~~120~~	~~2.16~~
~~25~~	~~0.68~~	~~25~~	~~0.45~~	~~125~~	~~2.26~~
~~30~~	~~0.81~~	~~30~~	~~0.54~~	~~130~~	~~2.34~~
~~35~~	~~0.95~~	~~35~~	~~0.63~~	~~135~~	~~2.43~~
~~40~~	~~1.08~~	~~40~~	~~0.72~~	~~140~~	~~2.52~~
~~45~~	~~1.22~~	~~45~~	~~0.81~~	~~145~~	~~2.61~~
~~50~~	~~1.35~~	~~50~~	~~0.90~~	~~150~~	~~2.70~~
~~55~~	~~1.49~~	~~55~~	~~0.99~~	~~155~~	~~2.79~~
~~60~~	~~1.62~~	~~60~~	~~1.08~~	~~160~~	~~2.88~~
~~65~~	~~1.76~~	~~65~~	~~1.17~~	~~165~~	~~2.97~~
~~70~~	~~1.80~~	~~70~~	~~1.26~~	~~170~~	~~3.06~~
~~75~~	~~2.03~~	~~75~~	~~1.35~~	~~175~~	~~3.15~~
~~80~~	~~2.16~~	~~80~~	~~1.44~~	~~180~~	~~3.24~~
~~85~~	~~2.30~~	~~85~~	~~1.53~~	~~185~~	~~3.33~~
~~90~~	~~2.43~~	~~90~~	~~1.62~~	~~190~~	~~3.42~~
~~95~~	~~2.57~~	~~95~~	~~1.71~~	~~195~~	~~3.51~~
~~100~~	~~2.70~~	~~100~~	~~1.80~~	~~200~~	~~3.60~~

352.46 Bushings. Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.

352.48 Joints. All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.

352.56 Splices and Taps. Splices and taps shall be made in accordance with 300.15.

352.60 Grounding. Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the conduit.

Exception No. 1: As permitted in 250.134(B), Exception No. 2, for dc circuits and 250.134(B), Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in 250.142.

III. Construction Specifications.

352.100 Construction. PVC conduit ~~RNC~~ and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

352.120 Marking. Each length of PVC conduit ~~RNC~~ shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21. The type of material shall also be included in the marking unless it is visually identifiable. for conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.

FPN: Examples of these markings include but are not limited to “limited smoke” and “sunglight resistant.”

Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Condit (RNC) in Article 100 and the new Article 355 for Type RTRC conduit. This proposal revises the current Article 352 to remove all references to reenforced thermosetting resin conduit and limit the allowable materials to PVC.

In the 2002 edition of the National Electrical Code, Article 352; Rigid Nonmetallic Conduit (RNC) included PVC, RTRC, and HDPE products. However, for the 2005 edition of the NEC, HDPE was separated from these other conduit types and located in new Article 353. This left two very dissimilar products grouped together as RNC under Article 352 and technically eliminated HDPE as an acceptable wiring method in all applications where rigid nonmetallic conduit was specified. The separation of the PVC and RTRC products, and the definition of RNC as including rigid PVC, HDPE and RTRC will correct this situation by better defining the installation and construction specifications for each conduit type.

Panel Meeting Action: Accept in Principle

Revise Article 352 to read as follows:

Article 352

Rigid ~~Nonmetallic~~ Polyvinyl Chloride Conduit: Type PVC ~~RNC~~

I. General

352.1 Scope. This article covers the use, installation, and construction specifications for rigid ~~nonmetallic~~ polyvinyl chloride conduit (PVC ~~RNC~~) and associated fittings.

FPN: Refer to Article 353 for High Density Polyethylene Conduit: Type HDPE and Article 355 for Reinforced Thermosetting Resin Conduit: Type RTRC.

352.2 Definition.

Rigid ~~Nonmetallic~~ Polyvinyl Chloride Conduit (PVC ~~RNC~~). A rigid nonmetallic ~~raceway~~ conduit (RNC) of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.

352.6 Listing Requirements. PVC conduit ~~RNC~~ , factory elbows, and associated fittings shall be listed.

II. Installation

352.10 Uses Permitted. The use of PVC conduit ~~RNC~~ shall be permitted in accordance with 352.10(A) through (H).

FPN: Extreme cold may cause some nonmetallic conduits to become brittle and, therefore, more susceptible to damage from physical contact.

(A) Concealed. PVC conduit ~~RNC~~ shall be permitted in walls, floors, and ceilings.

(B) Corrosive Influences. PVC conduit ~~RNC~~ shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(C) Cinders. PVC conduit ~~RNC~~ shall be permitted in cinder fill.

(D) Wet Locations. PVC conduit ~~RNC~~ shall be permitted in portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.

(E) Dry and Damp Locations. PVC conduit ~~RNC~~ shall be permitted for use in dry and damp locations not prohibited by 352.12.

(F) Exposed. PVC conduit ~~RNC~~ shall be permitted for exposed work where not subject to physical damage if identified for such use.

(G) Underground Installations. For underground installations, see 300.5 and 300.50.

~~FPN: Refer to Article 353 for High Density Polyethylene Conduit: Type HDPE.~~

(H) Support of Conduit Bodies. ~~Rigid nonmetallic~~ PVC conduit shall be permitted to support nonmetallic conduit bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaires (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).

352.12 Uses Not Permitted. PVC conduit ~~RNC~~ shall not be used under the following conditions.

(A) Hazardous (Classified) Locations.

(1) In hazardous (classified) locations, except as permitted in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8

(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3)

(B) Support of Luminaires (Fixtures). For the support of luminaires (fixtures) or other equipment not described in 352.10(H).

(C) Physical Damage. Where subject to physical damage unless identified for such use.

(D) Ambient Temperatures. Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.

(E) Insulation Temperature Limitations. For conductors or cables operating at a temperature higher than the PVC conduit ~~RNC~~ listed operating temperature rating.

Exception: Conductors or cables rated at a temperature higher than the ~~RNC~~ PVC conduit listed temperature rating shall be permitted to be installed in ~~RNC~~ PVC conduit, provided they are not operated at a temperature higher than the ~~RNC~~ PVC conduit listed temperature rating.

(F) Theaters and Similar Locations. In theaters and similar locations, except as provided in 518.4 and 520.5.

352.20 Size.

(A) Minimum. PVC Conduit ~~RNC~~ smaller than metric designator 16 (trade size 1/2) shall not be used.

(B) Maximum. PVC Conduit ~~RNC~~ larger than metric designator 155 (trade size 6) shall not be used.

FPN: The trade sizes and metric designators are for identification purposes only and do not relate to actual dimensions. See 300.1(C).

352.22 Number of Conductors. The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

352.24 Bends - How Made. Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purposes. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

352.26 Bends - Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.

352.28 Trimming. All cut ends shall be trimmed inside and outside to remove rough edges.

352.30 Securing and Supporting. PVC conduit ~~RNC~~ shall be installed as a complete system as provided in 300.18 and shall be fastened so that movement from thermal expansion or contraction is permitted. PVC conduit ~~RNC~~ shall be securely fastened and supported in accordance with 352.30(A) and (B).

(A) Securely Fastened. PVC conduit ~~RNC~~ shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) shall be permitted to be installed in accordance with the listing.

(B) Supports. PVC conduit ~~RNC~~ shall be supported as required in Table 352.30 ~~(B)~~ . Conduit listed for support at spacings other than as shown in Table 352.30 ~~(B)~~ shall be permitted to be installed in accordance with the listing. Horizontal runs of PVC conduit ~~RNC~~ supported by openings through framing members at intervals not exceeding those in Table 352.30 ~~(B)~~ and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

(EXISTING TABLE 352.30(B) HERE AND RENUMBER AS TABLE 352.30)

352.44 Expansion Fittings. Expansion fittings for PVC conduit ~~RNC~~ shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 352.44(~~A) or Table 352.44(B)~~ is expected to be 6 mm (1/4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

(EXISTING TABLE 352.44(A) HERE AND RENUMBER AS TABLE 352.44)

DELETE EXISTING TABLE 352.44(B)

352.46 Bushings. Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.

352.48 Joints. All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.

352.56 Splices and Taps. Splices and taps shall be made in accordance with 300.15.

352.60 Grounding. Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the conduit.

Exception No. 1: As permitted in 250.134(B), Exception No. 2, for dc circuits and 250.134(B), Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in 250.142.

III. Construction Specifications.

352.100 Construction. PVC conduit ~~RNC~~ and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

352.120 Marking. Each length of PVC conduit ~~RNC~~ shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21. The type of material shall also be included in the marking unless it is visually identifiable. for conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.

FPN: Examples of these markings include but are not limited to “limited smoke” and “sunlight resistant.”

Panel Statement: Changes are made to the submitter’s recommendation to more closely follow the NEC Style Manual, and to correlate with the structure of other articles. The revised text meets the intent of the submitter.

It is recommended that the TCC consider the article scope as revised.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-54 Log #2669 NEC-P08 **Final Action: Accept in Principle**
(352)

Submitter: Goran Haag, Champion Fiberglass, Inc.

Recommendation: Separate Article 352 into two separate articles one for rigid PVC conduit and one for rigid fiber glass c onduit. Suggest naming article for rigid PVC conduit 352 (same as today) and moving the rigid fiberglass conduit to Article 351 (new article) Below is the revised text for each respective article:

I. General

352.1 Scope This article covers the use, installation, and construction specifications for PVC rigid nonmetallic conduit and associated fittings.

352.2 Definition PVC rigid nonmetallic conduit. A PVC rigid nonmetallic conduit raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.

352.6 Listing Requirements PVC rigid nonmetallic conduit, factory elbows, and associated fittings shall be listed.

II. Installation

352.10 Uses Permitted The use of PVC rigid nonmetallic conduit shall be permitted in accordance with 352.10(A) through (H).

FPN: Extreme cold may cause some nonmetallic conduits to become brittle and therefore more susceptible to damage from physical contact.

(A) Concealed. PVC rigid nonmetallic conduit shall be permitted in walls, floors, and ceilings.

(B) Corrosive Influences. PVC rigid nonmetallic conduit shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(C) Cinders. PVC rigid nonmetallic conduit shall be permitted in cinder fill.

(D) Wet Locations. PVC rigid nonmetallic conduit shall be permitted in portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.

(E) Dry and Damp Locations. PVC rigid nonmetallic conduit shall be permitted for use in dry and damp locations not prohibited by 352.12.

(F) Exposed. PVC rigid nonmetallic conduit shall be permitted for exposed work where not subject to physical damage if identified for such use.

(G) Underground Installations. For underground installations, see 300.5 and 300.50.

FPN: Refer to Article 353 for High Density Polyethylene Conduit: Type HDPE.

(H) Support of Conduit Bodies. PVC rigid nonmetallic conduit shall be permitted to support PVC conduit bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaires (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).

352.12 Uses Not Permitted

PVC rigid nonmetallic conduit shall not be used under the following conditions.

(A) Hazardous (Classified) Locations

(1) In hazardous (classified) locations, except as permitted in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8

(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3)

(B) Support of Luminaires (Fixtures) For the support of luminaires (fixtures) or other equipment not described in 352.10(H).

(C) Physical Damage. Where subject to physical damage unless identified for such use.

(D) Ambient Temperatures. Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.

(E) Insulation Temperature Limitations For conductors or cables operating at a temperature higher than the PVC rigid nonmetallic conduit listed operating temperature rating.

Exception: Conductors or cables rated at a temperature higher than the PVC rigid nonmetallic conduit listed temperature rating shall be permitted to be installed in PVC rigid nonmetallic conduit, provided they are not operated at a temperature higher than the PVC rigid nonmetallic conduit listed temperature rating.

(F) Theaters and Similar Locations. In theaters and similar locations, except as provided in 518.4 and 520.5.

352.20 Size

(A) Minimum. PVC rigid nonmetallic conduit smaller than metric designator 16 (trade size 1/ 2) shall not be used.

(B) Maximum. PVC rigid nonmetallic conduit larger than metric designator 155 (trade size 6) shall not be used.

FPN: The trade sizes and metric designators are for identification purposes only and do not relate to actual dimensions. See 300.1(C).

352.22 Number of Conductors

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

352.24 Bends — How Made

Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

352.26 Bends — Number in One Run

There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.

352.28 Trimming

All cut ends shall be trimmed inside and outside to remove rough edges.

352.30 Securing and Supporting

PVC rigid nonmetallic conduit shall be installed as a complete system as provided in 300.18 and shall be fastened so that movement from thermal expansion or contraction is permitted. PVC rigid nonmetallic conduit shall be securely fastened and supported in accordance with 352.30(A) and (B).

(A) Securely Fastened. PVC rigid nonmetallic conduit shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) shall be permitted to be installed in accordance with the listing.

(B) Supports. PVC rigid nonmetallic conduit shall be supported as required in Table 352.30(B). Horizontal runs of PVC rigid nonmetallic conduit supported by openings through framing members at intervals not exceeding those in Table 352.30(B) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Table 352.30(B) Support of PVC rigid nonmetallic conduit

Conduit Size		Maximum Spacing Between Supports	
Metric Designator Trade	Size	mm or m	ft
16–27	1/2–1	900 mm	3
35–53	11/4–2	1.5 m	5
63–78	21/2–3	1.8 m	6
91–129	31/2–5	2.1 m	7
155	6	2.5 m	8

352.44 Expansion Fittings

Expansion fittings for PVC Rigid Nonmetallic Conduit shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 352.44, is expected to be 6 mm (1/ 4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

Table 352.44(A) Expansion Characteristics of PVC Rigid Nonmetallic Conduit Coefficient of Thermal Expansion = 6.084 × 10–5 mm/mm/°C (3.38 × 10–5 in./in./°F)

Temperature Change (°C)	Length Change of PVC Conduit (mm/m)	Temperature Change (°F)	Length Change of PVC Conduit (in./100 ft)	Temperature Change (°F)	Length Change of PVC Conduit (in./100 ft)t
5	0.30	5	0.20	105	4.26
10	0.61	10	0.41	110	4.46
15	0.91	15	0.61	115	4.66
20	1.22	20	0.81	120	4.87
25	1.52	25	1.01	125	5.07
30	1.83	30	1.22	130	5.27
35	2.13	35	1.42	135	5.48
40	2.43	40	1.62	140	5.68
45	2.74	45	1.83	145	5.88
50	3.04	50	2.03	150	6.08
55	3.35	55	2.23	155	6.29
60	3.65	60	2.43	160	6.49
65	3.95	65	2.64	165	6.69
70	4.26	70	2.84	170	6.90
75	4.56	75	3.04	175	7.10
80	4.87	80	3.24	180	7.30
85	5.17	85	3.45	185	7.50
90	5.48	90	3.65	190	7.71
95	5.78	95	3.85	195	7.91
100	6.08	100	4.06	200	8.11

352.46 Bushings

Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.

352.48 Joints

All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.

352.56 Splices and Taps

Splices and taps shall be made in accordance with 300.15.

352.60 Grounding

Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the conduit.

Exception No. 1: As permitted in 250.134(B), Exception No. 2, for dc circuits and 250.134(B), Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in 250.142.

III. Construction Specifications

352.100 Construction

PVC rigid nonmetallic conduit and fittings shall be composed of suitable PVC material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

352.120 Marking

Each length of PVC rigid nonmetallic conduit shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21. The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.

FPN: Examples of these markings include but are not limited to ``limited smoke'' and ``sunlight resistant.''

I. General

351.1 Scope

This article covers the use, installation, and construction specifications for rigid fiberglass conduit (RFC) and associated fittings.

351.2 Definition

Rigid fiberglass conduit. A rigid fiberglass conduit raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.

351.6 Listing Requirements

RFC, factory elbows, and associated fittings shall be listed.

II. Installation

351.10 Uses Permitted

The use of RFC shall be permitted in accordance with 352.10(A) through (H).

(A) Concealed. RFC shall be permitted in walls, floors, and ceilings.

(B) Corrosive Influences. RFC shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(C) Cinders. RFC shall be permitted in cinder fill.

(D) Wet Locations. RFC shall be permitted in portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.

(E) Dry and Damp Locations. RFC shall be permitted for use in dry and damp locations not prohibited by 351.12.

(F) Exposed. RFC shall be permitted for exposed work where not subject to physical damage if identified for such use.

(G) Underground Installations. For underground installations, see 300.5 and 300.50.

FPN: Refer to Article 353 for High Density Polyethylene Conduit: Type HDPE.

(H) Support of Conduit Bodies. RFC shall be permitted to support RFC bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaires (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).

351.12 Uses Not Permitted

RFC shall not be used under the following conditions.

(A) Hazardous (Classified) Locations

(1) In hazardous (classified) locations, except as permitted in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8

(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3)

(B) Support of Luminaires (Fixtures) For the support of luminaires (fixtures) or other equipment not described in 352.10(H).

(C) Physical Damage. Where subject to physical damage unless identified for such use.

(D) Ambient Temperatures. Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.

(E) Insulation Temperature Limitations For conductors or cables operating at a temperature higher than the RFC listed operating temperature rating.

Exception: Conductors or cables rated at a temperature higher than the RFC listed temperature rating shall be permitted to be installed in RFC, provided they are not operated at a temperature higher than the RFC listed temperature rating.

(F) Theaters and Similar Locations. In theaters and similar locations, except as provided in 518.4 and 520.5.

352.20 Size

(A) Minimum. RFC smaller than metric designator 16 (trade size 1/ 2) shall not be used.

(B) Maximum. RFC larger than metric designator 155 (trade size 6) shall not be used.

FPN: The trade sizes and metric designators are for identification purposes only and do not relate to actual dimensions. See 300.1(C).

351.22 Number of Conductors

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

351.24 Bends — How Made

Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

351.26 Bends — Number in One Run

There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.

351.28 Trimming

All cut ends shall be trimmed inside and outside to remove rough edges.

351.30 Securing and Supporting

RFC shall be installed as a complete system as provided in 300.18 and shall be fastened so that movement from thermal expansion or contraction is permitted. RFC shall be securely fastened and supported in accordance with 351.30(A) and (B).

(A) Securely Fastened. RFC shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) shall be permitted to be installed in accordance with the listing.

(B) Supports. Conduit listed for support at spacings different from Table 352.30 (B), shall be permitted to be installed in accordance with the listing. If there is no listing, RFC shall be supported as required in Table 352.30(B). Horizontal runs of RFC supported by openings through framing members at intervals not exceeding those in Table 352.30(B) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

351.44 Expansion Fittings

Expansion fittings for RFC shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 351.44, is expected to be 6 mm (1/ 4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

351.46 Bushings

Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.

351.48 Joints

All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.

351.56 Splices and Taps

Splices and taps shall be made in accordance with 300.15.

351.60 Grounding

Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the conduit.

Exception No. 1: As permitted in 250.134(B), Exception No. 2, for dc circuits and 250.134(B), Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in 250.142.

III. Construction Specifications

351.100 Construction

RFC and fittings shall be composed of suitable material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

351.120 Marking

Each length of RFC shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21. The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.

FPN: Examples of these markings include but are not limited to ``limited smoke'' and ``sunlight resistant.''

I**Substantiation:** For the 2005 NEC, High Density Poly Ethylene (HDPE) was broken out from Article 352 and a new Article 353 was created. It is our opinion that the same should have been done for fiberglass conduit as well, but as there was no formal proposal at that time, it couldn't be done for obvious reasons. Fiberglass conduit has entirely different properties (chemical, electrical, physical) compared to PVC conduit. Furthermore, fiberglass conduit has different dimensions compared to PVC conduit. Rigid fiberglass conduit has been produced for almost 40 years now as an accepted conduti material and it is time that fiberglass conduit is being recognized with its own article.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 8-53 and 8-78.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Table 351.44(A) Expansion Characteristics of RFC
Coefficient of Thermal Expansion = 2.7 × 10–5 mm/mm/°C (1.5 × 10–5 in./in./°F)

Temperature Change (°C)	Length Change of RFC (mm/m)	Temperature Change (°F)	Length Change of RFC (in./100 ft)	Temperature Change (°F)	Length Change of RFC (in./100 ft)
5	0.14	5	0.09	105	1.89
10	0.27	10	0.18	110	1.98
15	0.41	15	0.27	115	2.07
20	0.54	20	0.36	120	2.16
25	0.68	25	0.45	125	2.25
30	0.81	30	0.54	130	2.34
35	0.95	35	0.63	135	2.43
40	1.08	40	0.72	140	2.52
45	1.22	45	0.81	145	2.61
50	1.35	50	0.90	150	2.70
55	1.49	55	0.99	155	2.79
60	1.62	60	1.08	160	2.88
65	1.76	65	1.17	165	2.97
70	1.89	70	1.26	170	3.06
75	2.03	75	1.35	175	3.15
80	2.16	80	1.44	180	3.24
85	2.30	85	1.53	185	3.33
90	2.43	90	1.62	190	3.42
95	2.57	95	1.71	195	3.51
100	2.70	100	1.80	200	3.60

8-55 Log #230 NEC-P08 **Final Action: Reject**
(352.10, FPN)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
FPN: Extreme cold may cause some nonmetallic conduits to become brittle, and therefore, more susceptible to damage from ~~physical~~ contact.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "contact" means "physical contact."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-56 Log #316 NEC-P08 **Final Action: Reject**
(352.10(F))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(F) Exposed. For exposed work where not subject to ~~physical~~ damage if identified for such use.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-57 Log #2614 NEC-P08 **Final Action: Accept in Principle**
(352.10(F))

Submitter: David H. Kendall, Carlon
Recommendation: Revise 352.10(F) to read as follows:
(F) Exposed. RNC shall be permitted for exposed work ~~not subject to physical damage if identified for such use~~ . RNC used exposed in areas of physical damage shall be identified for the use.
<u>FPN: Rigid nonmetallic PVC Conduit, Type Schedule 80, is identified for areas of physical damage.</u>
Substantiation: 352.10(F) was revised for clarification and made the section more user friendly. The FPN was added to help the user to identify known product for areas of physical damage.
Panel Meeting Action: Accept in Principle
Modify 352.10(F) as follows:
(F) Exposed. <u>PVC conduit</u> ~~RNC~~ shall be permitted for exposed work ~~not subject to physical damage if identified for such use~~ . <u>PVC conduit</u> ~~RNC~~ used exposed in areas of physical damage shall be identified for the use.
<u>FPN: Rigid nonmetallic PVC Conduit, Type Schedule 80, is identified for areas of physical damage.</u>
Panel Statement: The submitter's intent was met.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

Comment on Affirmative:
LOYD, R.: While I approve of the rule to be applied I feel the FPN is not necessary and could have been better stated in positive text in the Section, such as: "352.10(F) Exposed. Schedule 40 PVC conduit shall be permitted where not subject to physical damage. Schedule 80 PVC conduit shall be permitted in areas where subject to physical damage."
The testing laboratory representatives and the manufacturer on the panel both stated Schedule 80 is the only nonmetallic conduit presently listed for applications where subject to physical damage.

8-58 Log #3449 NEC-P08 **Final Action: Reject**
(352.12 Exception (New))

Submitter: Joseph S. Zimnoch, The Okonite Company
Recommendation: Add the following Exception:
Exception: Medium voltage cables rated 105°C shall be permitted to be installed in concrete encased or direct buried RNC.
Substantiation: Since the introduction of 105°C rated medium voltage cables in the 1996 NEC, many 105°C rated cables have been installed in concrete encased PVC ducts and direct buried PVC ducts without incident.
Since the thermal mass of the concrete and soil dissipate heat away from the duct and there is a temperature gradient from the conductor to the cables outer surface, the cables outer surface runs cooler than the thermal rating of the rating of the duct.
Panel Meeting Action: Reject
Panel Statement: 352.12(E) Exception permits the use of 105 degree C medium voltage cables to be used in rigid nonmetallic conduit, provided that the medium voltage cables are not operated at a temperature higher than the RNC listed temperature rating. The submitter did not provide technical data to support that the concrete and soil thermal conductivity is adequate to protect the conduit against excessive temperature rise.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-59 Log #1974 NEC-P08 **Final Action: Accept**
(352.12(A))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 352.12(A) to read as shown:
352.12(A) Hazardous (Classified) Locations. ~~(1)~~ In <u>any</u> hazardous (classified) locations, except as permitted <u>by other Articles in this Code.</u> ~~in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8.~~
~~(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3).~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for RNC within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of RNC, by an AHJ, because the RNC Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Panel Statement: See panel action and statement on Proposals 8-53 and 8-78. This accepted change should be inserted into the revised Article 352 and new Article 355 based on Proposals 8-53 and 8-78.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-60 Log #3630 NEC-P08 **Final Action: Accept in Principle**
(352.12(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for Comment.
Submitter: Goran Haag, Champion Fiberglass, Inc.
Recommendation: For sub-paragraph (1), insert the words "501.10 (B)(1)(7)" before 503.10(A) and delete the next sentence. "(2)In Class I, Division 2 locations, except as permitted in 501.10(B)(3)".
Substantiation: Addition of rigid nonmetallic conduit to Class I, Division 2 wiring methods. This proposal provides the option of using a conduit system that is corrosion resistant and safe for Class I, Division 2 locations. Chemical plants, refineries, off shore drilling facilities and other similar processes are highly corrosive and also have classified areas. Nonmetallic conduit provides a critical option on these locations. The NEC requirements for rigid nonmetallic conduit are found in Article 352. Rigid nonmetallic conduit is listed in the UL Information Directory, which describes the types of rigid nonmetallic conduit, and also in UL standard 1684. Rigid nonmetallic conduit is permitted in Class III, Division 1 locations; a s buried raceway in Class I location in commercial Garages, Article 511; in Bulk Storage Plants, Article 515, and in Class I, Division 1 locations when enclosed in concrete. This proposal also requires an equipment grounding conductor with the nonmetallic conduit in Class I, Division 2 locations. Rigid nonmetallic conduit, not other cabling or conduit systems, is not permitted where subject to physical damage unless identified for such use.
A second proposal to permit RNC in Class I, Division 2 locations is being submitted to section 501.10(B)(1)(7)

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 8-59. Only Panel 14, the CMP responsible for Hazardous Locations, can determine the acceptable wiring method for hazardous locations.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-61 Log #315 NEC-P08 **Final Action: Reject**
(352.12(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(C) ~~Physical damage~~ Violence. Where subject to ~~physical damage~~ blows or abrasion unless identified for such use.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Here, though, the immediately following item, (D), refers to a form of physical damage–deterioration by overheating. The proposed rewording is an attempt at precision. If you don't care to reword (C), its existing form theoretically eliminates the need for (D).
Furthermore, I would then have to fall back to arguing that in that case the term "physical" should be eliminated. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-62 Log #2615 NEC-P08 **Final Action: Accept in Principle**
(352.12(C))

Submitter: David H. Kendall, Carlon
Recommendation: Revise 352.12(C) to read as follows:
(C) Physical Damage. Where subject to physical damage unless identified for such use.
FPN: Rigid nonmetallic PVC conduit, Type Schedule 80, is identified for areas of physical damage.
Substantiation: The FPN was added to help the user to identify known product for areas of physical damage.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 8-57. The submitter's intent is met.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: While I approve of the rule to be applied I feel the FPN is not necessary and could have been better stated in positive text in the section, such as: "352.12(C) Exposed. Schedule PVC conduit shall not be permitted where subject to physical damage.
Exception: Schedule 80 PVC conduit shall be permitted."
The testing laboratory representatives and the manufacturer on the panel both stated Schedule 80 is the only nonmetallic conduit presently listed for applications where subject to physical damage.

8-63 Log #3357 NEC-P08 **Final Action: Reject**
(352.12(G) (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Add a new (G) to read as follows:
(G) High-Rise Buildings. Where used in buildings more than 21 m (70 ft) above mean grade, rigid nonmetallic conduit shall not be used unless the building is protected by an approved fire sprinkler system(s) installed on all floors as a complete system, or the conduit is concealed behind a thermal barrier as described in 362.10(2) or 362.10(5), or the conduit is encased in not less than 50 mm (2 in.) of concrete.
Substantiation: This proposal removes a technical inconsistency in the Code, since rigid nonmetallic conduit constructed of polyvinyl chloride is the identical material as used in Electrical Nonmetallic Tubing (ENT). ENT, with a lower volume of nonmetallic material per comparable unit length, now has a more severe restriction.
Although the existence of a technical inconsistency in and of itself does not necessarily justify changing the NEC, certain conclusions can be legitimately drawn from the field experience with comparable products. That chemical composition and its behavior under fire conditions is what led to the final outcome of allowed uses for ENT. The restriction should not be confined to the wiring method with the largest potential market share.
Panel Meeting Action: Reject
Panel Statement: The proposal does not remove a technical inconsistency in the Code but adds a restriction to the use of RNC without technical substantiation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-64 Log #2261 NEC-P08 **Final Action: Reject**
(352.13)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
352.xx Rigid nonmetallic conduit shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 111-2003, Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC), and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment and systems covered by Article 352. However, safety would be improved by offering more detailed installation guidance for rigid nonmetallic conduit.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: See my comment on 8-3.

8-65 Log #1348 NEC-P08 **Final Action: Accept in Principle**
(352.30(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add the following text to 352.30
(C) Unsupported raceways: Type RNC shall be permitted to be unsupported where the raceway is not more than 900 mm (3 ft) in length and remains in unbroken lengths (without coupling). Such raceway shall terminate in an outlet box, junction box, device box, cabinet, or other termination at each end of the raceway.
Substantiation: Unsupported raceways are violations of the *Code* that occur everyday. As written, a 3 inch length of conduit between enclosures is required to be supported, despite the fact that it adds little if any structural value to the system. Quite often, particularly with conduit nipples, securing and supporting a raceway shorter than 36 inches is not possible. Furthermore, securing and supporting is of little value on lengths less than 36 inches where the conduit terminates at a box on each end, where the box is installed and supported in compliance with its applicable *Code* section.
This proposal is written with the parallel effect of *Code* sections that have been strived for in chapter 3, and matches the numbering system used in the Cable Articles. It also uses existing text taken from both the Cable Articles and the Raceway Articles
Panel Meeting Action: Accept in Principle
Add the following text to 352.30
(C) Unsupported raceways: Type PVC conduit RNC shall be permitted to be unsupported where the raceway is not more than 900 mm (3 ft) in length and remains in unbroken lengths (without coupling). Such raceway shall terminate in an outlet box, junction box, device box, cabinet, or other termination at each end of the raceway.
Panel Statement: The submitter's intent is met. It is the committee intent that this change be folded into 8-53 and 8-78 (in 355.30, change PVC conduit to RTRC).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
DABE, J.: See my comment for 8-9.
HUMPHREY, D.: This proposal does not address other issues that may have a direct impact on the durability of the electrical installation., The affects of weight and vibration on concentric and eccentric knockouts at each end of a three foot run between pieces of equipment, a scenario that would be frequently encountered in many electrical installations may compromise the strength of the installation. The raceway having even a single point of support would help to mitigate these deleterious affects. 300.11 further requires that raceways be

securely fastened in place. I would assert that this proposal would conflict with the requirements of 300.11. In summation, depending on connectors, double locknuts etc. to support and secure this up to 36 in. installation especially where concentric or eccentric knockouts are encountered is dubious at best. 36 in. should provide ample space in which to install normal supporting and securing hardware. A proposal involving a shorter distance and where no concentric or eccentric knockouts are encountered may be in order.

8-66 Log #3359 NEC-P08 **Final Action: Reject**
(352.44)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise to read as follows:
352.44 Expansion Fittings. Expansion fittings for rigid nonmetallic conduit shall be provided to compensate for thermal expansion and contraction where the length change will exceed, in accordance with Tables 352.44(A) and (B), 3 mm (1 / 8 in) at securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.
Substantiation: The main problem with the existing wording is that one cannot assume the problem is only between two securely mounted boxes, etc. If that is the case, then the current NEC wording (1/4 inch) is fine because the box at each end only moves 1/8 inch. Suppose, however, the conduit 90's away from a brick inside corner on the left to a box on the right. The left side cannot move, so how much distance is allowed for the box? The full 1/4-inch will break the supports free of the box, as members of the Advisory Committee have verified by test. The current NEC wording does not address this common occurrence. Another related problem in the NEC concerns boxes mounted on either end of reverse 90's or the like. The conduit may expand and contract over its length much more than 1/4 inch and not put very much pressure on the boxes at all.
The point is, how much displacement should any fixed termination tolerate? The rule should be written to prevent, under any circumstances, RNC movement that will tend to displace a securely fastened item more than 1/8-inch due to field temperature fluctuation. If the panel has technical information that demonstrates that typical items in a run of PVC can tolerate more that 1/8-inch, then so be it. However, the Advisory Committee members are aware of instances where even this smaller dimension pushed the envelope on what mounted equipment would tolerate. Remember, the point of this proposal is not to change the allowed tolerance between two items connected with RNC. The 1/4-inch limit works fine until the entire expansion motion occurs at only one end of a run. These circumstances occur frequently.
Panel Meeting Action: Reject
Panel Statement: The current language of this section adequately conveys the requirement. In addition, there is not enough technical substantiation to revise the requirement.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-67 Log #960 NEC-P08 **Final Action: Reject**
(352.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Where an equipment grounding conductor is ~~required~~ provided , ~~a separate equipment grounding conductor~~ it shall be installed in the raceway.
Substantiation: Where equipment is not to be grounded, but grounded by choice, present wording does not preclude an EGC installed in any manner, and if not in the raceway is not covered by 250.120(A). Code provisions are not limited to mandatory requirements and 110.12 applies to all wiring. 250.1(1) indicates Article 250 covers installations "permitting" and the proposal would correlate this section.
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are addressed in Section 300.3(B) for equipment grounding conductors that are provided, but not required.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-68 Log #2616 NEC-P08 **Final Action: Accept in Principle in Part**
(352.100)

Submitter: David H. Kendall, Carlon
Recommendation: Revise 352.100 to read as follows:
352.100 Construction. RNC shall be made of rigid (nonplasticized) polyvinyl chloride (PVC) or reenforced thermosetting resin (RTRC). The material shall be homogenous without the use of foaming agents . RNC and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortions from heat under conditions likely to be encountered in service and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.
Substantiation: 352.100 was revised to narrow the scope of the PVC and RTRC material allowed to be used without Panel 8 review.
UL has recently issued a Listing for a foamed core Schedule 40 Rigid PVC Conduit. Several Panel members had concerns regarding this listing that was not addressed by UL.
This product was evaluated to the requirements contained in the standard for Schedule 40 and 80 Rigid PVC Conduit, UL 651. However, the foam core product utilizes foaming agents within its wall, and is therefore nonhomogeneous in nature. This produces a product that is obviously different from any other conduit previously listed under UL 651. As a result, there are several inherent safety concerns pertaining to this product that would not have been addressed by the Listing evaluation. It should also be noted that this type of product has previously been submitted to UL prior to their restructuring and was rejected for evaluation under the UL 651 standard due to these same concerns. While the foam core product may have its place as a Listable conduit, it should not be considered equivalent to currently Listed PVC conduits. The development of separate requirements to address these products should have taken place through UL's Subject 651 STP, in accordance with UL's own standards development process.
When discussing the technical considerations and concerns related to this product, it is important to bear in mind the uses for which it was developed. Coextruded cellular core PVC pipe originated within the plumbing industry for use in DWV (Drain, Waste, and Vent) applications. Due to its low mechanical strength, it is excluded from pressure applications and is used almost exclusively in nonexposed locations. While some electrical utilities have subsequently used this product in limited applications outside of the scope of the National Electrical Code, it was always subject to strict premise control and never permitted as a general purpose wiring method.
Based on this history and our familiarity with this pipe, industry is greatly concerned over its ability to withstand the physical conditions to which it will be subjected. While the resistance of homogenous rigid PVC conduit to mechanical damage on both a short term and long term basis has been well established, the same cannot be said for the foamed pipe. UL's decision to List coextruded cellular cover PVC pipe as an electrical raceway, without a thorough analysis and understanding of its nature and inherent weaknesses, has established a dangerous precedent which can only serve to damage the reputation of the rigid nonmetallic conduit industry.
The UL 651 Standard requires that the compound used for Schedule 40 and Schedule 80 Rigid PVC Conduit be as described in the Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds, ASTM D 1784. However, that standard applies only to homogenous conduit and indicates that the materials used "shall be of uniform composition." This is clearly not the case once the foaming agents have been introduced.
Instead of the ASTM D 1784 standard, the document that is applicable to the cellular pipe is the Standard Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core, ASTM F 891. This is acknowledged in the manufacturer's own product literature. However, the F 891 document clearly indicates that this product is intended for use as drain, waste, or vent pipe or as underground communication conduit and that it is "not for underground electrical power distribution usage."
Our concerns over the use of this pipe in power distribution applications center on its nonhomogeneous nature, and the highly questionable performance characteristics of the foamed inner layer. Our principle technical concerns are as follows:
1) Pockets of air, such as those found within the cells of the foam core pipe, provide an excellent insulating layer. While this may be desirable in many applications, electrical conduit is not one of them. Once such an insulating layer has been introduced within the wall of any type of rigid nonmetallic conduit, the conduits ability to dissipate the heat generated by the conductors contained within is severely compromised. As the heat generation effects are one of the two main factors used to determine a raceway's wirefill capacity, in all likelihood this product should have a decreased wirefill. However, this was not addressed by UL's investigation, nor was it envisioned by the wirefill tables contained in the National Electrical Code.
2) As noted above, the manufacturer's own literature for this product states that its performance is in accordance with the ASTM F891 Standard. However, this standard specifies impact values which range from 42 - 55% of those specified in UL 651. Based upon our experience, it would be extremely difficult, if not impossible, for a coextruded cellular pipe to comply with the UL 651 requirements. Impact testing is one of the areas where we have been receiving contradictory information from UL as to whether or not this product was subjected to the UL 651 requirements. As impact resistance is one of the principle parameters that need to be maintained in any type of rigid conduit, it is imperative that this not be compromised in any manner.
3) Homogeneous rigid PVC conduit provides a predictable behavior pattern in that if the outer wall is scratched or the end of the conduit is chambered in the factory or in the field, it will only expose identical material underneath. However, in the case of the foam core product, a new material will be exposed. UL's policy has long been to evaluate products based upon their intended conditions of use and reasonably foreseeable conditions of misuse. As minor nicks or scrapes may occur during transport or installation, a number of the

foam core conduit's performance characteristics should be evaluated both from the standpoint of the performance of the inner and outer walls, as well as the foam core.

4) The blowing agent used to produce the cellular core pipe has a flash point of 320°F and the MSDS sheets for this material indicates that "elevated temperatures and flames" are to be avoided because of this. As almost all cellular core pipe will have residual blowing agent embedded in them after manufacture, this is a significant concern. Should the outer or inner layer of PVC be compromised during installation of the conduit or conductors, a potentially hazardous situation can arise. The effect of the blowing agent on the flammability of this product is of great concern and must be thoroughly investigated.

5) Should the outer PVC layer of these products become compromised, it can also expose the cellular inner core to moisture. Due to the open nature of this inner layer, moisture could then readily penetrate the conduit, resulting in an electrically or mechanically hazardous situation. The cells provide a pathway through the conduit wall whereby moisture can penetrate and potentially contact the electrical conductors. Additionally, the detrimental effect of increased moisture content on PVC conduit's mechanical properties has long been established.

6) The resistance to sunlight of PVC products has always been of great concern to conduit manufacturers, and additives have been developed to address this. However, the effect of sunlight on the foam core pipe, in either the short term or long term, is largely unknown. Even the plumbing and utility applications of this pipe have only involved applications that are shielded from sunlight, so no history can be extrapolated for electrical conduit. Our concerns once again center on the possibility of minor surface damage, which would not have a detrimental effect on a homogenous product, having a serious effect on the cellular core product.

7) The DZYR Guide information states that this product is "inherently resistant to atmosphere containing common industrial corrosive agents and will also withstand vapors or mist of caustic, pickling acids, plating bath and hydrofluoric and chromic acids." While the behavior of the homogenous PVC product has been established for these environments, and therefore does not require an evaluation as part of the Listing investigation, the same cannot be said for the foam core pipe. This situation would be significantly aggravated by the introduction of moisture as a transport mechanism.

8) The thermal expansion characteristics of homogenous PVC conduit are well known, and are defined in Table 352.44(A) of the National Electrical Code. However, the same cannot be said for the foam core pipe. Stresses imposed upon the conduit system by insufficient allowance for thermal expansion would result in a hazardous situation, and this situation must be addressed both by UL and the National Electrical Code.

9) Schedule 40 and 80 rigid PVC conduit is acceptable for both field and factory bending by a variety of methods. however, when the foam core pipe is similarly bent, the PVC layer will stretch and thin, thereby reducing its wall thickness. This thinning can create a number of complications for the foam core pipe that are not present for the homogeneous conduit, such as increasing the possibility of burn through to the foam inner layer when wires or cables are pulled. In addition to the hazards implicit in exposing this foamed material to the environment, the cellular structure of this material will be very susceptible to damage by the wire insulation.

10) Concerns over delamination of rigid conduit products have been addressed through the incorporation of the Extrusion Process Test in UL 651. However, as noted before, if the exterior PVC layer is compromised, it will expose an interior layer which does not have a similar history.

11) Recycled/Regrind materials are currently permitted for use with Schedule 40 and Schedule 80 rigid PVC conduit, due to their homogenous nature However, the introduction of the blowing agents and nonuniform materials may preclude this for the coextruded cellular core pipe. Steps must be taken to quantify the blowing agents and additives that are introduced in the cellular process, as their presence and amount can have a significant impact on the overall behavior of this pipe.

Material Identification for a nonhomogenous PVC pipe will similarly introduce new challenges for these products that will need to be addressed. In addition to the PVC compounds used in the inner and outer layers, the amount and identification of the blowing agent and other additives present in the cellular core will need to be determined and tightly controlled. As noted above, these additional materials and the porosity that results can significantly affect the mechanical characteristics of this pipe.

12) This pipe should be provided with an additional marking in order to distinguish it from the standard homogeneous wall conduit. As the outward physical appearances of the two products are virtually indistinguishable once it has been installed, to not alert the installation and inspection communities of its use will do them a severe disservice.

As noted in earlier communication to UL, this product was clearly not envisioned for coverage under Article 352 of the National Electrical Code. Each of the three conduit types currently or formerly covered by Article 352 (rigid PVC, HDPE, and RTRC) was first introduced to the Code Making Panel (CMP) through the use of a Fact Finding Investigation. To introduce a new and significantly different type of rigid nonmetallic conduit without following this same procedure indicates a willingness on UL's part to unilaterally determine what types of products should be accepted as general purpose wiring methods without receiving input from the CMP or UL's STP.

Due to the extent and nature of our concerns, which are shared by other manufacturers within the rigid PVC industry as well as members of CMP 8, it can be readily seen that insufficient technical consideration was given to the potential hazards implicit with the use of this product.

Panel Meeting Action: Accept in Principle in Part

Revise the proposed text in 352.100 to read as follows:

352.100 Construction. PVC conduit RNC shall be made of rigid (nonplasticized) polyvinyl chloride (PVC) ~~or reenforced thermosetting resin (RTRC).~~ The material shall be homogeneous without the use of foaming agents . RNC and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortions from heat under conditions likely to be encountered in service and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

Panel Statement: The committee accepts the changes but rejects the change to include reinforced thermosetting resin (RTRC). The panel doesn't believe that RTRC can be constructed using the nonhomogeneous foaming agent. See panel action and statement on Proposal 8-53.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

WALBRECHT, G.: UL is opposed to the proposed revision limiting the material for rigid nonmetallic conduit (RNC) to only homogeneous polyvinyl chloride (PVC) or reinforced thermosetting resin (RTRC) for a number of reasons.

The level of detail associated with defining the materials used in the construction of RNC is better addressed in the relevant product safety standards, in this case the Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings, ANSI/UL 651. ANSI/UL 651 includes assessments of impact resistance, flammability, water absorption, sunlight resistance, and other relevant safety properties related to RNC. Proposals to revise ANSI/UL 651 may be submitted by any interested party for the action of the Standards Technical Panel. The proposed revision under consideration by Panel 8 related to homogenous material has not been submitted for action by STP 651.

Most importantly, the numerous allegations included within the proposal are not technically substantiated by factual information.

Based on this, UL does not support the proposed revision to Article 352. The proposed revision will modify very detailed material requirements within the NEC, with the practical result of effective suppression of suitable alternative technologies - and repetitive future work in CMP 8 to address product level details better addressed in the applicable product standard forum.

ARTICLE 353 — HIGH DENSITY POLYETHYLENE CONDUIT: TYPE HDPE CONDUIT

8-68a Log #CP801 NEC-P08 **Final Action: Accept**
(353.1)

Submitter: Code-Making Panel 8,

Recommendation: Revise 353.1 to add an FPN as follows:

353.1 Scope. This article covers the use, installation, and construction specification for high density polyethylene (HDPE) conduit and associated fittings.

FPN: Refer to Article 352 for Rigid Polyvinyl Chloride Conduit: Type PVC and Article 355 for Reinforced Thermosetting Resin Conduit: Type RTRC.

Substantiation: The intent of this proposal is to provide consistency with panel actions on Proposals 8-53 and 8-78. It is recommended that the TCC consider the article scope as revised.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KENDALL, D.: This proposal should be rejected. The scope of Article 353 should state that HDPE Conduit is a rigid nonmetallic conduit as stated for both PVC Conduit (Article 352) and RTRC Conduit (Proposed Article 355). All three conduits were under the scope of Article 352 prior to the 2005 NEC. Article 352 was for rigid nonmetallic conduits.

Comment on Affirmative:

DUREN, R.: Foamed core products should undergo a fact-finding investigation to determine the scope and range of their acceptable use. If the manufacturer wants to sell this product for use as a wiring method, a separate article covering application of the foamed core product should be developed unless the product is found to be comparable in every way to the performance of the homogenous product covered in Article 352.

8-69 Log #2617 NEC-P08 **Final Action: Accept in Principle**
(353.10(5))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
353.10 Uses Permitted.
(5) Aboveground where encased in not less than 50 mm (2 in.) of concrete.
Substantiation: The proposal clarifies that HDPE conduit is acceptable to be used aboveground where encased in concrete per the listing of the product. HDPE conduit has been listed per UL651A and UL651B for aboveground uses where encased in not less than 50 mm of concrete prior to the adoption of this new article.
Panel Meeting Action: Accept in Principle
Revise as follows:
353.10 Uses Permitted.
(5) Aboveground, except as prohibited in Section 353.12, where encased in not less than 50 mm (2 in.) of concrete.
Panel Statement: The submitter's intent was met. The phrase ", except as prohibited in Section 353.12, " was added to clarify that HDPE is not permitted in buildings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-70 Log #1967 NEC-P08 **Final Action: Accept**
(353.12(3))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 353.12(3) to read as shown:
353.12(3) in any hazardous (classified) locations, except as permitted by other Articles in this Code. ~~in 504.20~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for HDPE Conduit within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of HDPE Conduit, by an AHJ, because the HDPE Conduit Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-71 Log #2262 NEC-P08 **Final Action: Reject**
(353.13)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
353.xx HDPE conduit shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA/NEMA 605-2005, Recommended Practice for Installing Nonmetallic Underground Utility Duct, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 353. However, safety would be improved by offering more detailed installation guidance for HDPE conduit.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: See my comment on 8-3.

8-72 Log #2618 NEC-P08 **Final Action: Accept**
(353.20(B))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
353.20 Size.
(A) Minimum. HDPE conduit smaller than metric designator 16 (trade size 1/2) shall not be used.
(B) Maximum. HDPE conduit larger than metric designator 155 (trade size 6) ~~103 (trade size 4)~~ shall not be used.
FPN: The trade sized and metric designations are for identification purposes only and do not relate to actual dimensions, see 300.1(C).
Substantiation: The proposal clarifies that metric designator 155 (trade size 6) is the maximum size HDPE conduit listed on the market to date. HDPE conduit, metric designator 155 (trade size 6), has been listed per UL651A and UL651B prior to the adoption of this new article.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-73 Log #2782 NEC-P08 **Final Action: Reject**
(353.44)

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.
Recommendation: Add new text to read:
353.44 Expansion Fittings. Expansion fittings shall be installed where expected length change, due to expansion and contraction due to temperature change and designed building movement is more than 6 mm (.25 in.)
Substantiation: Large structures are often times designed with expansion joints to all for building movement and temperature change expansion and contraction. HDPE installed across these expansion joints is subject to movement which will lead to loosened connections at couplings and connectors. The loosened connections will decrease the effectiveness of the ground fault return path and ultimately affect the safety of the electrical installation.
Panel Meeting Action: Reject
Panel Statement: HDPE is only for underground use or within 2 inches of concrete above ground if 8-69 is accepted, not for use within buildings. HDPE cannot be used within a building. There are no technical data submitted for temperature coefficents for expansion. Setting the stage for any type of code violation is not the intent of the panel.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-74 Log #2619 NEC-P08 **Final Action: Accept**
(353.48, FPN (New))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
353.48 Joints. All joints between lengths of conduit and between conduit and couplings, fittings, and boxes, shall be made by an approved method.
FPN: HDPE Conduit can be joined using either heat fusion, electrofusion or mechanical fittings.
Substantiation: The new fine print note indicates several common ways of joining HDPE Conduit together. Unlike PVC Conduit, two pieces of HDPE Conduit can be heat fusion together. This has been a common and safe practice used for years by the Gas Utility Companies for joining two pieces of yellow HDPE natural gas pipe. Electrical and telephone contractors also use this established method to join two pieces of conduit. This type of joining creates a joint that is both air and water tight. The joint is usually stronger than the conduit itself.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 354 — NONMETALLIC UNDERGROUND CONDUIT WITH CONDUCTORS: TYPE NUCC

8-75 Log #2620 NEC-P08 **Final Action: Accept in Principle**
(354.10(5))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
354.10 Uses Permitted.
(5) Aboveground where encased in not less than 50 mm (2 in.) of concrete.
Substantiation: The proposal clarifies that NUCC is acceptable to be used aboveground where encased in concrete per the listing of the product. NUCC has been listed as an assembly per UL1990 for aboveground uses where encased in not less than 50 mm of concrete. The raceway is listed to UL651B. This has always been an acceptable use of the product in barrier walls.
Panel Meeting Action: Accept in Principle
Revise as follows:
354.10 Uses Permitted.
(5) Aboveground, except as prohibited in Section 354.12, where encased in not less than 50 mm (2 in.) of concrete.
Panel Statement: The submitter's intent was met. The phrase ", except as prohibited in Section 354.12, " was added to clarify that NUCC is not permitted in buildings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-76 Log #1968 NEC-P08 **Final Action: Accept**
(354.12(3))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 354.12(3) to read as shown:
354.12(3) in any hazardous (classified) locations, except as permitted by other Articles in this Code . ~~503.10(A), 504.20, 514.8, and 515.8, and in Class I, Division 2 locations as permitted in 501.10(B)(3)~~

Substantiation: This change is necessary because the current text is too limiting. The areas of usage for NUCC within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of NUCC, by an AHJ, because the NUCC Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-77 Log #2621 NEC-P08 **Final Action: Reject**
(354.48, FPN (New))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
354.48 Joints. All joints between conduit, fittings, and boxes shall be made by an approved method.
FPN: HDPE Conduit can be joined using either heat fusion, electrofusion or mechanical fittings.
Substantiation: The new fine print note indicates several common ways of joining HDPE conduit together. Unlike PVC conduit, two pieces of HDPE Conduit can be heat fusion together. This has been a common and safe practice for years by the Gas Utility Companies for joining two pieces of yellow HDPE natural gas pipe. Electrical and telephone contractors also use this established method to join two pieces of conduit. This type of joining creates a joint that is both air and water tight. The joint is usually stronger than the conduit itself.
Panel Meeting Action: Reject
Panel Statement: This FPN is not appropriate for this location since NUCC is not intended to be joined in the field.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-78 Log #1920 NEC-P08 **Final Action: Accept in Principle**
(355 (New))

TCC Action: The Technical Correlating Committee advises that Article Scope statements and Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
Submitter: William Wagner, Certification Solutions
Recommendation: Add Article 355 as follows:
Article 355
Reinforced Thermosetting Resin Conduit: Type RTRC
I. General
355.1 Scope. This article covers the use, installation, and construction specification for reinforced thermosetting resin conduit (RTRC) and associated fittings.
355.2 Definition.
Reinforced Thermosetting Resin Conduit (RTRC). A nonmetallic raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.
355.6 Listing Requirements. RTRC, factory elbows, and associated fittings shall be listed.
II. Installation.
355.10 Uses Permitted. The use of RTRC shall be permitted in accordance with 355.10(A) through (H)
(A) Concealed. RTRC shall be permitted in walls, floors, and ceilings.
(B) Corrosive Influences. RTRC shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.
(C) Cinders. RTRC shall be permitted in cinder fill.
(D) Wet Locations. RTRC shall be permitted in portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.
(E) Dry and Damp Locations. RTRC shall be permitted for use in dry and damp locations not prohibited by 355.12.
(F) Exposed. RTRC shall be permitted for exposed work where not subject to physical damage if identified for such use.
(G) Underground Installations. For underground installations, see 300.5 and 300.50.
FPN: Refer to Article 352 for Rigid Polyvinyl Chloride Conduit: Type PVC and Article 353 for High Density Polyethylene Conduit: Type HDPE.
(H) Support of Conduit Bodies. RTRC shall be permitted to support nonmetallic conduit bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaires (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).

355.12. Uses Not Permitted. RTRC shall not be used under the following conditions.
(A) Hazardous (Classified) Locations.
(1) In hazardous (classified) locations, except as permitted in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8
(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3).
(B) Support of Luminaires (Fixtures). For the support of luminaires (fixtures) or other equipment not described in 355.10(H).
(C) Physical Damage. Where subject to physical damage unless identified for such use.
(D) Ambient Temperatures. Where subject to ambient temperatures in excess of 110°C (230°F) unless listed otherwise.
(E) Insulation Temperature Limitations. For conductors or cables operating at a temperature higher than the RTRC listed operating temperature rating.
Exception: Conductors or cables rated at a temperature higher than the RTRC listed temperature rating shall be permitted to be installed in RTRC, provided they are not operated at a temperature higher than the RTRC listed temperature rating.
(F) Theaters and Similar Locations. In theaters and similar locations, except as provided in 518.4 and 520.5.
355.20 Size.
(A) Minimum. RTRC smaller than metric designator 16 (trade size 1/2) shall not be used.
(B) Maximum. RTRC larger than metric designator 155 (trade size 6) shall not be used.
FPN: The trade sizes and metric designators are for identification purposes only and do not relate to actual dimensions. See 300.1(C).
355.22 Number of Conductors. The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.
Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
355.24 Bends – How Made. Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.
355.26 Bends – Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.
355.28 Tripping. All cut ends shall be trimmed inside and outside to remove rough edges.
355.30 Securing and Supporting. RTRC shall be installed as a complete system as provided in 300.18 and shall be fastened so that movement from thermal expansion or contraction is permitted. RTRC shall be securely fastened and supported in accordance with 355.30(A) and (B).
(A) Securely Fastened. RTRC shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) shall be permitted to be installed in accordance with the listing.
(B) Supports. RTRC shall be supported as required in Table 355.30(B). Conduit listed for support at spacing other than as shown in Table 355.30(B) shall be permitted to be installed in accordance with the listing. Horizontal runs of RTRC supported by openings through framing members at intervals not exceeding those in Table 355.30(B) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Table 355.30(B) Support of Reinforced Thermosetting Resin Conduit (RTRC)

Conduit Size		Maximum Spacing Between Supports	
Metric Designator	**Trade Size**	**Mm or m**	**Ft**
16 – 27	½ – 1	900 mm	3
35 – 53	1 ¼ – 2	1.5 m	5
63 – 78	2 ½ – 3	1.8 m	6
91 – 129	3 ½ – 5	2.1 m	7
155	6	2.5 m	8

355.44 Expansion Fittings. Expansion fittings for RTRC shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 355.44 is expected to be 6 mm (1/4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

Table 355.44 Expansion Characteristics of Reinforced Thermosetting Resin Conduit (RTRC) Coefficient of Thermal Expansion = 27.10-5 mm/mm°C (1.5 x 10-5 in./in.°F)

Temperature Change	Length Change of RTC Conduit (mm/m)	Temperature Change (°F)	Length Change of RTC Conduit (in./100 ft)	Temperature Change (°F)	Length Change of RTC Conduit (in./100 ft)
5	0.14	5	0.09	105	1.89
10	0.27	10	0.18	110	1.98
15	0.41	15	0.27	115	2.07
20	0.54	20	0.36	120	2.16
25	0.68	25	0.45	125	2.25
30	0.81	30	0.54	130	2.34
35	0.95	35	0.63	135	2.43
40	1.08	40	0.72	140	2.52
45	1.22	45	0.81	145	2.61
50	1.35	50	0.90	150	2.70
55	1.49	55	0.99	155	2.79
60	1.62	60	1.08	160	2.88
65	1.76	65	1.17	165	2.97
70	1.89	70	1.26	170	3.06
75	2.03	75	1.35	175	3.15
80	2.16	80	1.44	180	3.24
85	2.30	85	1.53	185	3.33
90	2.43	90	1.62	190	3.42
95	2.57	95	1.71	195	3.51
100	2.70	100	1.80	200	3.60

355.46 Bushings. Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.

355.48 Joints. All joints between lengths of conduit, and between conduit and couplings, fitting, and boxes, shall be made by an approved method.

355.56 Splices and Taps. Splices and taps shall be made in accordance with 300.15.

355.60 Grounding. Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the conduit.

Exception No. 1: As permitted in 250.134(B), Exception No. 2, for dc circuits and 250.134(B), Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in 250.142.

III. Construction Specifications.

355.100 Construction. RTRC and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

355.120 Marking. Each length of RTRC shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21. The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.

Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit (RNC) in Article 100 and the revised Article 352 for Type PVC Conduit. This is a NEW article for the National Electrical Code.

In the 2002 edition of the National Electrical Code, Article 352; Rigid Nonmetallic Conduit (RNC) included PVC, RTRC, and HDPE products. However, for the 2005 edition of the NEC, HDPE was separated from these other conduit types and located in new Article 353. This left two very dissimilar products grouped together as RNC under Article 352 and technically eliminated HDPE as an acceptable wiring method in all applications where rigid nonmetallic conduit was specified. The separation of the PVC and RTRC products, and the definition of RNC as including rigid PVC, HDPE, and RTRC will correct this situation by better defining the installation and construction specifications for each conduit type.

It is requested that new Article be located as Article 355, which would place it after the PVC and HDPE conduit and Nonmetallic Underground Conduit with Conductors Articles.

Panel Meeting Action: Accept in Principle

Add new Article 355 to read as follows:

Article 355

Reinforced Thermosetting Resin Conduit: Type RTRC

I. General

355.1 Scope. This article covers the use, installation, and construction specification for reinforced thermosetting resin conduit (RTRC) and associated fittings.

FPN: Refer to Article 352 for Rigid Polyvinyl Chloride Conduit: Type PVC and Article 353 for High Density Polyethylene Conduit: Type HDPE.

355.2 Definition.

Reinforced Thermosetting Resin Conduit (RTRC). A rigid nonmetallic conduit (RNC) of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.

355.6 Listing Requirements. RTRC, factory elbows, and associated fittings shall be listed.

II. Installation.

355.10 Uses Permitted. The use of RTRC shall be permitted in accordance with 355.10(A) through (H)

(A) Concealed. RTRC shall be permitted in walls, floors, and ceilings.

(B) Corrosive Influences. RTRC shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(C) Cinders. RTRC shall be permitted in cinder fill.

(D) Wet Locations. RTRC shall be permitted in portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.

(E) Dry and Damp Locations. RTRC shall be permitted for use in dry and damp locations not prohibited by 355.12.

(F) Exposed. RTRC shall be permitted for exposed work where not subject to physical damage if identified for such use.

(G) Underground Installations. For underground installations, see 300.5 and 300.50.

(H) Support of Conduit Bodies. RTRC shall be permitted to support nonmetallic conduit bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaires (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).

355.12. Uses Not Permitted. RTRC shall not be used under the following conditions.

(A) Hazardous (Classified) Locations.

(1) In hazardous (classified) locations, except as permitted in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8

(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3).

(B) Support of Luminaires (Fixtures). For the support of luminaires (fixtures) or other equipment not described in 355.10(H).

(C) Physical Damage. Where subject to physical damage unless identified for such use.

(D) Ambient Temperatures. Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.
(E) Insulation Temperature Limitations. For conductors or cables operating at a temperature higher than the RTRC listed operating temperature rating.
Exception: Conductors or cables rated at a temperature higher than the RTRC listed temperature rating shall be permitted to be installed in RTRC, provided they are not operated at a temperature higher than the RTRC listed temperature rating.
(F) Theaters and Similar Locations. In theaters and similar locations, except as provided in 518.4 and 520.5.
355.20 Size.
(A) Minimum. RTRC smaller than metric designator 16 (trade size 1/2) shall not be used.
(B) Maximum. RTRC larger than metric designator 155 (trade size 6) shall not be used.
FPN: The trade sizes and metric designators are for identification purposes only and do not relate to actual dimensions. See 300.1(C). 355.22 Number of Conductors. The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9. Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
355.24 Bends – How Made. Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.
355.26 Bends – Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.
355.28 Trimming. All cut ends shall be trimmed inside and outside to remove rough edges.
355.30 Securing and Supporting. RTRC shall be installed as a complete system as provided in 300.18 and shall be fastened so that movement from thermal expansion or contraction is permitted. RTRC shall be securely fastened and supported in accordance with 355.30(A) and (B).
(A) Securely Fastened. RTRC shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) shall be permitted to be installed in accordance with the listing.
(B) Supports. RTRC shall be supported as required in Table 355.30. Conduit listed for support at spacing other than as shown in Table 355.30 shall be permitted to be installed in accordance with the listing. Horizontal runs of RTRC supported by openings through framing members at intervals not exceeding those in Table 355.30 and securely fastened within 900 mm (3 ft) of termination points shall be permitted.
(EXISTING TABLE 352.30(B) HERE AS TABLE 355.30)
355.44 Expansion Fittings. Expansion fittings for RTRC shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 355.44 is expected to be 6 mm (1/4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.
(EXISTING TABLE 352.44(B) HERE AS TABLE 355.44)
355.46 Bushings. Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.
FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.
355.48 Joints. All joints between lengths of conduit, and between conduit and couplings, fitting, and boxes, shall be made by an approved method.
355.56 Splices and Taps. Splices and taps shall be made in accordance with 300.15.
355.60 Grounding. Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the conduit.
Exception No. 1: As permitted in 250.134(B), Exception No. 2, for dc circuits and 250.134(B), Exception No. 1, for separately run equipment grounding conductors.
Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in 250.142.

III. Construction Specifications.

355.100 Construction. RTRC and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use above ground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.
355.120 Marking. Each length of RTRC shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21. The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.
FPN: Examples of these markings include but are not limited to "limited smoke" and "sunlight resistant."
Panel Statement: The submitter's intent is met, and additional editorial changes are made for clarity. This article better clarifies what RTRC is and its use. Changes are made to the submitter's recommendation to more closely follow the NEC Style Manual, and to correlate with the structure of other articles. The revised text meets the intent of the submitter.
It is recommended that the TCC consider the proposed numbering sequence of this article as well as the article scope.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-79 Log #1921 NEC-P08 **Final Action: Reject**
(355.10)

Submitter: William Wagner, Certification Solutions
Recommendation: Revise 355.10 as follows:
355.10 Uses Permitted. The use of RTRC shall be permitted in accordance with 352.10(A) through (~~H~~) (J).
(A) Concealed. RTRC shall be permitted in walls, floors, and ceilings.
(B) Corrosive Influences. RTRC shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.
(C) Cinders. RTRC shall be permitted in cinder fill.
(D) Wet Locations. RTRC shall be permitted in portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.
(E) Dry and Damp Locations. RTRC shall be permitted for use in dry and damp locations not prohibited by 355.12.
(F) Exposed. RTRC shall be permitted for exposed work where not subject to physical damage if identified for such use.
(G) Underground Installations. For underground installations, see 300.5 and 300.50.
FPN: Refer to Article 352 for Rigid Polyvinyl Chloride Conduit: Type PVC and Article 353 for High Density Polyethylene Conduit: Type HDPE.
(H) Support of Conduit Bodies. RTRC shall be permitted to support nonmetallic conduit bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaires (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).
(I) Ducts, Plenums, and Other Air-Handling Spaces. RTRC shall be permitted for use in ducts, plenums, and other air-handling spaces as covered in 300.22 if listed as having adequate fire-resistant and low smoke-producing characteristics.
FPN: One method of defining that RTRC is a fire-resistant and low smoke-producing raceway is that it exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m(5 ft) or less when tested in accordance with the plenum test in UL 2024, Standard for Optical Fiber Cable Raceway.
(J) Riser, RTRC shall be permitted for use in riser applications if listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.
FPN: One method of defining that RTRC has fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that it pass the requirements of the test for Flame Propagation (riser) in UL 2024, Standard for Optical Fiber Cable Raceway.
Substantiation: This is a companion proposal for the revised 300.22 and new Article 355.
Manufacturers have developed Type RTRC rigid nonmetallic conduit products that they believe are suitable for use as wiring methods in plenum and riser applications. However, in order to have these products evaluated accordingly, certification agencies require that there be at least one potential application for their use in accordance with the National Electrical Code. This proposal would permit these products to be employed in these applications providing that they have been specifically evaluated and listed for such use. Additionally, the Fine Pint Notes provide suggested methodologies for evaluating the fire and smoke producing aspects of these products, which are based upon other nonmetallic raceways that have previously been listed for use in these environments.
Panel Meeting Action: Reject
Panel Statement: The submitter has not supplied any technical substantiation to support this proposal. Code Panel 3 will determine which wiring methods are permitted in ducts, plenums, and other air handling spaces (300.22). Individual raceway articles do not need to duplicate acceptable systems. In addition, UL 2024 is used to evaluate nonmetallic raceways for Articles 725,

770, 800, and 825 and is not intended to be used for the evaluation of electrical raceways. Only plenum rated cables are permitted to be used in these raceways in the final application and testing. 300.22 is for electrical conductors, cables, and raceways.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-80 Log #1922 NEC-P08 **Final Action: Reject**
(355.12)

Submitter: William Wagner, Certification Solutions
Recommendation: Revise 355.12 as follows:
355.12 Uses Not Permitted. RTRC shall not be used under the following conditions.
(A) Hazardous (Classified) Locations.
(1) In hazardous (classified) locations, except as permitted in 503.10(A), 504.20, 514.8 Exception No. 2, and 515.8
(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(3).
(B) Support of Luminaires (Fixtures). For the support of luminaires (fixtures) or other equipment not described in 355.10(H).
(C) Physical Damage. Where subject to physical damage unless identified for such use.
(D) Ambient Temperatures. Where subject to ambient temperatures in excess of 110°C (230°F) unless listed otherwise.
(E) Insulation Temperature Limitations. For conductors or cables operating at a temperature higher than the RTRC listed operating temperature rating.
Exception: Conductors or cables rated at a temperature higher than the RTRC listed temperature rating shall be permitted to be installed in RTRC, provided they are not operated at a temperature higher than the RTRC listed temperature rating.
(F) Theaters and Similar Locations. In theaters and similar locations, except as provided in 518.4 and 520.5.
<u>(G) Ducts, Plenums, and Other Air-Handilng Spaces. RTRC shall not be used in ducts, plenums, and other air-handling spaces as covered in 300.22, unless listed as having adequate fire-resistant and low smoke-producing characteristics.</u>
<u>FPN: One method of defining that RTRC is a fire-resistant and low smoke-producing raceway is that it exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with the plenum test in UL 2024, Standard for Optical Fiber Cable Raceway.</u>
<u>(H) Riser. RTRC shall not be used in riser applications unless listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.</u>
<u>FPN: One method of defining that RTRC has fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that is pass the requirements of the test for Flame Propagation (riser) in UL 2024, Standard for Optical Fiber Cable Raceway.</u>
Substantiation: Manufactures have developed Type RTRC rigid nonmetallic conduit products that they believe are suitable for use as wiring methods i plenum and riser applications. However, general purpose Type RTRC conduit has not been evaluated for either or these uses. This proposal would prohibit Type RTRC conduit from being employed in these applications unless it has been specifically evaluated and listed for such use. Additionally, the Fine Print Notes provide suggested methodologies for evaluating the fire and smoke producing aspects of these products, which are based upon other nonmetallic raceways that have previously been listed for use in these environments.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-79.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 356 — LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT: TYPE LFNC

8-81 Log #309 NEC-P08 **Final Action: Reject**
(356.10, FPN)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
FPN: Extreme cold may cause some nonmetallic conduits to become brittle and, therefore, more susceptible to damage from ~~physical~~ contact.
Substantiation: Use of the word “physical” is superfluous– the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Let’s take care of that for good: for our purposes, “damage” means “physical damage.”
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-82 Log #2622 NEC-P08 **Final Action: Accept in Principle**
(356.10(7) (New))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
356.10 Uses Permitted.
<u>(7) For encasement in concrete when installed in compliance with 356.42.</u>
Substantiation: This proposal adds a clarification to 356.10 Uses Permitted, to make it clear that LFNC can be encased in concrete when straight fittings are used.
Panel Meeting Action: Accept in Principle
Rewrite new 356.10(7) as follows
<u>(7) For encasement in concrete where listed for direct burial and installed in compliance with 356.42</u>
Panel Statement: The text was revised to accurately reflect the listing of the product. Editorial changes for clarity. The submitter’s intent was met.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-83 Log #308 NEC-P08 **Final Action: Reject**
(356.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) Where subject to ~~physical damage~~ <u>blows or abrasion.</u>
Substantiation: Use of the word “physical” generally is superfluous– the purpose is obvious. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Here, though, the immediately following item, (2), refers to form of physical damage–deterioration by overheating. The proposed rewording is an attempt at precision. If you don’t care to reword (1), its existing form theoretically eliminates the need for (2).
Furthermore, I would then have to fall back to arguing that in that case the term “physical” should be eliminated. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-84 Log #1969 NEC-P08 **Final Action: Accept**
(356.12(5))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 356.12(5) to read as shown:
356.12(5) in <u>any</u> hazardous (classified) locations, <u>except</u> ~~other than~~ a s permitted by other Articles in this Code. ~~in 501.10(B), 502.10(A) and (B), 503.10(A), and 504.20~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for LFNC within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of LFNC, by an AHJ, because the LFNC Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-85 Log #2263 NEC-P08 **Final Action: Reject**
(356.13 (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
356.xx Liquidtight flexible nonmetallic conduit shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 111-2003, Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC), and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 356. However, safety would be improved by offering more detailed installation guidance for liquidtight flexible nonmetallic conduit.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: See my comment on 8-3.

8-86 Log #2904 NEC-P08 **Final Action: Accept**
(356.20(A)(3))

Submitter: Julian R. Burns, Quality Power Solutions, Inc./Burns Electrical Contractors
Recommendation: Delete the following text:
~~(3) For electric sign conductors in accordance with 600.32(A).~~
Substantiation: This section of the NEC is in conflict with 600.32(A) which only permits the use of minimum size of 1/2 in. LFNC. Thus this section is misleading.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-87 Log #3060 NEC-P08 **Final Action: Reject**
(356.20(A)(3))

Submitter: Randall K. Wright, RKW Consulting
Recommendation: Revise text to read as follows:
(3) For electric sign conductors 600 volts or less ~~in accordance with 600.32(A).~~
Substantiation: 356.20(A)(3) is in conflict with 600.32(A)(3). 600.32(A)(3) relates to secondary wiring over 1000 volts, using 3/8 conduit for primary wiring is still acceptable.
Panel Meeting Action: Reject
Panel Statement: See panel action and substantiation on Proposal 8-86.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-88 Log #485 NEC-P08 **Final Action: Reject**
(356.30(1))

Submitter: David Perry, IAEI
Recommendation: Revise text to read:
~~Where installed in lengths exceeding 1.8 m (6 ft), the~~ Conduit shall be securely fastened at intervals not exceeding 900 mm (3 ft) and within 300 mm (12 in.) on each side of every outlet box, junction box, cabinet, or fitting.
Substantiation: Problem: Conduit does not have to be securely fastened if less than 1.8 m (6 ft).
Substantiation: Conduit should be securely fastened over 900 mm (3 ft) and within 300 mm (12 in.) on each side of every outlet box, junction box, cabinet, or fitting regardless of lengths.
Panel Meeting Action: Reject
Panel Statement: LFNC is not required to be secured in lengths of 1.8 m (6 ft) or less. LFNC and LFNC fittings have been evaluated for securing the conduit in lengths not exceeding 1.8 m (6 ft).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
DABE, J.: To protect the conductors in the raceway even lengths of LFNC that do not exceed 6 ft, should be strapped and supported where exposed to physical contact.
LOYD, R.: This proposal should have been accepted as the proponent is correct. All raceways except this one does require support when used as a fixed wiring method which is appropriate and adds safety. 356.30 should be revised to read the same as 350.30 since these two wiring methods are used in a similar fashion.

8-89 Log #1458 NEC-P08 **Final Action: Reject**
(356.30(A))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
356.30 Securing and Supporting. Type LFNC-B shall be securely fastened and supported in accordance with one of the following:
(1) Where installed in lengths exceeding 1.8 m (6 ft), the conduit shall be securely fastened at intervals not exceeding 900 mm (3 ft) and within 300 mm (12 in.) on each side of every outlet box, junction box, cabinet, or fitting.
(2) Securing or supporting of the conduit shall not be required where it is fished, installed in lengths not exceeding 900 mm (3 ft) at terminals where flexibility is required, or installed in lengths not exceeding 1.8 m (6 ft) from a luminaire (fixture) terminal connection for tap conductors to luminaries (lighting fixtures) permitted in 410.67(C).
(3) Horizontal runs of LFNC supported by openings through framing members at intervals not exceeding 900 mm (3 ft) and securely fastened within 300 mm (12 in.) of termination points shall be permitted.
(4) Securing or supporting of LFNC-B shall not be required where installed in lengths not exceeding 1.8 m (6 ft) ~~from the last point where the raceway is securely fastened~~ for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or other equipment.
Substantiation: This proposal is intended to add correlation between the flexible raceway Articles and the cable Articles. Panel 7 accepted changes in the 2005 cycle to the cable wiring methods to clarify that the fitting connecting the cable to the box is considered to be a support. Panel 8 should consider the same allowance for its wiring methods.
For the purposes of correlation, similar proposals will be made to Articles 348, 350, and 356.
Panel Meeting Action: Reject
Panel Statement: The panel believes that the raceway must be supported independently of the box. If the raceway is pulled free, it could put undue stress on the conductors.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
DOLLINS, J.: Liquidtight Flexible Nonmetallic Conduit is required by the UL 1660 product standard to withstand a 200 pound pull for 3/8 size and a 300 pound pull for all other sizes without opening. Additionally, the UL 514B product standard for connectors used with LFNC requires that the conduit be subjected to a pull of 75 to 150 pounds, based on size, without pulling out of the connector. A 6 ft length of Liquidtight Flexible Nonmetallic Conduit within an accessible ceiling that is secured by connectors at each end at the luminaire or equipment does not require additional support to maintain the physical performance of the conduit or the connector.

ARTICLE 358 — ELECTRICAL METALLIC TUBING: TYPE EMT

8-90 Log #3463 NEC-P08 **Final Action: Reject**
(358.xx)

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Add new text to read:
358.xx EMT shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in the National Electrical Installation Standards (NEIS) NECA-101, "Standard for Installing Steel Conduit (Rigid, IMC, EMT) and other NEIS installation methods.
Substantiation: NECA 101, Standard for Installing Steel Concuit (Rigid, IMC, EMT) has been used for several years. This standard provides best practices for safe steel conduit installations and should be referenced in the conduit and EMT articles, similar to the reference that is now included in the FPN to 110.12.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: See my comment on 8-3.

8-91 Log #314 NEC-P08 **Final Action: Reject**
(358.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
"358.2 Electrical Metallic Tubing (EMT). An unthreaded thinwall raceway of circular cross section designed for the ~~physical~~ protection...".

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)

Let's take care of that for good: for our present purposes, "protection" means "physical protection".

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-92 Log #2240 NEC-P08 **Final Action: Reject**
(358.6 Exception (New))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:

344.6 Listing Requirements. RMC, factory elbows and couplings, and associated fittings shall be listed.

<u>Exception: Raceway support fittings and accessories shall not be required to be listed.</u>

Substantiation: The Article 100 definition of "fitting" seems to include raceway supports. Many of the commonly and used raceway support straps, clamps, and other items are not listed.
Panel Meeting Action: Reject
Panel Statement: The panel assumes that the submitter intended to add a new exception to 344.6 and not 358.6 per Proposal 8-93. See panel action and statement on Proposal 8-5.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-93 Log #2242 NEC-P08 **Final Action: Reject**
(358.6 Exception (New))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:

358.6 Listing Requirements. EMT, factory elbows, and associated fittings shall be listed.

<u>Exception: Raceway support fittings and accessories shall not be required to be listed.</u>

Substantiation: The Article 100 definition of "fitting" seems to include raceway supports. Many of the commonly used raceway support straps, clamps and other items are not listed.
Panel Meeting Action: Reject
Panel Statement: Tubing support accessories are not considered "fittings". Sections 300.6 and 300.6(A) require support hardware to be constructed of materials suitable for the environment for which they are to be installed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-94 Log #3460 NEC-P08 **Final Action: Reject**
(358.10, FPN)

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Revise text to read:

FPN: See 300.6 for protection against corrosion. <u>When aluminum (non-ferrous) EMT is in direct contact with the earth or is installed in concrete, supplementary corrosion protection is required. The galvanizing on steel EMT provides corrosion protection. When steel (non-ferrous) EMT is in direct contact with the earth or is installed in concrete, supplementary corrosion protection *may* be required.</u>

Substantiation: UL's *Electrical Construction Equipment Directory* states that "Galvanized steel electrical metallic tubing installed in concrete on grade or above generally requires no supplementary corrosion protection. Galvanized steel electrical metallic tubing in concrete slab below grade level may require supplementary corrosion protection.

"In general, galvanized steel electrical metallic tubing in contact with soil requires supplementary corrosion protection.

"Aluminum electrical metallic tubing used in concrete or in contact with soil requires supplementary corrosion protection."

Article 358 has not differentiated between the corrosion protection required for ferrous vs. non-ferrous EMT leading to confusion among installers/users. This new text will provide useful guidance and will be in line with the listing requirements.

Panel Meeting Action: Reject
Panel Statement: The reference to 300.6 in the fine print note gives the installer the proper location to determine corrosion protection requirements for ferrous and non-ferrous raceways. The committee also notes that "is required" is mandatory text and is not permitted in an FPN.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

LOYD, R.: The panel acted inconsistently in rejecting this proposal. This proposal was submitted as a companion to Proposal 8-15 which was accepted and since both contain information that is accurate and provides information beneficial to the user both should have been accepted.

If this proposal is accepted editorial strike "non" in the 3rd sentence "when steel (~~non-~~ ferrous)" since steel is a ferrous material.

8-95 Log #3084 NEC-P08 **Final Action: Reject**
(358.10(B))

Submitter: Joseph A. Hertel, Safety and Buildings
Recommendation: Delete paragraph (B) Corrosion Protection.
Substantiation: Most jurisdictions delete this paragraph because EMT has been shown to fail in underground environments. An example of language that may be added to restrict the installation would be:

Electrical metallic tubing shall not be used in direct contact with earth, in concrete slabs or floors poured on earth, or in exterior concrete walls below grade.

Panel Meeting Action: Reject
Panel Statement: EMT is suitable for underground installations where corrosion protection is provided in accordance with 358.10(B).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-96 Log #1687 NEC-P08 **Final Action: Reject**
(358.10(D))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: This is a companion proposal to ones for 314.23(E) Exception and (F) Exception, 342.10(D), and 344.10(E).

Add text to read as follows:

<u>358.10(D) Support of Conduit Bodies. Electrical metallic tubing shall be permitted to support metallic and non-metallic conduit bodies not larger than the largest trade size of an entering raceway, including a conduit body constructed with only one conduit entry. These conduit bodies shall not support luminaries (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).</u>

Substantiation: The exceptions to 314.23(E) and (F) have been a source of confusion for years. 314.23(E) and (F) refer to enclosures while the exception refers to conduit bodies. The proper place for this type of information is in the article for each type of raceway as currently found in 352.10(H).
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-6.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-97 Log #313 NEC-P08 **Final Action: Reject**
(358.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

(1) Where, during installation or afterward, it will be subject to severe ~~physical damage~~ <u>blows or abrasion.</u>

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering this unnecessary.

The proposed rewording is an attempt at precision. Furthermore, if you retain "damage," I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent

opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-98 Log #946 NEC-P08 **Final Action: Reject**
(358.12(1))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "severe."
Substantiation: Edit. "Severe" is subjective and argumentative. Similar sections do not use the word "severe".
Panel Meeting Action: Reject
Panel Statement: The current text reflects the panel's understanding of the proper use of EMT. The determination between physical damage and severe physical damage remains with the authority having jurisdiction.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-99 Log #1036 NEC-P08 **Final Action: Reject**
(358.12(1))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "severe".
Substantiation: Edit. "Severe" is subjective and argumentative. Other similar sections do not use the word severe.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-98.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-100 Log #3461 NEC-P08 **Final Action: Reject**
(358.12(1))

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Revise text to read:
(1) Where, during installation or afterward, <u>steel EMT</u> will be subject to severe physical damage. <u>Aluminum EMT shall not be used where subject to physical damage.</u>
Substantiation: The mechanical properties of steel and aluminum EMT are very different. This has never been recognized by the NEC but has direct bearing on the suitability of the product for certain applications. The modulus of elasticity of aluminum is 1/3 that of steel, for example, which means that it would deflect 1/3 more under the same load. The typical mechanical properties are shown below (Aluminum EMT is typically produced from a higher strength alloy and different designation from aluminum rigid but is still substantially less impervious to damage than steel EMT. The values shown below reflect the typical properties of a 6005 aluminum alloy of Temper Designation 5. Steel values reflect the typical mechanical properties of mild steel.)

Ultimate Tensile Strength: Aluminum: 38,000psi Steel: 48,000psi
Yield strength: Aluminum: 31,000psi Steel: 45,000psi
Modulus of
Elasticity: Aluminum: 10,000,000 lb/in 2 (psi) Steel: 30,000,000 lb/in 2 (psi)

Panel Meeting Action: Reject
Panel Statement: As a general rule, aluminum EMT is capable of being exposed to physical damage, but not severe physical damage.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
LOYD, R.: This proposal should have been accepted. There is substantial technical substantiation provided. Field testing reports are not necessary since the data provided shows that in physical damage tests aluminum would flatten and fail at much lower values than steel.

8-101 Log #642 NEC-P08 **Final Action: Accept**
(358.12(4))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 358.12(4) to read as shown:
358.12(4) In any hazardous (classified) location except as permitted by <u>other Articles in this Code.</u> ~~502.10, 503.10, and 504.20.~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for EMT within the hazardous (Classified) locations Articles in the Code are broader. There are installations such as wiring intrinsically safe apparatus, nonincendive field wring, and in specific hazardous (classified) locations where EMT is permitted. The current text may limit the use of EMT, by an AHJ, because the EMT Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-102 Log #2264 NEC-P08 **Final Action: Reject**
(358.13)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
358.xx Electrical metallic tubing shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 101-2006, Standard for Installing Steel Conduits (Rigid, IMC, EMT), and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 358. However, safety would be improved by offering more detailed installation guidance for steel intermediate metal conduit.
ANSI/NECA 101-2006 is currently under development. It will be published prior to the Public Comment deadline.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: See my comment on 8-3.

8-103 Log #3462 NEC-P08 **Final Action: Reject**
(358.30(A) and 358.30(B))

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Revise text to read:
(A) Securely Fastened. <u>Steel</u> EMT shall be securely fastened in place at least every 3 m (10 ft). <u>Aluminum EMT shall be securely fastened in place at least every 1.5 m (5 ft)</u> . In addition, each EMT run between termination points shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing termination.
(B) Supports. Horizontal runs of <u>steel</u> EMT supported by openings than 3 m (10 ft) and securely fastened within 900 mm (3 ft) termination points shall be permitted. <u>Aluminum EMT shall be supported at intervals not greater than 1.5 m (5 ft).</u>
Substantiation: The mechanical properties of steel and aluminum EMT are very different. This has never been recognized by the NEC but has direct bearing on the suitability of the product for certain applications. The modulus of elasticity of aluminum is 1/3 that of steel, for example, which means that it would deflect 1/3 more under the same load. The typical mechanical properties are shown below (Aluminum EMT is typically produced from a higher strength alloy and different designation from aluminum rigid but is still substantially less impervious to damage than steel EMT. The values shown below reflect the typical properties of a 6005 aluminum alloy of Temper Designation 5. Steel values reflect the typical mechanical properties of mild steel.)

Ultimate Tensile Strength: Aluminum: 38,000psi Steel: 48,000psi
Yield strength: Aluminum: 31,000psi Steel: 45,000psi
Modulus of
Elasticity: Aluminum: 10,000,000 lb/in 2 (psi) Steel: 30,000,000 lb/in 2 (psi)

Panel Meeting Action: Reject
Panel Statement: The submitter has supplied us with technical data, but not the information, testing, or field reports necessary to determine if shorter support lengths are required for aluminum.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
LOYD, R.: This proposal should have been accepted. There is substantial technical substantiation provided. Field testing reports are not necessary since the data provided shows that in tests aluminum EMT would sag at lengths much shorter than galvanized steel EMT especially the smaller sizes.

8-104 Log #1349 NEC-P08 **Final Action: Accept**
(358.30(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add the following text to 358.30
(C) Unsupported raceways: Type EMT shall be permitted to be unsupported where the raceway is not more than 900 mm (3 ft) in length and remains in unbroken lengths (without coupling). Such raceway shall terminate in an outlet box, junction box, device box, cabinet, or other termination at each end of the raceway.
Substantiation: Unsupported raceways are violations of the *Code* that occur everyday. As written, a 3 inch length of conduit between enclosures is required to be supported, despite the fact that it adds little if any structural value to the system. Quite often, particularly with conduit nipples, securing and supporting a raceway shorter than 36 inches is not possible. Furthermore, securing and supporting is of little value on lengths less than 36 inches where the conduit terminates at a box on each end, where the box is installed and supported in compliance with its applicable *Code* section.
This proposal is written with the parallel effect of *Code* sections that have been strived for in chapter 3, and matches the numbering system used in the Cable Articles. It also uses existing text taken from both the Cable Articles and the Raceway Articles.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
DABE, J.: See my comment for 8-9.
HUMPHREY, D.: This proposal does not address other issues that may have a direct impact on the durability of the electrical installation. The affects of weight and vibration on concentric and eccentric knockouts at each end of a three foot run between pieces of equipment, a scenario that would be frequently in many electrical installations, may compromise the strength of the installation. The raceway having even a single point of support would help to mitigate these deleterious affects. In addition, the EMT installation in question may be used as an equipment grounding conductor and any loosening that could occur would serve to compromise the equipment grounding function of the raceway. 300.11 further requires that raceways be securely fastened in place. I would assert that this proposal would conflict with the requirements of 300.11. In summation, depending on connectors, double locknuts etc. to support and secure this up to 36 in. installation especially where concentric or eccentric knockouts are encountered is dubious at best. 36 in. should provide ample space in which to install normal supporting and securing hardware. A proposal involving a shorter distance and where no concentric or eccentric knockouts are encountered may be in order.

8-105 Log #2781 NEC-P08 **Final Action: Reject**
(358.44 (New))

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.
Recommendation: Add new text to read:
358.44 Expansion Fittings. Expansion fittings shall be installed where expected length change, due to expansion and contraction due to temperature change and designed building movement is more than 12 mm (5 in.)
Substantiation: Large structures are often times designed with expansion joints to all for building movement and temperature change expansion and contraction. EMT installed across these expansion joints is subject to movement which will lead to loosened connections at couplings and connectors. The loosened connections will decrease the effectiveness of the ground fault return path and ultimately affect the safety of the electrical installation.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-24.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 360 — FLEXIBLE METALLIC TUBING: TYPE FMT

8-106 Log #312 NEC-P08 **Final Action: Reject**
(360.12(5))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(5) Where subject to ~~physical damage~~ blows or abrasion.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering this unnecessary.
The proposed rewording is an attempt at precision. Furthermore, if you retain "damage," I would then have to fall back to arguing that in that case the term "physical" should be eliminated, and in fact (1), (2) and (4) probably are unnecessary as they are there to prevent forms of physical damage.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-107 Log #505 NEC-P08 **Final Action: Accept**
(360.20(A) Exception No. 2)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
360.20 Size
(A) Minimum FMT smaller than metric designator 16 (trade size 1/2) shall not be used.
Exception No. 1: FMT of metric designator 12 (trade size 3/8) shall be permitted to be installed in accordance with 300.22(B) and (C).
Exception No. 2: FMT of metric designator 12 (trade size 3/8) shall be permitted in lengths not in excess of 1.8 m (6 ft) as part of an ~~approved~~ listed assembly or for luminaires (lighting fixtures). See 410.67(C).
Substantiation: Approved is defined as "acceptable to the authority having jurisdiction." It appears as though the assembly that is referred to in this exception should be a listed assembly. It is recognized that the AHJ can base the approval of this assembly if it is listed or not. Manufacturers currently produce these as listed assemblies. This proposal is an effort to enhance consistency with the use of approved, listed, and identified throughout the NEC just as was done in the 2002 cycle in many of the hazardous (classified) locations articles in Chapter 5.
Panel Meeting Action: Accept
Make the changes in the proposal and change the word "an" to "a" in the proposal.
Panel Statement: Minor editorial change; the word "an" was changed to "a" in the proposed text.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 362 — ELECTRICAL NONMETALLIC TUBING: TYPE EMT

8-108 Log #1537 NEC-P08 **Final Action: Accept**
(362, 366, 368, 384 and 392)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 362, 366, 368, 384, and 392 as described in the following, relative to the terms bonding and grounding.
362.60 Revise 362.60 as follows:
Grounding. Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the raceway in compliance with Article 250 Part VI .
366.60 Revise 366.60 as follows:
Grounding. Metal auxiliary gutters shall be connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142 ~~grounded~~ .
368.60 Revise 368.60 as follows:
Grounding. Busway shall be connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142 ~~grounded~~ .
384.16 In 384.16, change "250.118(14)" to "250.118(13)".
392.7 Revise 392.7 as follows:
Grounding.
(A) Metallic Cable Trays. Metallic cable trays that support electrical conductors shall be connected to a grounded ~~as required for conductor~~ enclosure (s) in accordance with 250.96 and Part IV of Article 250 .
(B) Steel or Aluminum Cable Tray Systems. Steel or aluminum cable tray systems shall be permitted to be used as equipment grounding conductors, provided ~~that~~ all the following requirements are met:

(1) The cable tray sections and fittings <u>are</u> ~~shall be~~ identified <u>as an equipment</u> ~~for~~ grounding <u>conductor</u> ~~purposes~~ .

(2) The minimum cross-sectional area of cable trays ~~shall~~ conform to the requirements in Table 392.7(B).

(3) All cable tray sections and fittings <u>are</u> ~~shall be~~ legibly and durably marked to show the cross-sectional area of metal in channel cable trays, or cable trays of one-piece construction, and the total cross-sectional area of both side rails for ladder or trough cable trays.

(4) Cable tray sections, fittings, and connected raceways <u>are</u> ~~shall be~~ bonded in accordance with 250.96 using bolted mechanical connectors or bonding jumpers sized and installed in accordance with 250.102.

Substantiation: 362.60: The proposed changes are intended to make the requirements more prescriptive in nature by making a reference to where the requirements are found in Article 250.

366.60: The proposed changes are intended to make the requirements more prescriptive in nature and to include a reference to where the requirements are found in Article 250.

368.60: The proposed changes are intended to make the requirements more prescriptive in nature by making a reference to where the requirements are found in Article 250.

384.16: To correct the reference.

392.7: Changes are proposed to correct the terms to the definitions proposed for Article 100 and to the terms defined in 250.2. The proposed changes also are intended to make the requirements more prescriptive in nature.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms “bonded”, “grounded”, and “equipment grounding conductor” in Article 100 relative to this Task Group’s recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Panel Statement: The panel examined not only the TCC Task Group actions and TCC recommendation, but also the technical merits and voted to accept the proposal.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

DABE, J.: Based on the concerns of Michael Callanan, regarding whether this proposal is based on a true consensus, the panel, at this time, should reconsider their action and reject this proposal.

8-109 Log #334 NEC-P08 **Final Action: Reject**
(362.10, FPN)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

FPN: Extreme cold may cause some types of nonmetallic conduits to become brittle and, therefore, more susceptible to damage from ~~physical~~ contact.

Substantiation: Use of the word “physical” is superfluous– the purpose is obvious. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.) Let’s take care of that for good: for our purposes, “contact” means “physical contact.”

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-110 Log #635 NEC-P08 **Final Action: Reject**
(362.10(2))

Submitter: Tom Lang, Prescott, WI

Recommendation: 362.10(2) Delete exception to (2) in its entirety.

(2) In any building exceeding three floors above grade, ENT shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute-finish-rating as identified in listings of fire rated assemblies. The 15-minuite finish-rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings.

~~Exception to (2): Where a fire sprinkler system(s) is installed in accordance with NFPA 13, 2002, Standard for the Installation of Sprinkler Systems, on all floors, ENT shall be permitted to be used within walls, floors, and ceilings, exposed or concealed, in buildings exceeding three floors above grade.~~

Substantiation: Pertaining to style manual. Cannot reference an entire standard “NFPA 13-2002, Standard for the Installation of Sprinklers”.

Panel Meeting Action: Reject

Panel Statement: The reference to NFPA 13 was addressed in previous cycles and was brought before the NFPA Standards Council (SC#01-64(t) July 13, 2001) and was upheld. No new substantiation is provided.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-111 Log #636 NEC-P08 **Final Action: Reject**
(362.10(5))

Submitter: Tom Lang, Prescott, WI

Recommendation: 362.10(5) Delete exception to (5) in its entirety.

(5) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in 362.10(1)(a).

~~Exception to (5): ENT shall be permitted to be used above suspended ceilings in buildings exceeding three floors above grade where the building is protected throughout by a fire sprinkler system installed in accordance with NFPA 13 2002, Standard for the Installation of Sprinkler Systems.~~

Substantiation: Pertaining to style manual. Cannot reference an entire standard “NFPA 13-2002, Standard for the Installation of Sprinklers”.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-110.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-112 Log #2823 NEC-P08 **Final Action: Reject**
(362.12 X.)

Submitter: Lanny G. McMahill, Phoenix, AZ

Recommendation: Add new item number X:

<u>X. Where flexibility is required unless identified or such use.</u>

Substantiation: Generally, ENT is intended as a fixed wiring method. However, at least one ENT manufacturer promotes their product for use and application where flexibility is required. In addition, the listing and labeling laboratory for the ENT allows the use of the word “flex” in the manufacturer’s literature. Therefore, if the product is identified as acceptable for use as a flexible wiring method, it should be recognized as such in the NEC.

Panel Meeting Action: Reject

Panel Statement: Flexibility may be required during the installation. This is an acceptable feature of ENT. Flexible raceways shall be used where flexibility is required for operation or maintenance.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

WALBRECHT, G.: We agree with the action taken by CMP-8 on comment 8-112, but disagree with the panel statement. Electrical Nonmetallic Tubing (ENT) is capable of being bent without the use of tools during installation. However, reference to the term flexibility in the panel statement can be misleading when used to describe ENT. This product is not intended for use where flexibility is required.

8-113 Log #1963 NEC-P08 **Final Action: Accept**
(362.12(1))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Change the text of 362.12(1) to read as shown:

362.12(1) in <u>any</u> hazardous (classified) locations, except as permitted by <u>other Articles in this Code</u> . ~~504.20 and 505.15(A)(1)~~

Substantiation: This change is necessary because the current text is too limiting. The areas of usage for ENT within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of ENT, by an AHJ, because the ENT Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-114 Log #2265 NEC-P08 **Final Action: Reject**
(362.13 (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:

362.xx Electrical nonmetallic tubing shall be installed in a neat and workmanlike manner.

FPN: Accepted industry practices are described in ANSI/NECA 111-2003, Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC), and other ANSI-approved installation standards.

Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 362. However, safety would be improved by offering more detailed installation guidance for electrical nonmetallic tubing.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

LOYD, R.: See my comment on 8-3.

8-115 Log #3039 NEC-P08 **Final Action: Reject**
(362.13)

Submitter: Melvin K. Sanders, TECo Inc.
Recommendation: Insert as New Section 362.13 the following text.

362.13 Protection Against Physical Damage

Where subject to physical damage, wiring methods shall be protected by either, or all, in the following manner.

(A) Cables and Raceways Through Wood Members.

(1) Bored Holes. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed through bored holes in joists, rafters, or wood members, holes shall be bored so that the edge of the hole is not less than 32 mm (1 1/ 4 in.) from the nearest edge of the wood member. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate or bushing, at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width installed to cover the area of the wiring.

Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.

Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.

(2) Notches in Wood. Where there is no objection because of weakening the building structure, in both exposed and concealed locations, cables or raceways shall be permitted to be laid in notches in wood studs, joists, rafters, or other wood members where the cable or raceway at those points is protected against nails or screws by a steel plate at least 1.6 mm (1/ 16 in.) thick, and of appropriate length and width, installed to cover the area of the wiring. The steel plate shall be installed before the building finish is applied.

Exception No. 1: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.

Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.

(B) Nonmetallic-Sheathed Cables and Electrical Nonmetallic Tubing Through Metal Framing Members.

(1) Nonmetallic-Sheathed Cable . In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings or listed grommets covering all metal edges that are securely fastened in the opening prior to installation of the cable.

(2) Nonmetallic-Sheathed Cable and Electrical Nonmetallic Tubing. Where nails or screws are likely to penetrate nonmetallic-sheathed cable or electrical nonmetallic tubing, a steel sleeve, steel plate, or steel clip not less than 1.6 mm (1/ 16 in.) in thickness shall be used to protect the cable or tubing.

Exception: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.

(C) Cables and Raceways Parallel to Framing Members and Furring Strips. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed parallel to framing members, such as joists, rafters, or studs, or is installed parallel to furring strips, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (1-1/ 4 in.) from the nearest edge of the framing member or furring strips where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1.6 mm (1/ 16 in.) thick.

Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.

Exception No. 2: For concealed work in finished buildings, or finished panels for prefabricated buildings where such supporting is impracticable, it shall be permissible to fish the cables between access points.

Exception No. 3: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.

(D) Cables and Raceways Installed in Shallow Grooves. Cable- or raceway-type wiring methods installed in a groove, to be covered by wallboard, siding, paneling, carpeting, or similar finish, shall be protected by 1.6 mm (1/ 16 in.) thick steel plate, sleeve, or equivalent or by not less than 32-mm (1-1/ 4-in.) free space for the full length of the groove in which the cable or raceway is installed.

Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.

Exception No. 2: A listed and marked steel plate less than 1.6 mm (1/ 16 in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.

Substantiation: The wiring methods typically installed in wooded frame structures are Article 320 (Type AC), Article 330 (Type MC), Article 334 (Types NM, NMC, and NMS), and Article 362 (ENC). Insofar as Article 340 (Type UF) is installed in lieu of Article 334 wiring methods, its installation must meet the requirements of Article 334 Parts II and III, and also subject to the same installation restrictions.

Since the 1975 Edition of the NEC, there has been a requirement in Section 300.4 that steel plates or bushings be installed to provide protection of certain wiring method against damage from ordinary nails or screw-nails when they pass through wooden members or laid in notches or grooves and the distance from the nail direction could not be the required 1-1/4 inch (32 mm).

This restriction placed in Article 300 has prevented those CMP's most knowledgeable in application of these products from using any other protection schemes or technology for this purpose. During the 2005 ROP/ROC stage, fact-finding reports were presented to CMP 3 highlighting the steel plates called for provide little or no protection against nails or screw-nails larger than #8 or equivalent trade designation. Since Section 300.4 first paragraph was changed in 2005 ROP to emphasize conductors are to be protected against physical damage, it is obvious that such protection is to be provided by the wiring method in which they are contained, as spelled out in Section 300.3(A). Because the Scopes of Section 320.1, 330.1, 334.1, 340.1 and 362.1 state they govern the installation of those wiring methods which, by Section 300.3(A), contain the conductors that are to be protected, as stated in Section 300.4 first paragraph.

Sections 320.12(1), 330.12(1), 340(10), and 362.12(10) state those wiring methods are not to be exposed to physical damage, therefore the contained conductors are inherently protected against damage which meets the intent of Section 300.4 first paragraph, and Section 300.3(A) is satisfied.

This would allow Article 300 to set the general guidelines and allow CMP 7 and CMP 8 to set rules deemed necessary to protect appropriate wiring methods.

Separate proposals are being made to CMP 3 and CMP 8 to address the text to be deleted from Article 300. Coordination between all affected CMP's will be essential in order for this to be accomplished in one ROP/ROC cycle.

Panel Meeting Action: Reject

Panel Statement: The requirements for physical protection of conductors for different cables or raceways are adequately covered in Section 300.4.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-116 Log #332 NEC-P08 **Final Action: Reject**
(362.19)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

Where subject to ~~physical damage~~ blows or abrasion.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Here, though, the immediately preceeding item, (9), refers to a form of physical damage–deterioration by ultraviolet radiation. The proposed rewording is an attempt at precision. If you don't care to reword (10), theoretically its present form eliminates the need for (9) and probably (3) and (5) as well.

Furthermore, I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent

opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-117 Log #837 NEC-P08 **Final Action: Accept in Principle**
(362.30(A))

Submitter: Stephen W. Drayton, Eastern Idaho Electrical JATC
Recommendation: Add the following sentence to the end of 362.30(A):
Securing or supporting of ENT shall not be required where it is fished.
Substantiation: If it is the intent of the NEC to allow ENT to be fished in existing walls or ceilings, it should be mentioned. i.e., See 356.30(2), or 348.30(A) Exception no. 1.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 8-119.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-118 Log #1156 NEC-P08 **Final Action: Accept in Principle**
(362.30(A) Exception No. 3 (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
Exception No. 3: Fastening shall not be required where an unbroken length of ENT is fished between access points in finished buildings or structures and fastening is impractical.
Substantiation: Provision should be made for ENT where fished, as it is for other wiring methods.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 8-119.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-119 Log #2623 NEC-P08 **Final Action: Accept**
(362.30(A) Exception No. 3 (New))

Submitter: David H. Kendall, Carlon
Recommendation: Revise as follows:
362.30 Securing and Supporting.
ENT shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 362.30(A) and (B).
(A) Securely Fastened ENT shall be securely fastened at intervals not exceeding 900 mm (3 ft). In addition, ENT shall be securely fastened in place within 900 mm (3 ft) of each outlet box, device box, junction box, cabinet, or fitting where it terminates.
Exception No.1: Lengths not exceeding a distance of 1.8 m (6 ft) from a luminaire (fixture) terminal connection for tap connections to lighting luminaires (fixtures) shall be permitted without being secured.
Exception No. 2: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or other equipment.
<u>Exception No. 3: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of ENT shall be permitted to be fished.</u>
Substantiation: Fishing ENT into finished walls in existing buildings is a common practice for the protection of conductors and communication cabling. ENT's flexibility allows it to be easily fished between access points. 300.4(D) Exception 2 permits an inferior wiring method to be fished between access points. The proposed language is identical that is found for EMT in 358.30 with the exception of the reference to ENT.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-120 Log #434 NEC-P08 **Final Action: Reject**
(362.30(B))

Submitter: Michael Lenon, Lenon Electric
Recommendation: Revise text to read as follows:
(B) Supports. Horizontal runs of ENT supported by openings in framing members at intervals not exceeding 900 mm ~~3 ft~~ <u>2 ft</u> and securely fastened within 900 mm ~~(3 ft)~~ <u>2 ft</u> of termination points shall be permitted.
Substantiation: ENT is not strong enough to hang in 3 ft spans as it will sag making the workmanship look bad.
Panel Meeting Action: Reject
Panel Statement: There is a lack of technical substantiation to support the statement that ENT is not strong enough to be supported every three feet. The Code gives a maximum distance for supporting ENT. Reducing the spacing for the appearance of "workmanship" is always acceptable.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-121 Log #1233 NEC-P08 **Final Action: Reject**
(362.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:
Where equipment grounding is ~~required~~ provided, a separate equipment grounding conductor shall be installed in the raceway.
Substantiation: Where grounding is done by choice, and not required, the rule should apply. 250.1 indicates Article 250 covers installations where grounding is "permitted".
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are addressed in Section 300.3(B) for equipment grounding conductors that are provided, but not required.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 366 — AUXILIARY GUTTERS

8-122 Log #2569 NEC-P08 **Final Action: Reject**
(366)

Submitter: Larry Rogers, Vattertott College-Tulsa / Rep. Vattertott Colleges, NFPR and IAEI Member
Recommendation: Add new text as follows:
Enclosure fronts or faces; All unfinished edges, internally and externally of enclosure faces shall be rounded or de-burred to a smooth finish.
Substantiation: I am using enclosures in a generic form to include panel boards, auxiliary gutters, surface metal raceways, and large junction boxes above 4 11/16. Sharp corners/edges on enclosures have caused thousands of injuries to workmen and also thousands of hours of lost time man hours. Also, damage to the integrity of conductor insulation during installation or inspection is a problem with results of sometimes immediate arc flash or they are found later with a bare hand, which could lead to a fatal shock or serious cut due to jerk reaction. We ask this panel to consider having the manufacturer remove these sharp edges prior to shipment, thus attacking the problem from the start. Sharp edges stay sharp for years.
Panel Meeting Action: Reject
Panel Statement: 366.100(C) already provides protection for the conductors. Article 366 covers only Auxiliary Gutters and not the other referenced items in the submitter's substantiation. Protection of personnel from these types of hazards is covered in Section 110.3(A)(1) through (8) as well as in other documents.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-123 Log #285 NEC-P08 **Final Action: Reject**
(366.1(B)(1), FPN)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
FPN: Extreme cold may cause some nonmetallic auxiliary gutters to become brittle and, therefore, more susceptible to damage from ~~physical~~ contact.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "contact" means "physical contact."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-124 Log #3403 NEC-P08 **Final Action: Accept**
(366.2)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:

366.2 Definitions

Metallic Auxiliary Gutter. A sheet metal enclosure used to supplement wiring spaces at meter centers, distribution centers, switchboards, and similar points of wiring systems. The enclosure has hinged or removable covers for housing and protecting electric wires, cable and busbars. The enclosure is designed for conductors to be laid or set in place after the enclosures have been installed as a complete system.

Nonmetallic Auxiliary Gutter. A flame retardant, nonmetallic enclosure used to supplement wiring spaces at meter centers, distribution centers, switchboards, and similar points of wiring systems. The enclosure has hinged or removable covers for housing and protecting electric wires, cable and busbars. The enclosure is designed for conductors to be laid or set in place after the enclosures have been installed as a complete system.

Delete the parent text of 366.10, leaving only the title (“Uses Permitted”).

Substantiation: The present NEC text complicates one of the most difficult tasks for NEC trainers within the scope of CMP 8, namely, explaining the difference between auxiliary gutters and wireways. This is especially true given that the equipment used is always listed for both functions, and only the applicable field usage divides the two articles. Since the usage defines the article application, it is essential that the definitions at the beginning of the article focus on on this point.

This proposal includes the usage information now appearing in 366.10 in the definitions for this reason. This proposal also carefully excludes from the definitions any use of the word “wireway” which really confuses one from the other. This proposal does not change any code rules, but presents the information in a far more understandable format. The syntax has also been changed so it works purely as two definitions.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-125 Log #3611 NEC-P08 **Final Action: Accept in Principle**
(366.2)

Submitter: Noel Williams, Herriman, UT
Recommendation: In the definitions of Metallic and Nonmetallic Auxiliary Gutters (two places) replace the term “wireway” with the term “auxiliary gutter.”
Substantiation: The problem should be obvious. The assembly is either a wireway or an auxiliary gutter. Wireways are separately defined in Articles 376 and 378. This implies that an auxiliary gutter is a wireway used in a different way. In fact both may be the same thing, but they are listed as one or the other.
Panel Meeting Action: Accept in Principle
Panel Statement: The submitter’s intent was met. See panel action and statement on Proposal 8-124.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-126 Log #420b NEC-P08 **Final Action: Reject**
(366.23)

Submitter: John Brouzakis, John’s Electric
Recommendation: Discontinue use of all aluminum and copper clad wire in homes, business, and industry. Discontinue using aluminum bus bars in breaker panels and MCC panels. Aluminum and copper clad wire and bus bars are still being used in homes, business and industry.
Substantiation: I’ve seen aluminum or copper clad wire connections to 240 volt a.c. circuits such as on ranges, dryers and other circuits become loose or corroded and start arcing and burn the wire.

Some breaker panels in basements with aluminum bus bars corrode and start arcing where the breaker plugs into the bus bar. On one job, I had to remove all the breakers, clean the bus bar and replace some of the breakers.

These are just a couple of problems that I experienced with people using AL or copper clad wire and panels with AL bus bars. These situations could have turned into electrical fires with loss of life and property. I believe only copper wire and bus bars should be used in homes, buildings and industry.

When I see AL or copper clad wiring inside a home, I tell the owner it should be replaced with copper. I would appreciate it if you discontinue the usage of aluminum and copper clad wire inside homes, business and industry in your next code.
Panel Meeting Action: Reject
Panel Statement: Panel 8 is not the appropriate panel for this proposal. Article 366 is for Auxiliary Gutters only. Additionally, a specific change is not outlined in the proposal.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-127 Log #2243 NEC-P08 **Final Action: Accept**
(366.23(A))

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:

366.23 Ampacity of Conductors.

(A) Sheet Metal Auxiliary Gutters. Where the number of current-carrying conductors contained in the sheet metal auxiliary gutter is 30 or less, the ~~correction~~ adjustment factors specified in 310.15(B)(2)(a) shall not apply. The current carried continuously in bare copper bars in sheet metal auxiliary gutters shall not exceed 1.55 amperes/mm 2 (1000 amperes in. 2) of cross section of the conductor. For aluminum bars, the current carried continuously shall not exceed 1.09 amperes/ mm 2 (700 amperes/in. 2) of cross section of the conductor.
Substantiation: The term “adjustment factors” is used for adjusting the conductor ampacity for more than three conductors in a raceway or cable. The term “correction factor” is used to correct the conductor ampacity for ambient temperature. 310.15(B)(2)(a) is titled “adjustment factors”, not “correction factors”.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-128 Log #3529 NEC-P08 **Final Action: Reject**
(366.23(A))

Submitter: Timothy McCord, Washington, PA
Recommendation: Revise as follows:

Where the number of current-carrying conductors contained in the sheet metal auxiliary gutter is 30 or less, the correction factors specified in 310.15(B)(2)(a) shall not apply.
The current carried continuously in bare copper bars in sheet metal auxiliary gutters shall not exceed 1.55 amperes ~~/~~ per mm 2 (1000 amperes ~~/~~ per in. 2) of cross section of the conductor. For aluminum bars, the current carried continuously shall not exceed 1.09 amperes ~~/~~ per mm 2 (700 amperes ~~/~~ per in. 2) of cross section of the conductor.
Substantiation: The / symbol used for per is also used in mathematical equations as a division symbol. This change will eliminate any confusion.
Panel Meeting Action: Reject
Panel Statement: The panel believes the existing material is clear.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 368 — BUSWAYS

8-129 Log #455 NEC-P08 **Final Action: Reject**
(368.6 (New))

Submitter: W. Creighton Schwan, Hayward, CA
Recommendation: Add new text to read as follows:

368.6 Listing Requirements. Busways and associated fittings shall be listed.

Substantiation: The AHJ does not have the means to determine the safety of the design and manufacture of busways, particularly with regard to voltage and current ratings, heat rise, enclosure fault current path, support spacings, indoor or outdoor suitability. 230.42(A) refers to LISTED busways for allowable current for services.
Panel Meeting Action: Reject
Panel Statement: Per the 2000 ROC, the panel reaffirms its position that it is not the intent of the panel to require the listing of busways, and the submitter hasn’t provided sufficient substantiation for a listing requirement.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:

DABE, J.: The submitter is correct in stating that the AHJ does not have the means to determine the safety of the design and manufacture of busways. The panel should consider the fact that many panels including this one have required listing for far less hazardous and complex items.

WALBRECHT, G.: The submitter’s substantiation is correct. The Authority Having Jurisdiction will not have the means available to determine the safety of the design, manufacture, and installation of a busway. Busways and their associated fittings, as with any wiring method, should be evaluated and listed by nationally recognized third party certification organization. Field fabrication and modification of factory-produced components can also be hazardous and should be properly examined and evaluated by a nationally recognized testing organization.

8-130 Log #289 NEC-P08 **Final Action: Reject**
(368.10)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
"... to provide adequate protection from ~~physical damage~~ blows or abrasion."
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
The proposed rewording is an attempt at precision. Furthermore, if you reject the full rewording I would then have to fall back to arguing that in that case the term "physical" should be eliminated.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-131 Log #3404 NEC-P08 **Final Action: Reject**
(368.10)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Re-title 368.10(A) and 368.10(B) from "Exposed" and "Concealed" to "In View" and "Out of View."
Substantiation: These terms are not used in accordance with Article 100 definitions. "Exposed" includes behind hung ceiling access panels, and "Concealed" essentially means not closed in by structure. This comment provides correct terminology that does not conflict with the applicable provisions. The actual requirements that follow these titles are correct, but when we train journeymen that the area above hung ceilings is still "exposed" (because Article 100 says so), it doesn't help to have erroneous bold print with an opposite meaning.
Panel Meeting Action: Reject
Panel Statement: The terms "Exposed" and "Concealed "more closely represent the terminology used within this article. The terms "In View" and "Out of View "are not used in the NEC and would not add significant clarity. The panel does not believe there is existing confusion.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-131a Log #677 NEC-P08 **Final Action: Reject**
(368.10(A))

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
368.10 (A) ~~Exposed.~~ In Open.
Substantiation: The definition in article 100 of "Exposed (as applied to wiring methods). On or attached to the surface or behind panels designed to allow access" conflicts with the word exposed as used in 368.10. "368.10 (A) Exposed. Busways shall be permitted to be located in the open where visible, except as permitted i n 368.10(C). "
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 8-131. The term "Exposed "more closely represent the terminology used within this article. The term "In Open" is not used in this context in the NEC and would not add significant clarity.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-132 Log #690 NEC-P08 **Final Action: Reject**
(368.10(A) (New))

Submitter: Steve McNamara, Hastings, MN
Recommendation: Add new text to read:
368.10(A) Busways located in the open shall have a minimum of 12 in. working space on one side for maintenance and inspection.
Substantiation: This would provide a very minimal requirement to provide a small amount of working and inspection space on one side of busways. Currently, with no test on what is required, some think the working space in 110.26 is the minimum required while others think no space is needed for inspection or working.
Panel Meeting Action: Reject
Panel Statement: 110.26 already requires sufficient access and working space about all electrical equipment. And if the equipment is to be worked on while energized, the clearance requirements of Table 110.26(A)(1) or Table 110.34(A) are required. The 12 inches in many cases would be too restrictive. Working space is only required around busway joints between sections and fittings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-133 Log #1046 NEC-P08 **Final Action: Reject**
(368.12(1))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete the word "severe".
Substantiation: Edit. "Severe" is subjective and argumentative. Other similar sections do not use the word "severe".
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-98.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-134 Log #914 NEC-P08 **Final Action: Reject**
(368.12(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "severe".
Substantiation: Edit. "Severe" is subjective and argumentative. Other similar sections do not use the word severe.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-98.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-135 Log #2266 NEC-P08 **Final Action: Reject**
(368.13 (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
368.xx Busways shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 408-2002, Recommended Practice for Installing and Maintaining Busways, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 368. However, safety would be improved by offering more detailed installation guidance for busways.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-3 (Log 3454).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: See my comment on 8-3.

8-136 Log #1923 NEC-P08 **Final Action: Reject**
(368.56(A))

Submitter: William Wagner, Certification Solutions
Recommendation: Revise 368.56(A) as follows:
368.56(A) General. Branches from busways shall be permitted to use any of the following wiring methods:
(1) Type AC armored cable
(2) Type MC metal-clad cable
(3) Type MI mineral-insulated, metal-sheathed cable
(4) Type IMC intermediate metal conduit
(5) Type RMC rigid metal conduit
(6) Type FMC flexible metal conduit
(7) type LFMC liquidtight flexible metal conduit
(8) Type PVC ~~RNC~~ rigid-nonmetallic polyvinylchloride conduit
(9) Type HDPE high density polyethylene conduit
(10) Type RTRC reinforced thermosetting resin conduit
(~~9~~) (11) Type LFNC liquidtight flexible nonmetall ic conduit
(~~10~~)(12) Type EMT electrical metallic tubing
(~~11~~)(13) Type ENT electrical nonmetallic tubing
(~~12~~)(14) Busways
(~~13~~)(15) Strut-type channel raceway
(~~14~~)(16) Surface metal raceways
(~~15~~)(17) Surface nonmetallic raceways
Where a separate equipment grounding conductor is used, connection of the equipment grounding conductor to the busway shall comply with 250.8 and 250.12.

Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100, the revised Article 352 for Type PVC Conduit and the new Article 355 for type RTRC Conduit. It clarifies that the broad designation of rigid nonmetallic conduit (Type RNC) includes PVC, HDPE and RTRC and specifies each acceptable raceway type that is covered by a separate Code Article as a separate line item. Additionally, editorial revisions revise the names of several raceway types for uniformity.
Panel Meeting Action: Reject
Panel Statement: The proposal is rejected since Proposals 8-53 and 8-78 refer to RNC in the definition of PVC conduit and RTRC. Use of HDPE is not permitted to be used as a branch from a busway.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-137 Log #2207 NEC-P08 **Final Action: Reject**
(368.56(A)(16))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: (16) Type PA Cable
Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (368.56(A)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Panel 8 cannot accept this product until it has been accepted under the jurisdiction of Panel 7.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-138 Log #1591 NEC-P08 **Final Action: Accept**
(368.258)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 368.258:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

368.258 Neutral <u>Conductor</u> .
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Panel Statement: The panel agrees with the submitter's change but doesn't agree with the submitter's substantiation.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

DABE, J.: Based on the Negative Comment of Mike Callanan which states: "The proposed definitions for "neutral" and "neutral point" do not provide a clear and concise understanding of what actually constitutes a neutral conductor or when a grounded conductor is not a neutral. The fact that the Task Group needed to provide four drawings to help explain the meaning of the definitions is an indication they are not clear." The panel should reconsider the acceptance of this proposal.

ARTICLE 370 — CABLEBUS

8-139 Log #2753 NEC-P08 **Final Action: Reject**
(370.4(B))

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: Add a new sentence as follows:

<u>The adjustment factors in 310.15(B)(2)(a) shall not be required to apply</u>
Substantiation: Conductors installed in cablebus usually consist of parallel conductors per phase with many conductors within the cablebus. The cables are mounted on spacer blocks to maintain spacing for ventilation. These conductors act as free conductors in air and there is no need for applying the adjustment factors for more than three current-carrying conductors, but this is not stated in this section. There needs to be a clear statement that adjustment factors are not required to be applied in this section
Panel Meeting Action: Reject
Panel Statement: Without a fact-finding report, or listing of cablebus clearly indicating that the adjustment factor should not apply, this determination should be left up to the AHJ.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-140 Log #288 NEC-P08 **Final Action: Reject**
(370.6(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

"... protected against ~~physical damage~~ <u>blows or abrasion</u> , and unventilated."
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

The proposed rewording is an attempt at precision. Furthermore, if you reject the full rewording I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-141 Log #287 NEC-P08 **Final Action: Reject**
(370.7(4))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

(4) Additional ~~physical~~ protection where required, such as guards where subject to severe ~~physical damage~~ <u>blows or abrasion.</u>
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

The proposed rewording is an attempt at precision. Furthermore, if you reject the full rewording I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the

Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-142 Log #1151 NEC-P08 **Final Action: Reject**
(370.9)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:
A cablebus installation shall be grounded and bonded ~~in accordance with Article 250, excluding 250,86 Exception No. 2.~~
Alternatively, delete this section.
Substantiation: To comply with Style Manual requirements. Proposed wording excludes 250.86, Exception No. 2. Section 90.3 indicates Article 250 already applies.
Panel Meeting Action: Reject
Panel Statement: The current text is clearer than the proposed text. By meeting the requirements of 370.9, which refers to 250.86, the cablebus will both be bonded and grounded. The submitter was unclear in his proposal.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 372 — CELLULAR CONCRETE FLOOR RACEWAYS

8-143 Log #1964 NEC-P08 **Final Action: Accept**
(372.4(2))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 372.4(2) to read as shown:
372.4(2) in <u>any</u> hazardous (classified) locations, except as permitted by <u>other Articles in this Code</u> . ~~504.20, and in Class I, Division 2 locations as permitted by 501.10(B)(3)~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for Cellular Concrete Floor Raceways within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of Cellular Concrete Floor Raceways, by an AHJ, because the Cellular Concrete Floor Raceways Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-144 Log #1053 NEC-P08 **Final Action: Reject**
(372.12)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second sentence as follows:
For the purpose of this section, so-called loop wiring (continuous unbroken conductor connecting the individual outlets) <u>or connection to feed-through terminals</u> shall not be considered a splice or tap.
Substantiation: Where conductors are terminated on terminals designed for feed-through connections but are not unbroken, it seems reasonable not to consider this type connection a splice or tap, also.
Panel Meeting Action: Reject
Panel Statement: The Code is clear as to intent that splices or taps will only be allowed in header access units or junction boxes. Loop wiring is continuous and unbroken, whereas using the terminals on a device to join two wires is a splice. Splices are made in junction boxes not only to have access but also to limit the effects of arcing.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-145 Log #1056 NEC-P08 **Final Action: Reject**
(372.17 Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add a new Exception as follows:
<u>Exception: Where more than one outlet is individually supplied by a set of conductors on the same circuit, it shall be permitted to count only one set of current-carrying conductors of that circuit for derating purposes.</u>
Substantiation: The present derating factors discourages individual sets of conductors to outlets on the same circuit, which results in loop wiring and a tendency to violate 372.13 since inspection is not generally required to remove wiring. The proposal would improve efficiency, reduce voltage drop and heating of conductors.
Panel Meeting Action: Reject
Panel Statement: The current text is clear. It is the intent of the panel to have the adjustment factors of 310.15(B)(2) apply to cellular concrete floor raceways.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 374 — CELLULAR METAL FLOOR RACEWAYS

8-146 Log #1965 NEC-P08 **Final Action: Accept**
(374.3(2))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 374.3(2) to read as shown:
374.3(2) in <u>any</u> hazardous (classified) locations, except as permitted <u>by other Articles in this Code</u> . ~~504.20, and in Class I, Division 2 locations as permitted by 501.10(B)(3)~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for Cellular Metal Floor Raceways within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of Cellular Metal Floor Raceways, by an AHJ, because the Cellular Metal Floor Raceways Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-147 Log #1052 NEC-P08 **Final Action: Reject**
(374.6)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second sentence as follows:
For the purpose of this section, so-called loop wiring (continuous unbroken conductor connecting the individual outlets) <u>or connection to feed-through terminals</u> shall not be considered a splice or tap.
Substantiation: Where conductors are terminated on terminals designed for feed-through connections but are not unbroken, it seems reasonable not to consider this type connection a splice or tap, also.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-144.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-148 Log #1057 NEC-P08 **Final Action: Reject**
(374.17 Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add a new Exception as follows:
<u>Exception: Where more than one outlet is individually supplied by a set of conductors on the same circuit, it shall be permitted to count only one set of current-carrying conductors of that circuit for derating purposes.</u>
Substantiation: The present derating factors discourages individual sets of conductors to outlets on the same circuit, which results in loop wiring and a tendency to violate 374.7 since inspection is not generally required to remove wiring. The proposal would improve efficiency, reduce voltage drop and heating of conductors.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-145.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 376 — METAL WIREWAYS

8-149 Log #2570 NEC-P08 **Final Action: Reject**
(376.5 (New))

Submitter: Larry Rogers, Vattertott College-Tulsa / Rep. Vatterott Colleges, NFPR and IAEI Member
Recommendation: Add new text as follows:
Enclosure fronts or faces; All unfinished edges, internally and externally of enclosure faces shall be rounded or de-burred to a smooth finish.
Substantiation: I am using enclosures in a generic form to include panel boards, auxiliary gutters, surface metal raceways, and large junction boxes

above 4 11/16. Sharp corners/edges on enclosures have caused thousands of injuries to workmen and also thousands of hours of lost time man hours. Also, damage to the integrity of conductor insulation during installation or inspection is a problem with results of sometimes immediate arc flash or they are found later with a bare hand, which could lead to a fatal shock or serious cut due to jerk reaction. We ask this panel to consider having the manufacturer remove these sharp edges prior to shipment, thus attacking the problem from the start. Sharp edges stay sharp for years.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-122.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-150 Log #456 NEC-P08 **Final Action: Accept in Principle**
(376.6 (New))

Submitter: W. Creighton Schwan, Hayward, CA

Recommendation: Add new text to read as follows:

<u>Metal wireways and associated fittings shall be listed.</u>

Substantiation: The AHJ does not have the means to determine the safety of the design and manufacture, particularly the ability of the joints to carry large fault currents where power conductors are contained. Panel comment (Proposal 8-208, pg. 964, 2001 ROP) refers to 250.118(14) for use of wireway as an equipment grounding conductor. In the 2005 NEC, see 250.118(13) which refers to LISTED wireways.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 8-151.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 8 Negative: 4

Explanation of Negative:

DAUBERGER, G.: This is the same proposal that CMP 8 rejected in the last cycle, and no new substantiation has been provided. Because of the nature of the product and its application, many fittings are fabricated in the field to fill a specific need. It would be impractical and almost impossible to submit these fittings for listing prior to the installation.

DOLLINS, J.: The submitter’s recommendation is overly restrictive, and the substantiation is insufficient to require the listing of wireway and associated fittings. A similar proposal was submitted for the 2005 NEC and was rejected. No additional substantiation has been submitted to reverse the panel’s position.

KENDALL, D.: This proposal should be rejected. Listed metal raceways and associated fittings are unrealistic in the field. Fittings and elbows are required to be fabricated in the field by the contractor. It is impossible for a manufacturer to produce and list all the possible combination of fittings.

LOYD, R.: I am voting against this proposal which is to require all metal wireways to be listed. Metal wireways have been used based on the installers need for them. Many are used in unique applications and they may be custom made on the job or by local sheet metal shops. The present language is sufficient and the code should not be changed at this time.

8-151 Log #673 NEC-P08 **Final Action: Accept**
(376.6)

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the proposal as it is unclear what “one of a kind” means and that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

Submitter: Jamie McNamara, Hastings, MN

Recommendation: Revise as follows:

<u>**376.6 Listing Requirements.** Metal wireways and associated fittings shall be listed.</u>

<u>Exception: One of a kind and custom made wireways and fitting shall not be required to be listed.</u>

Substantiation: To require stand sections of metal raceway to be listed provides for a minimum standard of safety that all standard wireways should meet. It helps the AHJ determine if the raceway suitable for installation and use. The AHJ rarely has the ability in the field to determine the suitability of a raceway as to its condition of use. Virtually all other chapter three wring methods are required to be listed.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 8 Negative: 4

Explanation of Negative:

DAUBERGER, G.: This is the same proposal that CMP 8 rejected in the last cycle. At that time, the panel statement was: “The submitter’s recommendation is overly restrictive and the substantiation is insufficient to require the listing of wireway and associated fittings.” There was absolutely no substantiation provided with the proposal for the 2008 Code either, therefore, the proposal should be rejected.

DOLLINS, J.: The submitter’s recommendation is overly restrictive, and the substantiation is insufficient to require the listing of wireway and associated fittings. A similar proposal was submitted for the 2005 NEC and was rejected. No additional substantiation has been submitted to reverse the panel’s position.

KENDALL, D.: See my Explanation of Negative for Proposal 8-150.

LOYD, R.: I am voting against this proposal which is to require all metal wireways to be listed except for the one-of-a-kind and custom-made wireways.

Metal wireways have been used based on the installers need for them. Many are used in unique applications which is the bases for the exception. However, they may not be custom made. They can be made of manufactured enclosures that are not necessarily listed as “wireways”. They may be manufactured as auxiliary gutters, junction boxes, or cabinets or cutout boxes, then installed as wireways. Therefore, to require listing may be overly restrictive and does not add safety. The present language is sufficient and the code should not be changed at this time.

Comment on Affirmative:

DABE, J.: While we agree with the action taken by the panel, upon review of the recirculation for Code-Making Panel 8, we feel that the language shown below will lead to a greater degree of consensus. And, also better meet the needs of the industry that we represent, by meeting the intent of the proposal and allowing a field manufactured piece when necessary.

“376.6 Listing Requirements. Metal wireways and associated fittings shall be listed.

Exception: One of a kind, custom made, and <u>field-fabricated</u> wireways and fittings shall not be required to be listed.”

WALBRECHT, G.: We agree with the submitter that the Authority Having Jurisdiction will not have the means available to determine the safety of the design, manufacture, and installation of a metal wireway. Wireways and their associated fittings, as with a wiring method, should be evaluated and listed by a nationally recognized third party certification organization. However, we do not agree with the additional exception. Field fabrication and modification of factory-produced components can also be hazardous and should be properly examined and evaluated by a nationally recognized testing organization.

8-152 Log #304 NEC-P08 **Final Action: Reject**
(376.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

(1) Where subject to severe ~~physical damage~~ <u>blows or abrasion.</u>

Substantiation: Use of the word “physical” is superfluous– the purpose is obvious. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Here, though, item (2) also refers to a source of physical damage. The proposed rewording is an attempt at precision. If you don’t care to reword (a), its existing form theoretically eliminates the need for (2).

Furthermore, I would then have to fall back to arguing that in that case the term “physical” should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-153 Log #1037 NEC-P08 **Final Action: Reject**
(376.12(1))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete “severe”.

Substantiation: Edit. “Severe” is subjective and argumentative. Other similar sections do not use the word severe.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-98.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-154 Log #1150 NEC-P08 **Final Action: Reject**
(376.12(1) and (2))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete “severe”.

Substantiation: Edit. Severe damage is not defined and is subjective. Other similar requirements do not use the word “severe”.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 8-98.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-156 Log #3127 NEC-P08 **Final Action: Reject**
(376.23(B))

Submitter: Jeremy Enders, East Lansing, MI
Recommendation: Revise the section to make the meaning clear when a raceway must traverse from one side to the other of a wireway. The section will read as follows:
(B) Metallic Wireways Used as Pull Boxes. Where insulated conductors 4 AWG or larger are pulled through a wireway, the distance between raceway and cable entries enclosing the same conductor shall not be less than ~~eight times the diameter of the largest raceway or cable entry. that required by 314.28(A)(1) for straight pulls and 314.28(A)(2) for angle pulls~~ ...
Substantiation: Applying the rules for straight and angle pulls to conductors entering and leaving a wireway for the purpose of passing from one side to the other is not clear. There can be a simple rule that applies in all cases and that is to require a minimum of eight times the diameter of the largest raceway involved as a minimum distance between raceway entries. Then, it does not matter if it is a straight pull or the wires travel down the wireway a short distance before leaving either the top or the bottom. When wires enter a wireway and travel down the wireway a short distance than leave it this an angle pull or do the rules of wire deflection (376.23(A)) apply? This revision makes the answer clear.
Panel Meeting Action: Reject
Panel Statement: The current text is clear as to intent. The rules for determining if two raceways or cables enclosing the same conductors are considered a straight or angle pull is determined by whether the raceways or cables enter and leave on adjacent walls (angle) or opposite walls (straight), and not how far they travel down a wireway before leaving.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-155 Log #3405 NEC-P08 **Final Action: Accept**
(376.56(B)(4))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise to read as follows:
(4) Live Parts. Power distribution blocks shall not have uninsulated live parts exposed within a wireway, whether or not the wireway cover is installed.
Substantiation: Although members of the panel have clarified the intent of this new (2005 NEC) requirement, the literal test allows uninsulated power distribution blocks as long as the cover is on the wireway. With the cover in place, (“after installation”) uninsulated power distribution blocks are “in the wireway” but no longer “exposed” and therefore comply with the literal text. Remember that live parts include insulated conductors as long as they are energized. Therefore, the prohibition must address “uninsulated live parts” and must apply with the cover open. This proposal incorporates these concepts.
Panel Meeting Action: Accept
Change the code reference to 376.56(B)(4).
Panel Statement: The panel believes the submitter intended to reference 376.56(B)(4) not 376.15(B)(4). The print line heading should be changed from “376.15” to “376.56”.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-157 Log #2754 NEC-P08 **Final Action: Accept in Principle**
(376.80)

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: Move the last two sentences of 376.22 to a new section 376.24 to read as follows:
<u>376.80 Conductor Ampacity. The Ampacity of conductors installed in metal wireway shall be determined in accordance with 310.15.</u> The ~~derating~~ <u>adjustment</u> factors in 310.15(B)(2)(a) shall be applied only where the number of current-carrying conductors, including neutral conductors classified as current-carrying under the provisions of 310.15(B)(4), exceeds 30. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current carrying conductors.
Substantiation: Provisions dealing with wireway fill and ampacity of conductors installed within a wireway are covered in the same section. These two different subjects need to be in separate sections. It is confusing for some trades persons to find the ampacity rule when it is hidden within a section dealing with fill. The code refers to adjustment factors not derating factors in 310.15(B)(2)(a).
Panel Meeting Action: Accept in Principle
Modify existing 376.22 as follows:
376.22 Number of Conductors <u>and Ampacity.</u> The number of conductors and their ampacity shall comply with (A) and (B).
<u>(A)</u> The sum of the cross-sectional areas of all contained conductors at any cross section of a wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.
<u>(B)</u> The ~~derating~~ <u>adjustment</u> factors in 310.15(B)(2)(a) shall be applied only where the number of current-carrying conductors, including neutral conductors classified as current-carrying under the provisions of 310.15(B)(4), exceeds 30. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors.
Panel Statement: The submitter’s intent was met. Additional editorial changes were made for clarity.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-157a Log #CP802 NEC-P08 **Final Action: Accept**
(376.100 (new))

TCC Action: The Technical Correlating Committee directs that the panel add Titles to (A) and (B). This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 8,
Recommendation: Insert a new 376.100 as follows:
376.100 Construction.
(A) Electrical and Mechanical Continuity. Wireways shall be constructed and installed so that adequate electrical and mechanical continuity of the complete system is secured.
(B) Substantial Construction. Wireways shall be of substantial construction and shall provide a complete enclosure for the contained conductors. All surfaces, both interior and exterior, shall be suitably protected from corrosion. Corner joints shall be made tight, and where the assembly is held together by rivets, bolts, or screws, such fasteners shall be spaced not more than 300 mm (12 in.) apart.
(C) Smooth Rounded Edges. Suitable bushings, shields, or fittings having smooth, rounded edges shall be provided where conductors pass between wireways, through partitions, around bends, between wireways and cabinets or junction boxes, and at other locations where necessary to prevent abrasion of the insulation of the conductors.
(D) Covers. Covers shall be securely fastened to the wireway.
Substantiation: See action on Proposal 8-151 for field fabricated wireways.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 378 — NONMETALLIC WIREWAYS

8-158 Log #318 NEC-P08 **Final Action: Reject**
(378.10, FPN)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
FPN: Extreme cold may cause some nonmetallic wireways to become brittle and, therefore, more susceptible to damage from ~~physical~~ contact.
Substantiation: Use of the word “physical” is superfluous– the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Let’s take care of that for good: for our purposes, “contact” means “physical contact.”
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-159 Log #317 NEC-P08 **Final Action: Reject**
(378.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) Where subject to ~~physical damage~~ <u>blows or abrasion.</u>

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Here, though, items (3), (4) and (5) also refer to sources of physical damage. The proposed rewording is an attempt at precision. If you don't care to reword (1), its existing form theoretically eliminates the need for (3), (4) and (5).

Furthermore, I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-160 Log #1966 NEC-P08 **Final Action: Accept**
(378.12(2))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 378.12(2) to read as shown:
378.12(2) in any hazardous (classified) locations, except as permitted by other Articles in this Code . ~~in 504.20~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for Nonmetallic Wireways within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of Nonmetallic Wireways, by an AHJ, because the Nonmetallic Wireways Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-161 Log #1924 NEC-P08 **Final Action: Accept in Principle**
(378.44, FPN (New))

Submitter: William Wagner, Certification Solutions
Recommendation: Revise the FPN to 378.44 as follows:
FPN: See Table 352. ~~44(A)~~ for expansion characteristics of rigid PVC ~~rigid nonmetallic~~ conduit. The expansion characteristics of PVC nonmetallic wireway are identical.
Substantiation: This is a companion proposal for the revised Article 352 for Type PVC Conduit. Article 352 will now apply only to rigid polyvinyl chloride conduit (Type PVC), rather than to rigid nonmetallic conduit (Type RNC) which includes PVC, HDPE and RTRC. Therefore, there will only be one Table in 352.44 and the reference should be revised accordingly. It additionally corrects the reference to Type PVC conduit in order to employ uniform terminology for this product throughout the code.
Panel Meeting Action: Accept in Principle
Revise the FPN to 378.44 as follows:
FPN: See Table 352.44 ~~(A)~~ for expansion characteristics of ~~rigid~~ PVC ~~rigid nonmetallic~~ conduit. The expansion characteristics of PVC nonmetallic wireway are identical.
Panel Statement: The submitter's intent is met and a minor editorial change in the table reference is corrected. The word "rigid" was removed from the proposed language for consistency with other articles.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-162 Log #976 NEC-P08 **Final Action: Reject**
(378.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence to read as follows:
Where an equipment grounding conductor is ~~required~~ provided ~~a separate equipment grounding conductor it~~ shall be installed in the nonmetallic raceway.
Substantiation: Where equipment is not required to be grounded, but grounded by choice the present wording does not preclude an EGC installed in any manner, and if not in the raceway is not covered by 250.120(A). 250.1(1) indicates Article 250 covers installations "permitting" an EGC and the proposal would correlate this section. Code provisions are not limited to mandatory requirements and 110.12 applies to all installed equipment.
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are addressed in Section 300.3(B) for equipment grounding conductors that are provided but not required.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-163 Log #1087 NEC-P08 **Final Action: Reject**
(378.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Where an equipment ground conductor is ~~required~~ provided , ~~a separate equipment grounding conductor~~ it shall be installed in the wireway.
Substantiation: Where equipment is not required to be grounded, but grounded by choice, present wording does not preclude an EGC installed in any manner, and if not in the raceway is not covered by 250.120(A). Code provisions are not limited to mandatory requirements and 110.12 applies to all wiring. 250.1(1) indicates Article 250 covers installations "permitting" and the proposal would correlate this section.
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are addressed in Section 300.3(B) for equipment grounding conductors that are provided but not required.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-164 Log #1169 NEC-P08 **Final Action: Reject**
(378.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence:
Where an equipment grounding conductor is ~~required~~ provided ~~a separate equipment grounding conductor~~ it shall be installed in the nonmetallic raceway.
Substantiation: Where equipment is not required to be grounded, but grounded by choice the present wording does not preclude an EGC installed in any manner, and if not in the raceway is not covered by 250.120(A). 250.1(1) indicates Article 250 covers installations "permitting" an EGC and the proposal would correlate this section. Code provisions are not limited to mandatory requirements and 110.12 applies to all installed equipment.
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are addressed in Section 300.3(B) for equipment grounding conductors that are provided but not required.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 380 — MULTIOUTLET ASSEMBLY

8-165 Log #305 NEC-P08 **Final Action: Reject**
(380.2(B)(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(2) Where subject to severe ~~physical damage~~ blows or abrasion.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Here, though, items (4) and (5). refer to sources of physical damage. The proposed rewording is an attempt at precision. If you don't care to reword (2), its existing form theoretically eliminates the need for (4) and (5).

Furthermore, I would then have to fall back to arguing that in that case the term "physical" should be eliminated.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-166 Log #1020 NEC-P08 **Final Action: Reject**
(380.2(B)(2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete “severe.”
Substantiation: Edit. “Severe” is subjective; how much damage is acceptable? Uses not permitted for other wiring methods do not specify “severe” damage.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-98.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-167 Log #1959 NEC-P08 **Final Action: Accept in Principle**
(380.2(B)(6))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 380.2(B)(6) to read as shown:
380.2(B)(6) In any hazardous (classified) locations, ~~except Class I, Division 2 locations~~ as permitted by other Articles in this Code. ~~in 501.10(B)(3)~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for Multioutlet Assembly within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of Multioutlet Assembly, by an AHJ, because the Multioutlet Assembly Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept in Principle
Change the text of 380.2(B)(6) to read as shown:
380.2(B)(6) In any hazardous (classified) locations, except ~~Class I, Division 2 locations~~ as permitted by other Articles in this Code. ~~in 501.10(B)(3)~~
Panel Statement: The proposal was editorially revised to retain the word “except”. See panel statement on Proposal 8-29.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 382 — NONMETALLIC EXTENSIONS

7-98 Log #3450 NEC-P07 **Final Action: Accept in Principle**
(382)

Submitter: Richard Temblador, Southwire Company
Recommendation: Revise text to read:
I. General
382.1 Scope. This article covers the use, installation, and construction specifications for nonmetallic extensions.
382.2 Definition.
Concealable Nonmetallic Extension. A Listed assembly of two, three, or four insulated circuit conductors within a nonmetallic jacket, an extruded thermoplastic covering, or a sealed nonmetallic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings, and concealed with paint, texture, joint compound, plaster, wallpaper, tile, wall paneling, or other similar materials.
382.6 Listing Requirements. Concealable nonmetallic extensions and associated fittings and devices shall be listed and shall provide a level of shock protection equivalent to a GFCI.
II. Installation
382.10 Uses Permitted. Nonmetallic extensions shall be permitted only in accordance with 382.10(A), (B), and (C).
(A) From an Existing Outlet. The extension shall be from an existing outlet on a 15- 20-ampere branch circuit. Where a concealable nonmetallic extensions originates from non-grounding Type receptacles, the installation shall comply with 250.130(C), 406.3(D)(3)(b), or 406(D)(3)(c).
(B) Exposed and in a Dry Location. The extension shall be run exposed or concealed as permitted in 382.15, and in a dry location.
(C) Residential or Offices. For nonmetallic surface extensions mounted directly on the surface of walls or ceilings, the building shall be occupied for residential or office purposes and shall not exceed three floors above grade. Where identified for the use, concealable nonmetallic extensions shall be permitted more than three floors above grade.
382.12 Uses Not Permitted. Nonmetallic extensions shall not be used as follows:
(1) In unfinished basements, attics, or roof spaces
(2) Where the voltage between conductors exceeds 150 volts for nonmetallic surface extension and 300 volts for aerial cable
(3) Where subject to corrosive vapors
(4) Where run through a floor or partition, or outside the room in which it originates
382.15 Exposed.
(A) Nonmetallic Extensions. One or more extensions shall be permitted to be run in any direction from an existing outlet, but not on the floor or within 50 mm (2 in.) from the floors.
(B) Concealable Nonmetallic Extensions. Where identified for the use, nonmetallic extensions may be concealed with paint, texture, concealing compound, plaster, wallpaper, tile, wall paneling, or other similar materials and installed per 382.15(A).
382.26 Bends.
(A) Nonmetallic Extensions. A bend that reduces the normal spacing between the conductor shall be covered with a cap to protect the assembly from physical damage.
(B) Concealable Nonmetallic Extensions. Concealable extensions shall be permitted to be folded back over itself and flattened as required for installation.
382.30 Securing and Supporting.
(A) Nonmetallic Extensions. Nonmetallic surface extensions shall be secured in place by approved means at intervals not exceeding 200 mm (8 in.), with an allowance for 300 mm (12 in.) to the first fastening where the connection to the supplying outlet is by means of an attachment plug. There shall be at least one fastening between each two adjacent outlets supplied. An extension shall be attached to woodwork plaster finish and shall not be in contact with any metal work or other conductive material other than with metal plates on receptacles.
(B) Concealable Nonmetallic Extensions. All surface mounted concealable nonmetallic extension components shall be firmly anchored to the wall or ceiling using an adhesive or mechanical anchoring system identified for this use.
382.40 Boxes and Fittings. Each run shall terminate in a fitting , connector, or box that covers the end of the assembly. All fittings, connectors, and devices shall be of a type identified for the use.
382.42 Devices.
(A) Receptacles. All receptacles, receptacle housings, and self-contained devices used with concealable nonmetallic extensions shall be identified for this use.
(B) Receptacles and Housings. Receptacle housings and self-contained devices designed either for surface or for recessed mounting shall be permitted for use with concealable nonmetallic extensions. Receptacle housings and self-contained devices shall incorporate means for facilitating entry and termination of concealable nonmetallic extensions and for electrically connecting the housing or device. Receptacle and self-contained devices shall comply with 406.3. Power and communications outlets installed together in common housing shall be permitted in accordance with 800.133(A)(1)(c), Exception No. 2.
382.56 Splices and Taps. Extensions shall consist of a continuous unbroken length of the assembly, without splices, and without exposed conductors between fittings , connectors, or devices . Taps shall be permitted where approved fittings completely covering the tap connections are used. Aerial cable and its tap connectors shall be provided with an approved means for polarization. Receptacle-type tap connectors shall be of the locking type.
III. Construction Specifications (Concealable Nonmetallic Extensions only)
382.100 Construction. Concealable nonmetallic extensions shall be a multi-layer flat conductor design consisting of a center ungrounded conductor enclosed by a sectioned grounded conductor, and an overall sectioned grounding conductor.
382.104 Flat Conductors. Concealable nonmetallic extensions shall be constructed, using flat copper conductors equivalent to 14 AWG or 12 AWG conductor sizes, and constructed per 382.104(A), (B), and (C).
(A) Ungrounded Conductor (Center Layer). The ungrounded conductor shall consist of one or more ungrounded flat conductor(s) enclosed per 382.104(B) and (C), and identified in accordance with 310.12(C).
(B) Grounded Conductor (Inner Sectioned Layers). The grounded conductor shall consist of two sectioned inner flat conductors that enclose the center ungrounded conductor(s). The sectioned grounded conductor shall be enclosed by the sectioned grounding conductor, and identified in accordance with 200.6.
(C) Grounding Conductor (Outer Sectioned Layers). The grounding conductor shall consist of two overall sectioned conductors that enclose the grounded conductor and ungrounded conductor(s), and shall comply with 250.4(A)(5). The grounding conductor layers shall be identified by any one of the following methods:
(1) As permitted in 250.119,
(2) A clear covering,
(3) One or more continuous green stripes or hash marks, or
(4) The term “Equipment Ground” printed at regular intervals throughout the cable.
382.112 Insulation. The ungrounded and grounded flat conductor layers shall be individually insulated and comply with 310.10. The grounding conductor shall be covered or insulated.
382.120 Marking.
(A) Cable. Concealable nonmetallic extensions shall be clearly and durably marked on both sides at intervals of not more than 610 mm (24 in.) with the information required by 310.11(A) and with the following additional information:
(1) Material of conductors
(2) Maximum temperature rating
(3) Ampacity
(B) Conductor Identification. Conductors shall be clearly and durably identified on both sides throughout their length as specified in 382.104.
Substantiation: This proposal seeks to revise Article 382 to recognize a nonmetallic extension that can be concealed on the surface of walls and ceilings.

New technologies, consumer electronics devices and ever changing lifestyles have increased the need for additional power outlets and the desire to place power or lighting where needed to obtain an aesthetically pleasing environment. Often these changes are accommodated through the use of extension cords that are easily damaged and misused. This has led to distressing statistics such as:

"The U.S. Consumer Product Safety Commission (CPSC) estimates that each year, about 4,000 injuries associated with electric extension cords are treated in hospital emergency rooms. About half the injuries involve fractures, lacerations, contusions, or sprains from people tripping over extension cords. Thirteen percent of the injuries involve children under five years of age; electrical burns to the mouth accounted for half the injuries to young children."

"CPSC also estimates that about 3,300 residential fires originate in extension cords each year, killing 50 people and injuring about 280 others. The most frequent causes of such fires are short circuits, overloading, damage, and/or misuse of extension cords. Nearly 30 percent of home electrical wiring fires can be traced to the misuse of electric cords, such as overloading circuits, poor maintenance and running the cords under rugs or through high traffic areas."

Consumers are commonly using "temporary" methods to compensate for the limitations of their existing fixed wiring.

The proposed nonmetallic extension is a concealable multi-layer flat wire nonmetallic extension that can serve as a safe alternative to temporary extension cords. The design is inherently safe and eliminates the need to mechanically protect the cable from physical damage. Branch circuit wiring can be safely extended using concealable flat wire nonmetallic extension for power or lighting where needed, and as needed, to accommodate decorating schemes, placement of specific equipment or furniture to suit ever-changing lifestyles.

Because the concealable flat wire nonmetallic extension is inherently safe, requirements for mechanical protection are not necessary to insure the practical safeguarding of persons and property in the event physical damage to the cable. Unlike standard nonmetallic extensions, the conductors of the concealable flat wire nonmetallic extension are flat and layered in a manner that insures practical safeguarding of persons or property. The flat wire cable is a multi-layer flat conductor design consisting of a center ungrounded conductor enclosed by a sectioned grounded conductor, and an overall grounding conductor. The cable itself is a symmetrical design providing two levels of protection on both sides of the flat wire cable via the outer grounding conductor layers and inner grounded (neutral) conductor layers. This design insures that if the cable is damaged, punctured or penetrated, it will trip the over-current protection device (OCPD) and safely open the circuit. If the OCPD is reset, the circuit will trip and continue to do so upon subsequent resets. The concealable flat wire nonmetallic extension provides a level of shock protection equivalent to a GFCI.

The concealable flat wire nonmetallic extension is unlike most NEC recognized wiring methods that have installation requirements to prevent physical damage during normal use. These traditional wiring methods have relied on concealment, routing requirements, and mechanical protection to minimize the potential for damage. Exposed wiring methods rely on special installation requirements for routing and limited use to minimize the potential for damage. These requirements are in place because physical damage greatly increases the likelihood of shock and fire hazards. The concealable flat wire nonmetallic extension relies on an inherently safe design eliminating the need for these traditional installation requirements. The proposed system has been thoroughly investigated under a Fact-Finding Study performed by Underwriters Laboratories to assure the safeguarding of persons and property from shock and fire hazards.

Panel Meeting Action: Accept in Principle

The panel accepts the proposal in principle, with the following revisions to 382.6 listing requirements to read as follows:

"382.6 Listing Requirements. Concealable nonmetallic extensions and associated fittings and devices shall be listed. The starting/source tap device for the extension shall contain and provide the following protection for all load-side extensions and devices:

(1) Supplementary over-current protection

(2) Level of protection equivalent to a Class A GFCI

(3) Level of protection equivalent to a portable GFCI

The remainder of the proposal remains as submitted.

Panel Statement: The revised wording provides protection against possible miswiring.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 2

Explanation of Negative:

BROWN, H.: We disagree with the panel action to accept this proposal.

The panel action on Proposal 7-99 serves to recognize the requirement that "nonmetallic extensions" should not be located: (382.12(5), (new), WHERE SUBJECT TO PHYSICAL DANGER IN RESIDENTIAL OR OFFICE AREAS.

Although we encourage and promote the development of innovative wiring methods, the "concealable flatwire nonmetallic extension method" is unacceptable.

The opening sentence of the NEC, (90.1), clearly states that the intended purpose of the NEC is the practical safeguarding of persons and property from hazards arising from the use of electricity.

AC Flatwire is a fragile wiring method, with thin flat conductors, separated by thin layers of insulating material. The material is designed to be surface mounted on a dwelling or office wall using adhesives, and then painted for " CONCEALMENT ". The system is designed to have an inherent safety system that is built within.

Good judgment has prevailed. Everyone with whom we have discussed this wiring method, has quickly asked: Since I cannot see the wire, how can I avoid penetrating it with a nail, screw, or some other foreign object? The answer is quite clear. YOU CANNOT PROTECT THIS WIRING METHOD FROM PHYSICAL DAMAGE!!!

The proposal suggests that there is no need to protect the wiring method from physical damage. We disagree for a number of reasons. AC Flatwire is non-repairable, and it must be stripped from the wall in the inevitable event of failure. We feel that - in all likelihood of failure, this will become an economical disadvantage to the consumer.

Our foremost concern is product safety. The panel accepted this proposal on a "fact-finding study", and not on the merits of "product approval" by a recognized testing lab.

The substantiation for this proposal suggests that no protection from physical damage is necessary because the circuit for the nonmetallic extension is designed with "inherent" protection to protect against shock hazards.

Would you or your loved ones feel safe, while standing on a grounded surface, or being grounded --- And driving a nail into an energized 120 volt circuit under any set of circumstances that could possibly exist?

Circuits containing "inherent" safety devices are vital in preventing shock hazards associated with approved wiring methods. We feel, however, that the "inherent" design of an electrical circuit is placed within the circuit to augment the safety of an acceptable wiring method, and NOT FOR THE PURPOSE OF ATTEMPTING TO "MAKE SAFE" THE DESIGN OF AN UNSAFE CIRCUIT.

Make no mistake about it. We have been against this method of extending a branch circuit from the very beginning. The safety of an electrical circuit is a product of design and conditions of use. This product cannot be designed to meet the needs of safety as set forth in 90.1.

In the name of safety, we have an obligation to recommend the rejection of this proposal, and also refer the issue to CMP 10 for further review.

STEWART, H.: This application by which the surface mounted nonmetallic extension conductor(s) are installed per a flat wiring system covered by paint, texture, joint compound plaster, wallpaper, tile, wall paneling or other similar materials are not considered guarded or otherwise protected to remove the likelihood of contact by persons or objects to a point of inherent danger.

This type of installation is for convenience that will be favored among the inexperienced user when available as a shelf item.

Once concealed by paint or plaster or wall paper, etc., the occupant's visual awareness will be lowered and will increase the hazard potential.

New occupants or a change in classification in the occupied area(s) with this type of concealed wiring will increase the level of unawareness and reduce the concern for physical damage: Out of site, out of mind. Listing does not constitute a level of safety when there is the potential for a shock hazard or fire damage to property from no installed physical protection.

There was no data presented and no discussion of test results concerning the flammability of product or potential flame propagation.

Comment on Affirmative:

ROGERS: Other considerations for this proposal are:

1. The length of the extension should be limited.
2. Only one extension per branch circuit should be allowed.
3. The connection of the extension to any branch circuit should not make required receptacle outlets (such as dwellings) unusable.
4. The safety of this extension needs to be carefully considered since dwellings are sold and the new owners may not know that a concealed surface wiring method has been installed.
5. The overcurrent protection for the extension must be selectively co-coordinated with the branch circuit overcurrent protection.
6. Bends and any crossings need further requirements.
7. Installation of this extension should be completed by a qualified installer.
8. Installation of this extension cannot be under the baseboard or on the floor.

7-99 Log #1067 NEC-P07 **Final Action: Accept**
(382.12(5) (New))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add: (5) Where subject to physical damage.

Substantiation: Other wiring methods such as EMT, ENT etc., are not permitted where subject to physical damage in residential or office locations.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

Comment on Affirmative:

BROWN, H.: We agree with the panel, and that this proposal should continue to be accepted.

The NEC is written on the premise that no wiring method is to be exposed to any form of physical damage.

Nonmetallic extensions are no exception. The language that the panel accepted is exemplary of its commitment to the safety of the wiring methods under its purview.

The new text: 382.12(5), (new), (under uses not permitted) that states: Nonmetallic extensions are not permitted WHERE EXPOSED TO PHYSICAL DAMAGE is essential to the proper installation of nonmetallic extensions.

The submitter's substantiation is correct in stating that EMT, ENT, etc. are not permitted where subject to physical damage in residential or office locations.

No wiring method of any type should knowingly be located in an area that subjects the wiring method to an occurrence that will "LIKELY" damage the installation.

There are many safe and affordable wiring methods on the market today for the purpose of extending branch circuits that will not subject the installation to physical damage.

7-100 Log #337 NEC-P07 **Final Action: Reject**
(382.26)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

382.26 Bends. A bend that reduces the normal spacing between the conductors shall be covered with a cap to protect the assembly from ~~physical~~ damage.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

7-101 Log #3451 NEC-P07 **Final Action: Accept in Principle**
(383 (New))

Submitter: Richard Temblador, Southwire Company
Recommendation: Revise text to read:

I. General

383.1 Scope. This article covers the use, installation, and construction specifications for Concealable Nonmetallic Extenstions.

383.2 Definition.

Concealable Nonmetallic Extension (CNE). A Listed assembly of two, three, or four insulated conductors within a nonmetallic jacket, an extruded thermoplastic covering, or a sealed nonmetallic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings, and concealed with paint, texture, joint compound, plaster, wallpaper, tile, wall paneling, or other similar materials.

383.6 Listing Requirements. Concealable nonmetallic extensions and associated fittings and devices shall be listed and shall provide a level of protection equivalent to a GFCI.

II. Installation

383.10 Uses Permitted. Concealable nonmetallic extensions shall be permitted only in accordance with 382.10(A), (B), and (C).

(A) From an Existing Outlet. The CNE shall originate from an existing outlet on a 15- 20-ampere branch circuit. Where a CNE originates from non-grounding Type receptacles, the installation shall comply with 250.130(C), 406.3(D)(3)(b), or 406(D)(3)(c).

(B) Exposed or Concealed, and in a Dry Location. The CNE shall be run exposed as permitted in 382.15 or concealed as permitted in 382.16, and in dry locations.

(C) Residential or Offices. Concealable nonmetallic extensions shall be mounted directly on the surface of walls or ceilings in buildings or structures occupied for residential or office purposes.

383.12 Uses Not Permitted. Concealable nonmetallic extensions shall not be used as follows:

(1) In unfinished basements, attics, or roof spaces

(2) Where the voltage between conductors exceeds 150 volts for nonmetallic surface extension and 300 volts for aerial cable

(3) Where subject to corrosive vapors

(4) Where run through a floor or partition, or outside the room in which it originates

383.15 Exposed. One or more extensions shall be permitted to be run in any direction from an existing outlet, but not on the floor or within 50 mm (2 in.) from the floor.

383.16 Concealed. Concealable nonmetallic extensions may be concealed with paint, texture, concealing compound, plaster, wallpaper, tile, wall paneling, or other similar materials and isntalled in accordance with 382.15.

383.26 Bends. Concealable nonmetallic extensions shall be permitted to be folded back over itself and flattened as reuqired for installation.

383.30 Securing and Supporting. All surface mounted concealable nonmetallic extension components shall be firmly anchored to the wall or ceiling using an adhesive or mechanical anchoring system identified for this use. The CNE shall not be in contact with any metal work or other conductive material other than with metal plates on receptacles or connectors.

383.40 Boxes and Fittings. Each run shall terminate in a fitting, connector, or box that covers the end of the assembly. All fittings, connectors, and devices shall be of a type identified for the use.

383.42 Devices.

(A) Receptacles. All receptacles, receptacle housings, and self-contained devices used with concealable nonmetallic extensions shall be identified for this use.

(B) Receptacles and Housings. Receptacle housings and self-contained devices designed either for surface or for recessed mounting shall be permitted for use with concealable nonmetallic extensions. Receptacle housings and self-contained devices shall incorporate means for facilitating entry and termination of concealable nonmetallic extensions and for electrically connecting the housing or device. Receptacle and self-contained devices shall comply with 406.3. Power and communications outlets installed together in common housing shall be permitted in accordance with 800.133(A)(1)(c), Exception No. 2.

383.56 Splices and Taps. Concealable nonmetallic extensions shall consist of a continuous unbroken length of the assembly, without splices, and without exposed conductors between fittings, connectors, or devices. Taps shall be permitted where approved fittings completely covering the tap connections are used. Receptacle-type tap connectors shall be of the locking type.

III. Construction Specifications.

383.100 Construction. Concealable nonmetallic extensions shall be a multi-layer flat conductor design consisting of a center ungrounded conductor enclosed by a sectioned grounded conductor, and an overall sectioned grounding conductor.

383.104 Flat Conductors. Concealable nonmetallic extensions shall be constructed, using flat copper conductors equivalent to 14 AWG or 12 AWG conductor sizes, and constructed per 382.104(A), (B), and (C). Where sectioned conductors layers are utilized, the sum total of all sectioned conductor layers shall be equivalent to 14 or 12 AWG conductor sizes.

(A) Ungrounded Conductor (Center Layer). The ungrounded conductor shall consist of one or more ungrounded flat conductor(s) enclosed per 382.104(B) and (C), and identified in accordance with 310.12(C).

(B) Grounded Conductor (Inner Sectioned Layers). The grounded conductor shall consist of two sectioned inner flat conductors that enclose the center ungrounded conductor(s). The sectioned grounded conductor shall be enclosed by the sectioned grounding conductor, and identified in accordance with 200.6.

(C) Grounding Conductor (Outer Sectioned Layers). The grounding conductor shall consist of two overall sectioned conductors that enclose the grounded conductor and ungrounded conductor(s), and shall comply with 250.4(A)(5). The grounding conductor layers shall be identified by any one of the following methods:

(1) As permitted in 250.119,

(2) A clear covering,

(3) One or more continuous green stripes or hash marks, or

(4) The term "Equipment Ground" printed at regular intervals throughout the cable.

383.112 Insulation. The ungrounded and grounded flat conductor layers shall be individually insulated and comply with 310.10. The grounding conductor shall be covered or insulated.

383.120 Marking.

(A) Cable. Concealable nonmetallic extensions shall be clearly and durably marked on both sides at intervals of not more than 610 mm (24 in.) with the information required by 310.11(A) and with the following additional information:

(1) Material of conductors

(2) Maximum temperature rating

(3) Ampacity

(B) Conductor Identification. Conductors shall be clearly and durably identified on both sides throughout their length as specified in 382.104.

Substantiation: This proposal seeks to revise Article 383 to recognize a concealable nonmetallic extension that can be concealed on the surface of walls and ceilings.

New technologies, consumer electronics devices and ever changing lifestyles have increased the need for additional power outlets and the desire to place power or lighting where needed to obtain an aesthetically pleasing environment. Often these changes are accommodated through the use of extension cords that are easily damaged and misused. This has led to distressing statistics such as:

"The U.S. Consumer Product Safety Commission (CPSC) estimates that each year, about 4,000 injuries associated with electric extension cords are treated in hospital emergency rooms. About half the injuries involve fractures, lacerations, contusions, or sprains from people tripping over extension cords. Thirteen percent of the injuries involve children under five years of age; electrical burns to the mouth accounted for half the injuries to young children."

"CPSC also estimates that about 3,300 residential fires originate in extension cords each year, killing 50 people and injuring about 280 others. The most frequent causes of such fires are short circuits, overloading, damage, and/or misuse of extension cords. Nearly 30 percent of home electrical wiring fires can be traced to the misuse of electric cords, such as overloading circuits, poor maintenance and running the cords under rugs or through high traffic areas."

Consumers are commonly using "temporary" methods to compensate for the limitations of their existing fixed wiring.

The proposed nonmetallic extension is a concealable multi-layer flat wire nonmetallic extension that can serve as a safe alternative to temporary extension cords. The design is inherently safe and eliminates the need to mechanically protect the cable from physical damage. Branch circuit wiring can be safely extended using concealable flat wire nonmetallic extension for power or lighting where needed, and as needed, to accommodate decorating schemes, placement of specific equipment or furniture to suit ever-changing lifestyles.

Because the concealable flat wire nonmetallic extension is inherently safe, requirements for mechanical protection are not necessary to insure the practical safeguarding of persons and property in the event physical damage to the cable. Unlike standard nonmetallic extensions, the conductors of the concealable flat wire nonmetallic extension are flat and layered in a manner that insures practical safeguarding of persons or property. The flat wire cable is a multi-layer flat conductor design consisting of a center ungrounded conductor enclosed by a sectioned grounded conductor, and an overall grounding conductor. The cable itself is a symmetrical design providing two levels of protection on both sides of the flat wire cable via the outer grounding conductor layers and inner grounded (neutral) conductor layers. This design insures that if the cable is damaged, punctured or penetrated, it will trip the over-current protection device (OCPD) and safely open the circuit. If the OCPD is reset, the circuit will trip and continue to do so upon subsequent resets. The concealable flat wire nonmetallic extension provides a level of shock protection equivalent to a GFCI.

The concealable flat wire nonmetallic extension is unlike most NEC recognized wiring methods that have installation requirements to prevent physical damage during normal use. These traditional wiring methods have relied on concealment, routing requirements, and mechanical protection to minimize the potential for damage. Exposed wiring methods rely on special installation requirements for routing and limited use to minimize the potential for damage. These requirements are in place because physical damage greatly increases the likelihood of shock and fire hazards. The concealable flat wire nonmetallic extension relies on an inherently safe design eliminating the need for these traditional installation requirements. The proposed system has been thoroughly investigated under a Fact-Finding Study performed by Underwriters Laboratories to assure the safeguarding of persons and property from shock and fire hazards.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 7-98.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 3

Explanation of Negative:

ADAMS, M.: NECA opposes the acceptance of concealed nonmetallic extensions (CNE). A wiring method that can be concealed on building surfaces by paint or wallpaper is inherently subject to damage by, for example, building occupants driving nails to hang pictures. Even if this product is manufactured so that overcurrent devices will act to protect persons and property, there appears to be no practical way to repair such damage, except to replace large sections of CNE, with consequent inconvenience and damage to wall finishes. We believe these serious disadvantages make CNE an impractical wiring method.

BROWN, H.: We disagree with the panel action to accept this proposal.

The panel action on Proposal 7-99 serves to recognize the requirement that "nonmetallic extensions" should not be located: (382.12(5), (new) WHERE SUBJECT TO PHYSICAL DANGER IN RESIDENTIAL OR OFFICE AREAS.

This proposal, which serves to establish a new article governing "concealable nonmetallic extensions" should have the same requirement. This formulates the basis for our opposition to this proposal.

Although we encourage and promote the development of innovative wiring methods, the "Concealable flatwire nonmetallic extension method" is unacceptable.

The opening sentence of the NEC, (90.1), clearly states that the intended purpose of the NEC is the practical safeguarding of persons and property from hazards arising from the use of electricity.

AC Flatwire is a fragile wiring method, with thin flat conductors, separated by thin layers of insulating material. The material is designed to be surface mounted on a dwelling or office wall using adhesives, and then painted for " CONCEALMENT ". The system is designed to have an inherent safety system that is built within.

Good judgment has prevailed. Everyone with whom we have discussed this wiring method, has quickly asked; since I cannot see the wire, how can I avoid penetrating it with a nail, screw, or some other foreign object? The answer is quite clear. YOU CANNOT PROTECT THIS WIRING METHOD FROM PHYSICAL DAMAGE!!!

The proposal suggests that there is no need to protect the wiring method from physical damage. We disagree for a number of reasons. AC Flatwire is nonrepairable, and it must be stripped from the wall in the inevitable event of failure. We feel that - in all likelihood of failure, this will become an economical disadvantage to the consumer.

Our foremost concern is product safety. The panel accepted this proposal on a "fact-finding study", and not on the merits of "product approval" by a recognized testing lab.

The substantiation for this proposal suggests that no protection from physical damage is necessary because the circuit for the nonmetallic extension is designed with "inherent' protection to protect against shock hazards.

Would you or your loved ones feel safe, while standing on a grounded surface, or being grounded---and driving a nail into an energized 120 volt circuit under any set of circumstances that could possibly exist?

Circuits containing "inherent" safety devices are vital in preventing shock hazards associated with approved wiring methods. We feel, however, that the "inherent" design of an electrical circuit is placed within the circuit to augment the safety of an acceptable wiring method, and NOT FOR THE PURPOSE OF ATTEMPTING TO "MAKE SAFE" THE DESIGN OF AN UNSAFE CIRCUIT .

Make no mistake about it. We have been against this method of extending a branch circuit from the very beginning. The safety of an electrical circuit is a product of design and conditions of use. This product cannot be designed to meet the needs of safety as set forth in 90.1.

In the name of safety, we have an obligation to recommend the rejection of this proposal, and also refer the issue to CMP 10 for further review.

STEWART, H.: This application by which the surface mounted nonmetallic extension conductor(s) are installed per a flat wiring system covered by paint, texture, joint compound plaster, wallpaper, tile, wall paneling or other similar materials are not considered guarded or otherwise protected to remove the likelihood of contact by persons or objects to a point of inherent danger.

This type of installation is for convenience that will be favored among the inexperienced user when available as a shelf item.

Once concealed by paint or plaster or wall paper, etc., the occupant's visual awareness will be lowered and will increase the hazard potential.

New occupants or a change in classification in the occupied area(s) with this type of concealed wiring will increase the level of unawareness and reduce the concern for physical damage: Out of site, out of mind. Listing does not constitute a level of safety when there is the potential for a shock hazard or fire damage to property from no installed physical protection.

There was no data presented and no discussion of test results concerning the flammability of product or potential flame propagation.

ARTICLE 384 — STRUT-TYPE CHANNEL RACEWAY

8-168 Log #1152 NEC-P08 **Final Action: Reject**
(384.10(8))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete.

Substantiation: Edit. Unnecessary; (3) requires suitable finishes where subject to corrosion; (2) requires dry locations, which are essentially indoors since outdoor locations are either wet or damp per definitions.

Panel Meeting Action: Reject

Panel Statement: The product is produced in many finishs. It is important to limit painted strut to indoor dry atmospheres.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-169 Log #2154 NEC-P08 **Final Action: Accept in Principle**
(Table 384.22)

Submitter: Brian Dolan, IBEW/NECA Technical Institute

Recommendation: Revise text to read:

Table 384.22 channel size and ~~inside diameter area~~ cross sectional area .

Substantiation: Inside diameter dimensions are not necessary or required to calculate strut-type channel raceway fill.

Panel Meeting Action: Accept in Principle

Revise text to read:

Table 384.22 channel size and inside ~~diameter area~~ cross--sectional area .

Panel Statement: The submitter's intent was met.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

8-170 Log #2155 NEC-P08 **Final Action: Reject**
(384.22)

Submitter: Brian Dolan, IBEW/NECA Technical Institute
Recommendation: Revise text to read:
...shall not exceed the percentage fill using Table 384.22 and applicable ~~outside diameter (OD) dimensions~~ cross-sectional areas of specific types...
Substantiation: Outside diameter dimensions are not necessary or required to calculate strut-type channel raceway fill.
Panel Meeting Action: Reject
Panel Statement: Wire outside diameters can be used to calculate raceway fill.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 386 — SURFACE METAL RACEWAYS

8-171 Log #307 NEC-P08 **Final Action: Reject**
(386.12(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) Where subject to severe ~~physical damage~~ blows or abrasion unless otherwise approved.
Substantiation: Use of the word "physical" generally is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
The proposed rewording is an attempt at precision. If would argue that if you prefer to leave the wording general, in that case the term "physical" should be eliminated.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 388 — SURFACE NONMETALLIC RACEWAYS

8-172 Log #306 NEC-P08 **Final Action: Reject**
(388.12(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(2) Where subject to severe ~~physical damage~~ blows or abrasion.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
The proposed rewording is an attempt at precision. I would argue that if you prefer to leave the wording general, in that case the term "physical" should be eliminated. Here, in fact, leaving "physical" in place in (2) in principle would mean that (4), (6), and (7) could be eliminated, as all these represent physical threats to the raceway.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-173 Log #1047 NEC-P08 **Final Action: Reject**
(388.12(2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete the word "severe".
Substantiation: Edit. "Severe" is subjective and argumentative. Other similar sections do not use the word "severe".
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-98.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-174 Log #1960 NEC-P08 **Final Action: Accept**
(388.12(5))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Change the text of 388.12(5) to read as shown:
388.12(5) In any hazardous (classified) location except ~~, Class I, Division 2 locations~~ as permitted by other Articles in this Code. ~~in 501.10(B)(3)~~
Substantiation: This change is necessary because the current text is too limiting. The areas of usage for Surface Nonmetallic Raceways within the hazardous (Classified) locations Articles in the Code are broader. The current text may limit the use of Surface Nonmetallic Raceways, by an AHJ, because the Surface Nonmetallic Raceways Article itself does not recognize the broader permissions. The proposed text is preferred to a laundry list of section references.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-175 Log #1925 NEC-P08 **Final Action: Accept**
(388.30)

Submitter: William Wagner, Certification Solutions
Recommendation: Add 388.30 as follows:
388.30 Securing and Supporting. Surface nonmetallic raceways shall be supported at intervals in accordance with the manufacturer's installation instructions.
Substantiation: The listing standards for both nonmetallic surface raceway and surface metal raceway require that they be provided with installation instructions indicating the method of securement. Therefore, in order to establish uniformity between Articles 386 and 388, 388.30 should be added.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-176 Log #1926 NEC-P08 **Final Action: Accept**
(388.56)

Submitter: William Wagner, Certification Solutions
Recommendation: Revise 388.56 as follows:
388.56 Splices and Taps. Splices and taps shall be permitted in surface nonmetallic raceways having a ~~removable~~ cover that is accessible after installation. The conductors, including splices and taps, shall not fill the raceway to more than 75 percent of its area at that point. ~~Splices and taps in surface nonmetallic raceways without removable covers shall be made only in boxes.~~ All splices and taps shall be made by approved methods.
Substantiation: 388.6 of the National Electrical Code requires that surface nonmetallic raceway and associated fittings be listed. The listing standard for these products states that the cover for a raceway or fitting shall be constructed and installed so that it is capable of being removed or opened. For the purposes of the application of 388.56 there is no difference between raceway that has a cover that can be removed and one that has a cover that can be opened. Therefore, the references in 388.56 to raceway without a removable cover are contradictory and should be revised accordingly.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
DABE, J.: The current text is necessary so that splices are not made in the portions of Surface Nonmetallic Raceways that are made inaccessible by 388.10(2) unbroken extensions through walls and floors.

8-177 Log #959 NEC-P08 **Final Action: Reject**
(388.60)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Where an equipment grounding conductor is ~~required~~ provided , a separate equipment grounding conductor shall be installed in the raceway.
Substantiation: Where equipment is not required to be grounded, but grounded by choice, present wording does not preclude an EGC installed in any manner, and if not in the raceway is not covered by 250.120(A). Code provisions are not limited to mandatory requirements and 110.12 applies to all wiring. 250.1(1) indicates Article 250 covers installations "permitting" and the proposal would correlate this section.
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are addressed in Section 300.3(B) for equipment grounding conductors that are provided but not required.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 390 — UNDERFLOOR RACEWAYS

8-178 Log #1051 NEC-P08 **Final Action: Reject**
(390.6)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second sentence as follows:
For the purpose of this section, so-called loop wiring (continuous unbroken conductor connecting the individual outlets) or connection to feed-through terminals shall not be considered a splice or tap.
Substantiation: Where conductors are terminated on terminals designed for feed-through connections but are not unbroken, it seems reasonable not to consider this type connection a splice or tap, also.
Panel Meeting Action: Reject
Panel Statement: The Code is clear as to intent that splices or taps will only be allowed in junction boxes. The exception allows splices in removable accessible covers. Loop wiring is continuous and unbroken, where using the terminals on a device to join two wires is a splice. Splices are made in junction boxes not only to have access but also to limit the affects of arcing.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-179 Log #1055 NEC-P08 **Final Action: Reject**
(390.17 Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add a new Exception as follows:
Exception: Where more than one outlet is individually supplied by a set of conductors on the same circuit, it shall be permitted to count only one set of current-carrying conductors of that circuit for derating purposes.
Substantiation: The present derating factors discourages individual sets of conductors to outlets on the same circuit, which results in loop wiring and a tendency to violate 390.7 since inspection is not generally required to remove wiring. The proposal would improve efficiency, reduce voltage drop and heating of conductors.
Panel Meeting Action: Reject
Panel Statement: The current text is clear. It is the intent of the panel to have the adjustment factors of 310.15(B)(2) apply to underfloor raceways.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 392 — CABLE TRAYS

8-180 Log #2840 NEC-P08 **Final Action: Accept in Principle**
(392.3 and 392.4)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal in the reorganization of Article 392. This action will be considered by the Panel as a Public Comment.
Submitter: Robert P. McGann, City of Cambridge
Recommendation: Move:
392.3 to 392.10
392.4 to 392.12
Relocate and renumber existing 392.10 and 392.12.
Substantiation: To comply with numbering system in Chapter 3.
Panel Meeting Action: Accept in Principle
Panel Statement: Article 392 is renumbered for consistency with the rest of the document. The panel's intent was that there were no technical changes made. The submitter's intent was met.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
LOYD, R.: I believe the proposal to rewrite Article 392 has merit, however, it is incomplete as submitted. Editorial changes to align its numbering with the raceway articles can be completed during the comment period. Therefore, I support the proposal and hope the work can be completed.

8-181 Log #23 NEC-P08 **Final Action: Reject**
(392.3(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for Comment.
Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
~~Multipurpose and~~ communications cables
Substantiation: Panel 16 eliminated multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.
Panel Meeting Action: Reject
Change the reference to "Table"
Panel Statement: CMP 8 is uncomfortable with the removal of the term "Multipurpose" since there are other articles that have this in their text, i.e. 800.133(A)(1)(b).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-182 Log #67 NEC-P08 **Final Action: Reject**
(Table 392.3(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action taken on Proposal 16-181. This action will be considered by the Panel as a Public Comment.
Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise the columns "Wiring Method" and "Article" as shown below.

Table 392.3(A) Wiring Methods

Wiring Method		
Armored cable	Article	Section
CATV cables	320	
CATV raceways	820	
Class 2 & 3 cables	820	
Communications cables	725	
Communications raceways	800	
Electrical metallic tubing	800	
Electrical nonmetallic tubing	358	
Fire alarm cables	362	
Flexible metal conduit	760	
Flexible metallic tubing	348	
Instrumentation tray cable	360	
Intermediate metal conduit	727	
Liquidtight flexible metal conduit	342	
Liquidtight flexible nonmetallic conduit	350	
Metal-clad cable	356	
Mineral-insulated, metal-sheathed cable	330	
Multiconductor service-entrance cable	332	
Multiconductor underground feeder and branch-circuit cable	338	
~~Multipurpose and communications cables~~	340	
Network-powered broadband communications cables	~~800~~	-
Nonmetallic-sheathed cable	830	
Non-power-limited fire alarm cable	334	
Power and control tray cable	760	
Power-limited fire alarm cable	336	

	Article	Section
Power-limited tray cable	760	
Optical fiber cables	725	725.61(C) and 725.82(E)
Optical fiber raceways	770	
Other factory-assembled, multiconductor control, signal, or power cables that are specifically approved for installation in cable trays	770	
Rigid metal conduit		
Rigid nonmetallic conduit	344	
Signaling raceway	352	

Substantiation: Panel 16 eliminated multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. The following cables and raceways should be added to the table in order to make it complete: CATV cables, CATV raceways, Class 2 & 3 cables, signaling raceways and network-powered broadband cables.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-181. Additionally, the panel notes that there are errors in the table submitted.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-183 Log #1927 NEC-P08 **Final Action: Accept in Principle in Part**
(392.3(A))

Submitter: William Wagner, Certification Solutions
Recommendation: Revise the last line of Table 392.3(A) as follows:
Rigid ~~nonmetallic~~ polyvinyl chloride conduit 352
High density polyethylene conduit 353
Reinforced thermosetting resin conduit 355
Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100, the revised Article 352 for Type PVC Conduit and the new Article 355 for RTRC. It clarifies that the broad designation of rigid nonmetallic conduit (Type RNC) includes PVC HDPE and RTRC and specifies each acceptable raceway type that is covered by a separate Code Article as a separate line item.
Panel Meeting Action: Accept in Principle in Part
Revise the last line of Table 392.3(A) as follows:
~~Rigid~~ ~~nonmetallic~~ polyvinyl chloride PVC conduit 352
~~High density polyethylene conduit 353~~
~~Reinforced thermosetting resin conduit~~ RTRC 355
Panel Statement: The submitter's intent was met. The committee rejected the HDPE conduit because it is not permitted for use in cable trays.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-184 Log #2624 NEC-P08 **Final Action: Reject**
(392.3(F) (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add a new section to 392.3 to read as follows:
392.3 Uses Permitted.
(F) Cable Tray in a Plenum. Metal cable tray systems, including, but not limited to solid bottom metal cable trays systems with solid metal covers, are permitted to be used in ducts, plenums, and other air-handling spaces to support those wiring methods defined in 300.22 and to support raceway and cable types permitted for such use elsewhere in this code. Solid bottom metal cable trays systems with solid metal covers shall be permitted to be used in ducts, plenums, and other air-handling spaces to support other types of cables, conductors, raceways not defined in 300.22.
Substantiation: This proposal is a companion proposal for 392.4. This new language clarifies the use of Cable Trays systems in plenum application. 300.22(C)(1) makes it clear that solid bottom metal cable tray systems with solid covers are permitted to be used with nonplenum rated cables and raceways. Other types of metallic cable trays system such as ladder or ventilated are permitted to be used with those wiring methods defined in 300.22 and the raceways and cables found in Chapters 7 and 8.
Panel Meeting Action: Reject
Panel Statement: The panel's understanding is that they cannot evaluate the technical merits of this proposal because of a Standards Council directive. The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-185 Log #265 NEC-P08 **Final Action: Reject**
(392.4)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Cable tray systems shall not be used in hoistways or where subject to severe ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
I might suggest you consider whether what you really want to say is severe *abuse* or *blows* (or some synonym), that could result in damage, but I defer to your cable tray expertise.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-186 Log #2126 NEC-P08 **Final Action: Reject**
(392.4)

Submitter: Thomas F. Mueller, Southern Company Services
Recommendation: Revise second sentence as follows:
Cable tray systems shall not be used in ducts, plenums, and other air-handling spaces, except as permitted in 300.22 where installed behind panels designed to allow access , to support wiring methods recognized for use in such spaces.
Substantiation: 300.22 allows installation of wiring in ducts and plenums where the wiring is not exposed or accessible. This conflicts with the exposed and accessible provisions of 392.6(H). The change will eliminate conflicting requirements and require the tray installation to meet the exposed and accessible requirements.
Panel Meeting Action: Reject
Panel Statement: The current text is clearer than the proposed text. Cable trays are required to comply with 392.4 and 392.6(H), except as permitted by 392.6(G). For example, it is the panel's intent that cable trays behind panels designed to allow access, and in other air handling spaces, be permitted to go through a wall when installed in compliance with all applicable code articles.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-187 Log #2625 NEC-P08 **Final Action: Reject**
(392.4)

Submitter: David H. Kendall, Carlon
Recommendation: Revise section to 392.4 to read as follows:
392.4 Uses Not Permitted.
Cable tray systems shall not be used in hoistways or where subject to severe physical damage. ~~Cable tray systems shall not be used in ducts, plenums, and other air handling spaces, except as permitted in 300.22, to support wiring methods recognized for use in such spaces.~~
Substantiation: This proposals a companion proposal for 392.3. This section was revised to remove the statement that cable trays cannot be used in plenum since that metal cable trays are permitted per 300.22.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-184.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-188 Log #3100 NEC-P08 **Final Action: Reject**
(392.4)

Submitter: Donald Hall, Corning Cable Systems
Recommendation: This proposal may be considered as an alternate to my proposal to revise 300.22 or it may be considered in addition to acceptance of my proposal to revise 300.22.

Revise text as follows:

392.4 Uses Not Permitted.

Cable tray systems shall not be used in hoistways or where subject to severe physical damage. Nonmetallic ~~C~~ cable tray systems shall not be used in ducts, plenums, and other air-handling spaces ~~, except as permitted in 300.22, to support wiring methods recognized for use in such spaces~~ .

Substantiation: The existing reference to 300.22 adds no value and is confusing users of the Code. Because of this reference, code users are concluding that metallic tray systems can only be used in ducts, plenum, and other air handling spaces if they have solid bottoms and solid metal covers. This is not the intent of 392.4 or 300.22. The commentary to 392.4 in the NEC handbook correctly identifies the Code's intent by stating,

"Section 300.22 specifically limits the types of wiring methods that may be used within other spaces used for environmental air. Metallic cable trays may be used within these spaces to support only the recognized wiring methods permitted in these spaces. The cable tray types may be ladder ventilated trough, ventilated channel, or solid bottom. Metal cable trays are not the limiting factor; rather the cable or wiring method is the limiting factor".

392.4 addresses the use of trays as support structures .

300.22 refers to wiring methods . It allows "other types of cables and conductors", meaning those which 300.22 does not specifically mention by name, to be placed in various types of raceway, in metal wireway with metal covers, or in metallic trays having solid bottoms and solid metal covers. It does not require metal trays to have solid bottoms or solid metal covers unless the trays contain "other types of cables or conductors" which are not listed for use in that space. Furthermore, although "other cables and conductors" is inclusive of the various types of low voltage cable described in Articles 725, 760, 800, 820, and 830, these articles all contain sufficiently clear language explaining that plenum rated cables may be installed within other air-handling spaces without compliance to 300.22. Therefore, if a metal tray used in "other air-handling spaces" is used to support only wiring methods permitted in that space, there is no requirement or reason for them to have solid bottoms or solid metal covers.

Other proposals may be submitted which would propose to address this issue by adding text to Articles 725, 760, 800, 820, and 830 explicitly permitting the use of metal trays without solid bottom and solid metal covers. Since these other articles are not the source of the confusion and since these trays are already permitted to be used, it is more desirable to change 300.22 and/or 392.4 which are the source of confusion.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-184.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-189 Log #144 NEC-P08 **Final Action: Reject**
(392.6)

Submitter: Gary Wilson, Albert Garandy & Associates, Inc.
Recommendation: Revise as follows:

~~Sufficient Space~~ (Cable trays) shall be provided and maintained (12- 18 inches of workable clearance) about cable trays to permit adequate access for installing and maintaining the cables.

Substantiation: One of the biggest problems with the NEC is interpretation. On a recent project, we needed to stack 2 rows of 3.36 inch trays. A long discussion ensued dealing with how much workable space to leave between cable trays. By giving a specific length of 12 to 18 inches, it will eliminate confusion and make a project more efficient.
Panel Meeting Action: Reject
Panel Statement: The submitter did not supply substantiation to justify the dimensions (12 to 18 inches) in the proposal. The intent of the current text is clear and allows judgment by the designer/installer and AHJ.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-190 Log #321 NEC-P08 **Final Action: Reject**
(392.6)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

"...the conductors shall be secured to the cable tray(s) at the transition and they shall be protected, by guarding or by location, from ~~physical~~ damage.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)

Let's take care of that for good: for our purposes, "damage" means "physical damage."

I might suggest you consider whether what you really want to say is severe *abuse* or *blows* (or some synonym), that could result in damage, but I defer to your cable tray expertise.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-191 Log #1181 NEC-P08 **Final Action: Reject**
(392.7)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.
Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:

Metallic cable tray that supports electrical conductors shall be grounded and bonded ~~as required for conductor enclosures in accordance~~ ~~with 250.96.~~ The provisions of 250.86 shall not apply.

Substantiation: Edit. 250.96 relates to bonding, not grounding. Since cable tray may be perceived as a type of (partial) enclosure, 250.86 Exception No. 2 may apply. The requirement to be grounded and bonded requires compliance with Article 250.
Panel Meeting Action: Reject
Panel Statement: The current text is clearer than the proposed text. By meeting the requirements of 392.7, which refers to 250.96, the cable tray will both be bonded and grounded.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

GRIFFITH, M.: The submitter is correct that 250.96, referenced in the existing text, describes specific methods for bonding and is not an appropriate reference for grounding. The submitter's proposed "fix", however, is believed to be only partly correct. Panel vote, therefore, should have been to "Accept in Principle in Part" with the following Panel Action:

Revise 392.7 as follows:

"Metallic cable tray that supports electrical conductors shall be grounded and bonded. Bonding shall be as required for conductor enclosures in accordance with 250.96."

8-192 Log #2755 NEC-P08 **Final Action: Reject**
(392.8(A))

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: Revise the paragraph to prohibit cables from projecting above the side rails with the paragraph to read as follows:

(A) Cable and Splices. Cable splices shall be permitted where accessible and where made and insulated by approved methods. ~~shall be permitted to be located within a cable tray, provided they are accessible and do~~ Cable and splices shall not project above the side rails except at points where a cable enters or leaves a cable tray .

Substantiation: There is no rule limiting the height of cables in a cable tray. Where cables are permitted to be in multiple layers, they are permitted to be stacked above the side rails. This is especially a problem where cables are added to an existing cable tray system. There must be an exception where cables enter or leave a cable tray from the top. Sometimes it is not practical to keep a splice completely below the top of the side rail when a splice is made at a tap point where the tap is leaving the cable tray.
Panel Meeting Action: Reject
Panel Statement: The existing text allows for safe work practices, and the proposed text doesn't increase safety. See panel action and substantiation on Proposal CP800.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

GRIFFITH, M: Although I am in agreement with panel action on this panel proposal, a revision to the proposed wording is suggested as follows:

"(A) Cable Splices. Cable splices made and insulated by approved methods shall be permitted to be located within a cable tray, provided they are accessible. Splices that are subjected to physical damage shall not project above the tray side rails."

KENDALL, D: Section 392.8(A) should read as follows:
(A) Cable Splices. Cable splices made and insulated by approved methods shall be permitted to be located within a cable tray, provided they are accessible.
Splices that are subject to physical damage shall not project above the side rails.

8-192a Log #CP800 NEC-P08 **Final Action: Accept**
(392.8(A))

Submitter: Code-Making Panel 8,
Recommendation: Modify existing 392.8(A) as follows:
(A) Cable Splices. Cable splices made and insulated by approved methods shall be permitted to be located within a cable tray, provided they are accessible and do not project above the side rails where the splices are subject to physical damage .
Substantiation: The Panel believes the present wording is unnecessarily restrictive and does not currently allow proven installation practice.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
GRIFFITH, M: Although I am in agreement with panel action on this panel proposal, a revision to the proposed wording is suggested as follows:
"(A) Cable Splices. Cable splices made and insulated by approved methods shall be permitted to be located within a cable tray, provided they are accessible. Splices that are subjected to physical damage shall not project above the tray side rails."
KENDALL, D: Section 392.8(A) should read as follows:
(A) Cable Splices. Cable splices made and insulated by approved methods shall be permitted to be located within a cable tray, provided they are accessible.
Splices that are subject to physical damage shall not project above the side rails.

8-193 Log #268 NEC-P08 **Final Action: Reject**
(392.8(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(C) Bushed Conduit and Tubing. A box shall not be required where cables or conductors are installed in bushed conduit and tubing used for support or for protection against ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
I might suggest you consider whether what you really want to say is severe *abuse* or *blows* (or some synonym), that could result in damage, but I defer to your cable tray expertise.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-194 Log #3129 NEC-P08 **Final Action: Accept**
(392.9(A)(1))

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: Add a new sentence to deal with the case where a single layer of cables are installed with a maintained spacing between each cable with the last sentence to read as follows:
"... Where cable ampacity is determined according to 392.11(A)(3), the cable tray width shall not be less than the sum of the diameters of the cables and the sum of the required spacing widths between the cables .
Substantiation: As the rule stands now, the cable tray is not required to be wide enough for the cables to be installed. There is a problem with cables being added to cable trays during remodeling and there needs to be enough flags in the Code language to indicate that cables are deliberately installed with a maintained spacing with the ampacity determined accordingly. Personnel doing remodeling are not necessarily aware of the rules that applied when the conductors were first installed.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-195 Log #381 NEC-P08 **Final Action: Accept**
(392.10(A)(2))

Submitter: Brian Dolan, IBEW/NECA Technical Institute
Recommendation: Revise text to read:
"Where all of the cables are from 250 kcmil up to 1000 through 900 kcmil,...".
Substantiation: The present wording is confusing. The reader must look elsewhere to determine whether a 1,000 kcmil cable is included in the phrase "up to 1,000". In addition, the wording proposed is consistent with the wording of 392.10(A)(4) and 392.11(B)(2).
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-196 Log #3085 NEC-P08 **Final Action: Reject**
(392.11(A)(3))

Submitter: Christel Hunter, Alcan Cable
Recommendation: Revise text to read as follows:
(3) Where multiconductor cables are installed in a single layer in uncovered trays, with a maintained spacing of not less than one cable diameter between cables, the ampacity shall not exceed the allowable ambient temperature-corrected ampacities of multiconductor cables, with not more than three ~~insulated~~ current-carrying conductors rated 0 through 2000 volts in free air, in accordance with 310.15(C).
Substantiation: There is a wording inconsistency within 392.11(A) that affects its application. This change would make 392.11(A)(3) consistent with the wording in 392.11(A)(1).
Panel Meeting Action: Reject
Panel Statement: Section 392.11(A)(1) refers to derating criteria and has a correct reference to current carrying conductors, whereas 392.11(A)(3) and FPN correctly refer to Ampacity Table B.310.3, which covers "insulated conductors".
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-197 Log #2703 NEC-P08 **Final Action: Accept in Principle**
(392.11(C))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:
392.11(C) Combinations of Multiconductor and Single-Conductor Cables. Where a cable tray contains a combination of multiconductor and single-conductor cables, the allowable ampacities shall be as given in 392.11(A) for multiconductor cables and 392.11(B) for single-conductor cables, provided that:
(1) The sum of the multiconductor cable fill area as a percentage of the allowable fill area for the tray calculated per 392.9, and the single-conductor cable fill area as a percentage of the allowable fill area for the tray calculated per 392.10, totals not more than 100%.
(2) Multiconductor cables are installed according to 392.9 and single-conductor cables are installed according to 392.10.
Substantiation: Existing NEC does not provide guidance for installation for a combination of multiconductor and single-conductor cable in the same tray. This proposal clarifies that multiconductor and single-conductor cable installed in the same tray shall not exceed the fill requirements for each type of cable as if installed in its own tray and that all installation requirements and ampacity limits for each cable type apply.
Panel Meeting Action: Accept in Principle
Revise text to read:
392.11(C) Combinations of Multiconductor and Single-Conductor Cables. Where a cable tray contains a combination of multiconductor and single-conductor cables, the allowable ampacities shall be as given in 392.11(A) for multiconductor cables and 392.11(B) for single-conductor cables, provided that:
(1) The sum of the multiconductor cable fill area as a percentage of the allowable fill area for the tray calculated per 392.9, and the single-conductor cable fill area as a percentage of the allowable fill area for the tray calculated per 392.10, totals not more than 100%.
(2) Multiconductor cables are installed according to 392.9 and single-conductor cables are installed according to 392.10 and 392.8(D) and (E).
Panel Statement: The phrase " and 392.8(D) and (E)" was added to more completely address the submitter's intent.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 394 — CONCEALED KNOB-AND-TUBE WIRING

7-102 Log #1048 NEC-P07 **Final Action: Reject**
(394.19(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add "or flexible nonmetallic loom" after "tubing".
Substantiation: Edit. Loom should also be suitable, and may not be perceived as tubing.
Panel Meeting Action: Reject
Panel Statement: "Loom" is a generic term and is not defined or used anywhere else in the Code. Flexible nonmetallic tubing for electrical wiring is the true historical term.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 396 — MESSENGER SUPPORTED WIRING

7-103 Log #2795 NEC-P07 **Final Action: Accept**
(Table 396.10(A))

Submitter: George Straniero, AFC Cable Systems
Recommendation: In Table 396.10(A) Add " <u>Medium Voltage Cable</u> " under the "Cable Type" Column and add " <u>328</u> " under the "Article" Column.
Substantiation: Medium Voltage Cable Section 328.10(5), under uses permitted, includes messenger supported Wwiring. Table 396.10(A) specifies the cable types permitted to be installed in messenger supported wiring. The table should be revised to include the permitted use of medium voltage cable.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-104 Log #333 NEC-P07 **Final Action: Reject**
(396.12)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Uses Not Permitted. Messenger supported wiring shall not be used in hoistways or where subject to ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-105 Log #2426 NEC-P07 **Final Action: Accept**
(396.12(B))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be referred to Code-Making Panels 4, 5, and 19 for comment.
The Technical Correlating Committee directs that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.
Recommendation: Rearrange Section and add new.
396.12 Uses Not Permitted.
(A) (move existing sentence to here) Messenger supported wiring shall not be used in hoistways or where subject to physical damage.
(B) (new) The messenger shall not be used as a continuous current carrying conductor such as a neutral conductor.
Substantiation: This panel is to be complemented for their insight in accepting this proposal at this time during the last cycle.
Addressing the comments from the previous Code cycle, 2005 ROC.
"In certain instances, the messenger is permitted to be a current carrying conductor. For example, the Exception to 225.4 and Exception No. 2 to 250.184(A) make it clear that a bare messenger conductor is permitted to be a current carrying conductor for certain conditions. Acceptance of this proposal would create a conflict with other provisions of the Code." A proposal is being submitted to Code Making Panel 4 to eliminate the phrase, "and grounded circuit conductors"
In addition, a proposal is being submitted to Code Making Panel 5 to eliminate the exceptions 1 and 2 to 250.184 (A) (1) as these two exception are contribution to the death of cows and pigs and shocking humans since exercising these two exceptions results in on farm stray current being generated and stray current producing electrical shocks in swimming pools, showers, hot tubs, etc.
Zipse's Law states "In order to have and maintain an electrical installation safe from electrical shocks and to prevent electrocution from stray current:: All continuously, flowing current shall be contained within a conductor, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth." This is accomplished within industrial facilities since they do not make the bastardized electrical transformer connection between the primary neutral and the secondary neutral which allows the continuous flow of dangerous and hazardous high voltage neutral current over the earth and ground conductors.
Now as far as the previous comment about ice and snow breaking the messenger, the commenter forgot that the neutral is connected to the ground conductor in the service entrance panel. Therefore, there would be no lost of ground if the messenger broke.
The messenger has been used for three dissimilar functions:
1. As a messenger used to support insulated conductors.
2. As a ground or equipment grounding conductor.
3. As a continuous current carrying neutral conductor.
Approximately 35 years ago the panel that had metallic house trailers and travel trailers realized the combining of the equipment ground conductor with the continuous current carrying neutral as in a cable connecting electrical power to the metallic trailers which had the two conductors combined into one and was connected to the metallic frame, grounding the frame resulted in stray neutral current flowing on the metallic surfaces. When someone standing in water touched the metallic side, they were either shocked or electrocuted.
The panel, one of the more astute panels with keen insight and perception, required the separation of the equipment grounding conductor or ground conductor from the continuous current carrying neutral conductor. Insulated phase(s) conductor(s) were still required, but then an insulated neutral conductor and a separate equipment-grounding conductor were required. This could be referred to as a 3-wire replaced with a 4-wire safe connection.
The next code cycle the marina panel required 4-wire connections. However, panel 5, was very slow to realize dangers associated with combining of the continuous current carrying neutral and the equipment-grounding conductor and it took Panel 5, 21 years to require ranges and dryer to be wired with 4-wires, separating the continuous current carrying neutral conductor from the equipment-grounding conductor. This became code in 1996.
The next logical step in the progression of safety for the public is separation in the section for the messenger.
However, you no doubt are concern about this change after many, many years of unsafe wiring 3-wire messenger cable. The safer 4-wire, 2 phase conductors, (3 rd) an insulated neutral and a (4 th) combination ground / equipment-grounding conductor combined with the messenger where it connects with the utilities unsafe 3-wire service drop. Let the utilities make the error of combining the neutral and the ground and the messenger together. At least the NEC will be clean and free from future potential legal action.
Someone has to make the first move and let it be the more safer code, the NEC to do so. With your action, the NESC code cycle follows the NEC and that will allow them your concern for safety. The NESC will have to "you know What" or get off the pot.
In previous cycles, changes have been proposed to both the NESC and the NEC allowing 4-wire service. In the case of the NESC, it was worded that the customer would pay for the 4 th conductor.
Concern pervades the industry about stray current and cows. Cows are much more sensitive to stray current than humans. However, as the electrical load increases more and more humans will be experiencing electrical shocks and possible electrocutions.
Stray current has contributed to the death of 5 cows per day on one dairy farm. This lasted for over a year before stray current was realized.
Go to <u>www.app.com</u> and scroll down to "stray voltage and read about the many persons in NJ who are experiencing electric shocks from stray current. In fact, one family was told by the utility not to let their 3 boys play bare foot in their own back yard. This lasted all summer, in addition the inability to use their own above ground swimming pool and their hot tub lasted all summer and fall and the utility has yet to find and fix the problem.
Now I have come across a case where persons in a swimming pool complained about bugs biting them under the water. All electric power was turned off to the pool. Not confirmed that one person while trying to climb out of the pool muscles froze. It is preliminarily assumed another boy's muscles froze while in the water and after he was found, missing, the dark and cloudy pool was dragged. He was found dead.

Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 3
Explanation of Negative:
ADAMS, M.: Messengers are widely used as current carrying conductors for applications such as overhead service-entrance conductors and feeders between industrial buildings. The submitter's substantiation is not sufficient to ban this common practice. NECA recommends that the NEC Technical Correlating Committee refer this proposal to CMP 5 and CMP 19 for information.
CANGEMI, J.: This proposal should be rejected. Presently, a bare messenger is permitted to serve as a current carrying conductor in given situations. Examples of areas of concern are sections 225.4, 250.32(B) and 250.184(A). Considering the forgoing, CMP-7 should reject the proposal since there appears to be a correlation issue, and jurisdiction of the material in question falls under the purview of CMP-4 and CMP-5.
RAY, J.: This proposal should be rejected. The proposal should be forwarded by the Technical Correlating Committee to Panel 5 for action. The submitter's intent is to prohibit the use of the messenger from ever being a current carrying conductor. 250.32(B)(1) and 250.32(B)(2) clearly set forth the rules for when this conductor can be a grounding conductor and when it can be a grounded conductor. Acceptance of this proposal would negate these applicable grounding rules when this wiring method is used. Article 396 should be used to determine the use, installation, and construction specifications for messenger supported wiring. Article 250 should be used to determine the grounding requirements.
Comment on Affirmative:
ROGERS: Code Panel 4 and Code Panel 5 action, as outlined in this proposal, will have an impact on whether this should be accepted.
SCHUMACHER, D.: The panel was correct in accepting this, the bare messenger conductor should not be a current carrying conductor.

7-106 Log #3361 NEC-P07 **Final Action: Accept**
(396.60)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be referred to Code-Making Panels 4, 5, and 19 for comment.
The Technical Correlating Committee directs that further consideration be given to the comments expressed in the voting and that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Insert the following sentence at the end:
The messenger shall not be used as a current-carrying conductor unless used as a grounded conductor in accordance with 250.32(B)(2).
Substantiation: This application has been in routine use since the earliest days of the NEC. See, for example, the NFPA staff comments in the NEC Handbook at 225.4. However, a close reading of many sections of the NEC reveals that no explicit permission to use this procedure now exists, however obvious the intent in 225.4 Exception. This proposal supplies the specific permission that 225.4 Exception intends correlation with, and that does not, as of yet, exist elsewhere in the NEC. This simple proposal prevents the unintended obstruction of an allowance that goes back almost a century.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 2
Explanation of Negative:
CANGEMI, J.: See my explanation of negative vote on Proposal 7-105.
RUNYON, G.: The panel should have voted to Reject this proposal based on their acceptance of Proposal
7-105 which will prohibit the use of the messenger to be used as a current carrying conductor.
Comment on Affirmative:
RAY, J.: Panel action on Proposal 7-105 is in conflict with action taken on this proposal.

ARTICLE 398 — OPEN WIRING ON INSULATORS

7-107 Log #267 NEC-P07 **Final Action: Reject**
(398.15(A))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(A) Dry Locations. In dry locations, where not exposed to severe ~~physical~~ damage, conductors shall be permitted to be separately enclosed in flexible nonmetallic tubing.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
I might suggest you consider whether what you really want to say is severe *abuse* or *blows* (or some synonym), that could result in damage, but I defer to your cable tray expertise.
Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate, since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

7-108 Log #322 NEC-P07 **Final Action: Reject**
(398.15(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Where open conductors cross ceiling joists and wall studs and are exposed to ~~physical~~ damage, they shall be protected by one of the following methods.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

8-198 Log #266 NEC-P08 **Final Action: Reject**
(398.15(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Conductors within 2.1 m (7 ft) from the floor shall be considered exposed to ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an

eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 400 — FLEXIBLE CORDS AND CABLES

6-72 Log #2587 NEC-P06 **Final Action: Reject**
(400)

TCC Action: The Technical Correlating Committee advises that the location of Articles is the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Relocate Article 400-Flexible Cords and Cables, to Chapter 3, Wiring Methods and Materials.
Substantiation: Flexible cords are a means to connect to utilization equipment. They are used where flexibility is required, much like flexible metal conduit and other wiring methods. The parallel numbering system utilized in Chapter 3 and adopted by the 2002 NEC would translate well to this article.
Panel Meeting Action: Reject
Panel Statement: Chapter 3 addresses general wiring methods whereas Chapter 4 addresses more limited applications as permitted in 400.7.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
CLINE, S.: Sorry gentlemen, but I still disagree. - "Flexible Cords and Cables" - These are common, everyday conductors. Can you think of a building which does not have many them? Their limitations of allowable installation/application are well defined in the existing text. However it occurred in the Code's history, the text is just in a place which seems wrong to me.
The title of Chapter 3 is "Wiring Methods and Materials"; the title of Article 300 is "Wiring Methods"; and I. Of Article 300 is "General Requirements." Chapter 4 is "Equipment for General Use"; I don't think conductors belong there. If the cords and cables are indeed "General" as indicated by the title of Chapter 4, then don't they belong in Chapter 3?

6-73 Log #815 NEC-P06 **Final Action: Accept**
(Table 400.4)

Submitter: Austin D. Wetherell, Underwriters Laboratories, Inc.
Recommendation: In the 6th column (Insulation), the horizontal line which is now located between HSJ and HJSO, should be moved down so that it is located between HSJO and HSJOO and so that the words "Oil-resistant thermoset" remain below that line and adjacent to HSJOO.
Substantiation: As the table currently reads, it indicates that HSJO has oil resistant insulation, which it does not. As with the other Types throughout this table, a single "O" means oil resistant jacket, two "O"s means oil resistant insulation and jacket. Moving the line down as proposed would fix this error in the Table.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-74 Log #2282 NEC-P06 **Final Action: Accept**
(Table 400.4)

Submitter: Susan L. Stene, Underwriters Laboratories
Recommendation: Excerpt from current Table 400.4 (see following page)
Substantiation: SPT-1W and SPT-2W show "2 or 3" conductors. In UL 62, The Standard for Flexible Cords, they are restricted to only 2 conductors, since they are only for use in Decorative Lighting strings where there are no 3-wire applications.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-75 Log #816 NEC-P06 **Final Action: Accept**
(Table 400.4 & Note 6 to Table 400.4)

Submitter: Austin D. Wetherell, Underwriters Laboratories, Inc.
Recommendation: 1. In Table 400.4, a second column, remove "See Note 6" from Types NISP-1, NISP-2, SP-1, SP-2, SP-3, SV, SVE, SVEO, SVEOO, SVT, and SVTO.
2. Revise the first sentence of Note 6 to Table 400.4 to read:
"The third conductor in Type HPN shall be used for equipment grounding purpose only."
Substantiation: Note 6 currently specifies that the third conductor of the parallel cords (e.g., NISPT-1, SPE-2) and vacuum cleaner cords (e.g., SV, SVTO) is for grounding only. However, UL 62, the ANSI approved Standard for Flexible Cords, permits a 3-conductor, nongrounding version of these cords and has done so for many years. The first sentence of Note 6 should only pertain to Type HPN cord. The second sentence of Note 6 permits a thermoset-insulated grounding conductor on thermoplastic-insulated parallel types. Thermoset types already have that option.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-76 Log #2281 NEC-P06 **Final Action: Accept**
(Table 400.5(A))

Submitter: Susan L. Stene, Underwriters Laboratories
Recommendation: Revise Table 400.5(A) to read:
(see table below)
Substantiation: Manufacturers are producing 15 AWG and 17 AWG cords for use in cord sets and power supply cords. The ampacity values have not been stated, as there were previously no manufacturers of these cords. In addition, the "_" makes it appear that these sized cords cannot be manufactured.
The value used for the 15 AWG conductors is the same as that found in UL 1659, the Standard for Attachment Plug Blades for Use in Cord Sets and Power Supply Cords. The other ampacity values were interpolated using the values for one size smaller and larger conductors.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

[Proposal 6-76 (Log #2281)]

Size (AWG)	Thermoplastic Types TPT, TST	Thermoplastic Types ET, ETLB, ETP, …, SVT, SVTO, SVTOO		Types HPD, HPN, HSJ, HSJO, HSJOO
		A*	B*	
27*	0.5	—	—	—
20	—	5**	***	—
18	—	7	10	10
17	—	9	12	13
16	—	10	13	15
15	—	12	16	17
14	—	15	18	20
12	—	20	25	30
10	—	25	30	35
8	—	35	40	—
6	—	45	55	—
4	—	60	70	—
2	—	80	95	—

Proposal 6-74 (Log #2282)

Trade Name	Type Letter	Voltage	AWG or Kcmil	Number of Conductors	Insulation	Nominal Insulation Thickness AWG or Kcmil	mm	mils	Braid On each Conductor	Outer Covering	Use		
All plastic parallel cord	SPT-1 See Note 6	300	20-18	2 or 3	Thermoplastic	20-18	0.76	30	None	None	Pendant or portable	Damp locations	Not hard usage
	SPT-1W See Note 6 See Note 13	300										Damp and wet loca-tions	
	SPT-2 See Note 6	300	18-16			18-16	1.14	45				Damp locations	
	SPT-2W See Note 6 See Note 13	300										Damp and wet loca-tions	
	SPT-3 See Note 6	300	18-10			18-16 14 12 10	1.52 2.03 2.41 2.80	60 80 95 110			Refrigerations, room air conditioners, and as permitted in 422.16(B)	Damp locations	Not hard usage

Proposal 6-74 (Log #2282) Proposed

Trade Name	*Type Letter*	*Voltage*	*AWG or Kcmil*	*Number of Conductors*	*Insulation*	*Nominal Insulation Thickness*			*Braid On each Conductor*	*Outer Covering*	*Use*		
						AWG or Kcmil	*mm*	*mils*					
All plastic parallel cord	SPT-1 ~~*See Note 6*~~	300	20-18	2 or 3	Thermoplastic	20-18	0.76	30	None	None	Pendant or portable	Damp locations	Not hard usage
	SPT-1W ~~*See Note 6*~~ See Note 13	300		2								Damp and wet locations	
	SPT-2 ~~*See Note 6*~~	300	18-16	*2 or 3*		18-16	1.14	45				Damp locations	
	SPT-2W ~~*See Note 6*~~ See Note 13	300		2								Damp and wet locations	
	SPT-3 ~~*See Note 6*~~	300	18-10	*2 or 3*		18-16 14 12 10	1.52 2.03 2.41 2.80	60 80 95 110			Refrigerations, room air conditioners, and as permitted in 422.16(B)	Damp locations	Not hard usage

6-77 Log #1592 NEC-P06 **Final Action: Accept**
(400.5(B))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 400.5(B) fourth paragraph:
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
On a 4-wire, 3-phase, wye circuit where the major portion of the load consists of nonlinear loads, there are harmonic currents present in the neutral conductor and the neutral conductor shall be considered to be a current-carrying conductor.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
LAIDLER, W.: See my Explanation of Negative Vote on Proposal 6-59.
Comment on Affirmative:
CLINE, S.: While I agree that the use of the word "neutral" itself demands change, that is a separate argument for another Panel.
I can agree that changing "wire" to "conductor" in either "3-wire" or "4-wire" is a different subject with different impacts in the trade, and should not be done here.
The addition of the word "conductor" after "neutral" will help to focus that the item being discussed is part of the circuit construction, not a point of connection in a piece of equipment. This section has a disjointed use diction which this will clear up.

6-78 Log #1593 NEC-P06 **Final Action: Accept**
(400.5(B))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 400.5(B) third paragraph:
Change "neutral" to "neutral conductor." Also change "wire" to "conductor."
The revised text would appear as follows:
In a 3-wire circuit consisting of two phase ~~wires~~ conductors and the neutral conductor of a 4-wire, 3-phase, wye-connected system, a common conductor carries approximately the same current as the line-to-neutral currents of the other conductors and shall be considered to be a current-carrying conductor.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Also, the word "wire" should be replaced by "conductor" for consistency.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
LAIDLER, W.: See my Explanation of Negative Vote on Proposal 6-59.
Comment on Affirmative:
CLINE, S.: While I agree that the use of the word "neutral" itself demands change, that is a separate argument for another Panel.
I can agree that changing "wire" to "conductor" in either "3-wire" or "4-wire" is a different subject with different impacts in the trade, and should not be done here.
The addition of the word "conductor" after "phase" and "neutral" will help to focus that the item being discussed is part of the circuit construction, not a point of connection in a piece of equipment. This section has a disjointed use diction which this will clear up.

6-79 Log #283 NEC-P06 **Final Action: Reject**
(400.5(B) Note 1)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
"And are not in ~~physical~~ contact with each other except in lengths...".
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. You're not going to be in solely electromagnetic contact for a length not to exceed two feet, after all, unless you have wonderfully precise shielding.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "contact" means "physical contact."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 6-54. The panel understands that this proposal refers to Table 400.5(B), Note 1.1
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-80 Log #3323 NEC-P06 **Final Action: Reject**
(400.7(A)(12))

Submitter: Jerry D. Cain, Charolais Coal No. 1 LLC
Recommendation: Add new text to read:
(12) Wiring supplying power to mobile office or storage trailers receiving power from a portable generator.
Substantiation: We commonly use box type trailers as office and storage units. We have recently added GFCI receptacles at regular intervals along each side to facilitate connecting engine block heaters on heavy equipment located at the mine site, each having an individual 20 amp 120 VAC Circuit.
Since these trailers are moved every few months to keep them close to the mining area, it is not practical to serve them in a permanent manner such as conduit or MC cable. I feel a better solution would be a Type W, G or other hard service cable routed in an area that affords it protection from damage. The cable can be reused upon moving similar to trailing cables on mining equipment.
Please note the fixed wiring on these trailers is conduit and device boxes, the only place the cable would be used is between the generator and the load center at the trailer.
Panel Meeting Action: Reject
Panel Statement: The proposed text is not necessary. The present language would permit the use of flexible cord or cable in the installation the submitter described.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-81 Log #1752 NEC-P06 **Final Action: Accept**
(400.7(A)(3) and 400.11 Exception No. 2)

Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Replace the term "portable lamp" with the term "portable luminaire". Revise text as follows:
400.7 Use Permitted
(A) Uses
(3) Connection of portable ~~lamps~~ luminaires , portable and mobile signs or appliances
400.11 In Show Windows and Show Cases
Exception No. 2: As supply cords for portable ~~lamps~~ luminaires and other merchandise being displayed or exhibited.
Substantiation: The term "luminaire" has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms "fixture" or "lighting fixture", which were terms for fixed lighting systems.
The term "portable luminaire" has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled "Portable Electric Lamps" and is now titled "Portable Electric Luminaires".
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-82 Log #3083 NEC-P06 **Final Action: Reject**
(400.8 Exception No. 2 (New))

Submitter: Joseph A. Hertel, Safety and Buildings
Recommendation: Revise as follows:
Uses not Permitted [NEC 400.8] This is an exception in addition to the exception in 408.4(4):
Exception No. 2: Flexible cords and cables permitted by 400.7(A) that are connected to sources other than busways shall be permitted to be attached to adequately supported equipment or building surfaces provided the type of cord or cable, the attachment to the building and equipment, and the support comply with the provisions of 368.56(B).
Substantiation: The exception to 400.8(4) permits cord drops to be attached to building surfaces in accordance with the provisions of 368.56(B). This allows cord drops to have a take-up only if they originated in a busway. The use of the language permitting the surface attachment should be extended to all installations permitted in 400.7(A).
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any technical substantiation for this new exception. The existing exception provides a deviation from the requirement that flexible cords and cables not be attached to building surfaces for a specific type of installation. Also see the first sentence of 400.8.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-83 Log #282 NEC-P06 **Final Action: Reject**
(400.8(7))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(7) Where subject to ~~physical damage~~ blows or abrasion .
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
The proposed rewording is an attempt at precision. Furthermore, some of the other prevented uses are there to avoid sources of physical damage. If you retain "damage," I would then have to fall back to arguing that in that case the term "physical" should be eliminated.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: As the submitter points out, the term "physical damage" has been used in the Code since 1959 and is more encompassing than the language recommended by the submitter.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-84 Log #981 NEC-P06 **Final Action: Reject**
(400.8(1) and (4))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
(1) As a substitute for ~~the fixed~~ wiring ~~of a structure~~ methods covered by 225.1 and 300.1(A) .
(4) Where attached to buildings or structures except as otherwise permitted by this Code .
Delete exception to (4).
Substantiation: Fixed wiring is not defined. Does it mean attached in place, "permanent" installations? Structures that are not "buildings" should be included in (4) and the proposed additional wording follows that of (6). Attachment to structures is also permitted by 590.4(J) and 620.21. Flexible cords are permitted as permanent (fixed) wiring by 525.20, 553.7(B) and 555.13(A) and for underwater lighting fixtures by 680.23(B).
Panel Meeting Action: Reject
Panel Statement: The term "fixed wiring" is well understood and accepted within the industry. The references to Chapters 5 and 6 modify the general rule in Chapter 4. 590.4(J) and 620.12 apply to limited applications. 525.20 is not applicable to fixed/permanent wiring; it addresses portable wiring. 553.7(B) limits portable wiring to those lengths where flexibility is required. Section 553.13(A) limits the use of portable cables. Section680.23(B) limits the use of portable cords or cables to wet-niche luminaires.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

(Note: Sequence 6-85 was not used)

6-86 Log #3362 NEC-P06 **Final Action: Reject**
(400.8(4) Exception)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise text to read:
Exception to (4): Flexible cord and cable shall be permitted to be installed in accordance with 368.56(B). For other applications, where the length of the cord from the supply termination to a suitable tension take-up device is limited to 2.5 m (8 ft), flexible cord shall be permitted to have one connection to the building surface.
Substantiation: This proposal allows for traditional cord extensions from other, non-busway sources such as overhead wireways. The present NEC wording prohibits an entire family of cord uses that have been an integral part of untold thousands of industrial and commercial applications over the years. This represents an enormous change in standard installation practice, which should have been allowed to continue. This proposal restores the traditional applications.
By not allowing a connection to the building surface, the NEC is inviting the arrangement of cords at oblique angles, instead of the neat and workmanlike arrangement involved in a swag to a point directly over the load. In addition, the vertical strain is better accommodated by a take-up connected to the building instead of exclusively reliance on a basket or gland connector at the cord exit. Such arrangements are much more likely to fail over time.
Panel Meeting Action: Reject
Panel Statement: The current wording allows sufficient traditional uses.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-87 Log #281 NEC-P06 **Final Action: Reject**
(400.14)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
"In ~~industrial establishments~~ premises where the Authorities Having Jurisdiction are satisfied that the conditions of maintenance and supervision ensure that only qualified persons service the installation, a flexible cord ~~s~~ ~~and cable~~ or cable shall be permitted to be installed in an aboveground raceway ~~s~~ that ~~are~~ is no longer than 15 m (50 ft) to protect the flexible cord or cable from ~~physical~~ damage...".
Substantiation: Industrial establishments are not the only ones where AHJs are wont to accept this; warehousing operations are another example. Formal 90.4 documentation is not always provided, and given that there is no substantiation for differentiating the ill-defined "industrial" operation from other establishments that may have well-trained-in-house electricians, why not ease the liability picture for such inspectors? Also, why not use the more common code term "premises"?
Next, it seems like better English to the singular "raceway" to correspond to the singular "cord" or "cable" that it protects. Finally, use of the word "physical" is superfluous – the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However,

doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject

Panel Statement: The first phrase in the second paragraph is well understood and used throughout the Code. The word "physical" is appropriate since it specifically defines the type of protection being provided and complies with 3.2.5.5 of the NEC Style Manual. There are other types of protection that may be provided, such as protection from EMF interference. The other proposed changes do not improve clarity.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-88 Log #3363 NEC-P06 **Final Action: Reject**

(400.14)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Recommendation: Revise the second paragraph to read as follows:

Flexible cord shall be permitted to be installed in raceways not longer than 15 m (50 ft) in length where required to protect the flexible cord or cable from physical damage. The ampacity of the conductors within a raceway shall be adjusted in accordance with Table 400.5 based on the total number of current-carrying conductors within the raceway, and then further derated by a factor of 0.8, or the ampacity shall be calculated in accordance with 310.15(C). The raceway shall be exposed over its entire length.

Substantiation: The only reason on the public record for the general prohibition against running cord in raceways (new in the 1990 NEC) is that the table ampacities are figured with the cord able to dissipate its heat freely. Unfortunately, there are many, many legitimate uses for cord in raceway, far too many to give this up entirely. There are many machine tool applications where putting a suitable cord fitting on the end of a piece of conduit was the only way to go. The cord might provide some necessary flexibility to a movable solenoid, for example. Then, the cord would run through the raceway to the terminal blocks in a remote enclosure. The panel took an important step in the 2005 cycle by recognizing these applications in industrial environments.

There is more work to be done, however, because the current NEC wording does not correlate with the diminished ampacities that caused this limitation to go in the Code. Typically these applications never approached the ampacity of the cord. A designer frequently will be more than willing to pay a meaningless derating penalty (given the low loading) in exchange for reducing the numbers of splices in his system, since splices are always potential failure points. This proposal allows the engineering calculation, as well as a Table 400-5 type factor of 80%. The 80% factor is very conservative; reviewing similar tables in Appendix B and looking at the spread between 3/C cable in air vs. in raceway, the differences are less than 80%. The industry needs a practical way to quickly figure a revised ampacity here, and this revision provides the method.

This wording also assures the raceway will be exposed, which also improves air circulation. The only restriction in the Code now on this topic is to prohibit the use of cord underground. Very few installations would be so tempted, and that wording leaves open the possibility of sleeving cords through raceways in walls and ceilings, which should not be the point of this allowance.

Finally, this proposal omits the industrial/engineering supervision restriction. The NEC should, wherever possible, not include ever more provisions that require engineering and an industrial location to implement. The wording submitted with this proposal adequately covers the engineering issues, and in this form it will therefore be safe to apply in other occupancies as well.

Panel Meeting Action: Reject

Panel Statement: The panel intended this provision be used only in industrial applications and limited the length to 50 feet so that cords would not be used for fixed wiring. The rating does not have to be reduced by an additional 80% since cord ampacities are already lower than those in Table 310.16 for 60ºC products in conduit.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-89 Log #3565 NEC-P06 **Final Action: Reject**

(400.15(A) & (B) (New))

Submitter: Edward A. Schiff, Technology Research Corp.

Recommendation: Add new text to read:

400.15 Leakage Current Detection and Interruption (LCDI) Protection.

(a) Definition. Leakage Current Detection and Interruption (LCDI) Protection. A device provided in a power supply cord or cord set that senses leakage current flowing between or from the cord conductors and interrupts the circuit at a predetermined level of leakage current.

(b) Leakage Current Detection and Interruption (LCDI). Indoor extension cord sets shall be provided with factory-installed LCDI protection. The LCDI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.

Substantiation: Extension Cord Fire Problem

Faulty or damaged cords or plugs caused an estimated 6,900 attended fires, 91 civilian deaths, 421 civilian injuries, and $115.9 million in direct property damage per year in US homes between 194 and 1998 according to The US Home Product Report , published January, 2002 by the NFPA. The leading cause of cord and plug fires was short circuits and ground faults (52.3% of fires and 39.2% of deaths). Other electrical failure and overloads account for the majority of the balance.

Electrical cord fires and leading cause of residential fires in the United States. During the five year period from 1994 to 1998, there were 27,400 cord fires attended by the fire service according to the 1998 Residential Fire Loss Estimates published by the U.S. Consumer Safety Commission (CPSC) in 2002. These fires resulted in 350 deaths and 1,680 injuries. Extension cords were responsible for over half of these incidents.

The extension cord fire problem is getting worse. 2002 has been another terrible year for extension cord fires. In January alone, there were seven different fatal extension cord fires in US residences. Additionally two catastrophic fires have occurred that summer.

1. On August 3, 2002 an overloaded extension cord caused the fire that killed six children (ages 10, 4, 3, 2 and eight month old twins) in Baton Route, LA.

2. On June 11, 2002, an overloaded extension cord melted and set the couch on fire in Silver City, NC killing six family members. The 33 year old mother, daughter 6, two stepsons age 10 and 13, 48 year-old brother, and the children's 41 year-old aunt died of smoke inhalation. the father and their 2 year-old daughter escaped by braking out a rear window.

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These two fires accounted for 12 deaths, nine of which were children. The table entitled, "Fire Event Summary Report", highlights the severity of the problem.

Causes of Extension Cord Fires.

Extension cord fires have been and continue to be a major problem. There are many causes of cord fires including overload, overheating, pinching, crimping, crushing, customer misuse, fraying, and aging of the cord. These problems can cause combustion on their own or in conjunction with one another.

Extension cords are easily overloaded by exceeding the typical 13 Amp rating of the cord with multiple loads. Circuit breakers are designed to protect the fixed wiring in a dwelling. Their continuous current rating is typically 15A or 20A. A breaker allows an overload to exist for a period of time depending on its inverse-time trip curve; therefore, they do not provide overload protection for cords. Overloading damages the insulation from the inside (next to the conductor) to the outside of the cord.

Extension cords are frequently overheated. Consumers often run them under carpet or leave them coiled for ascetic reasons. Combustibles such as clothes or newspapers are put onto the cords. These scenarios prevent proper cooling and will overheat the cord. As with the overload condition, the insulation is damaged from the inside out. This damage is irreversible and may not be visible to inspection.

Extension cords can be mechanically damaged. They are frequently pinched or cramped by furniture and doorways. This will result in broken conductors within the cord and can cut or scrape the insulation. Cords may also be crushed by pedestrian traffic or by heavy items (furniture being placed on top of the cord). This damage is also irreversible and not visible to inspection.

Customer misuse comes in a variety of fashions including leaving the cord in pedestrian traffic, stapling of the cord to baseboards, using the cord as a permanent extension of premises wiring, and using the cord around pets or infants who chew cords. This misuse can result in fires caused by broken conductors and degraded insulation.

Finally, extension cords wear out in time resulting in cracked insulation and fraying of the conductors. Unlike the proposed LCDI cords, they will continue to pass current even though they present a major fire, injury and loss of life risk.

This damage described above results in insulation degradation and breaking of the current carrying conductors. The damage is irreversible and may not be visible to inspection. Circuit breakers and fuses are not sensitive enough to detect this damage before combustion can occur. Even the arc fault breakers (AFCIs) require a significant arc over a period of time which may be a fire in progress before detection. AFCIs are only being required on certain branch circuits in new homes, when the majority of electrical fires occur in older homes that do not have this limited protection.

Extension cords are used in high risk applications. Some of the common characteristics of these applications include unattended operation, high current loads, operation while people are sleeping and used around children and elderly people.

There are two primary types of cord faults. Series faults (the fault is in series with the load) are partially or completely severed conductors within the cord set. A parallel fault, either line to neutral or a ground fault is typically caused by degraded insulation. Both of these faults will lead to tracking within the cord set, leakage current, arcing and then combustion.

Over the past two decades, efforts have been made to reduce the number of extension cord fires including increased conductor size, improved labeling, improved materials and education. These efforts have reduced the annual number of extension cord fires by 35 percent since 1980. However, data for the most current years (1996 to 1998) demonstrates a plateau in number of extension cord fires (the same is true for other electrical cords). The fires cited in the table indicate the actual number of fatalities for 2002 will show a significant increase. LCDI protected cords provide the ability to eliminate extension cord fires.

LCDI protected cord sets sense leakage current flowing from or between conductors. Leakage current is the precursor to an arcing fault. This technology employs a ground fault sensing circuit as the disconnecting means so it also will prevent ground fault fires beyond the power supply cord and provide shock protection for the cord. Over the past six years, millions of LCDI protected cords have been field proven on extension cords, power strips, space heaters, and other appliance cords.

An additional benefit to this technology is preventing electrocutions and serious injury from electrical shock. According to the <u>1998 Electrocutions Associated with Consumer Products</u> , published by the U.S. Consumer Product Safety Commission in July, 2001 there were 12 electrocutions caused by extension cords in 1998. Since the LCDI utilizes a ground fault sensing circuit as the disconnect means, these deaths would also be prevented.

Economic Impact

This improvement in safety will have a positive economic impact on society. The current retail price of an eight foot 120V/13A two wire LCDI protected extension cord is under $9.00. TRC anticipates the retail price will be under $5.00 for this product in large scale production. Unprotected indoor extension cords currently sell for between $1.00 and $7.00 dependent on length, gauge, number of conductors and receptacle type. The added cost borne by the consumer will be minimal.

In 1998, the property damage from the 2,800 attended extension cord fires was $57.5 million. These fires resulted in 170 serious injuries. The costs associated with the medical treatments, lost work expense, quality of life and pain and suffering, and product liability from these injuries will likely exceed the property damage. The reduction in fire fighting expenses associated with the 2,800 fires per year will also be in the millions. The rough estimate of well over $100,00,000.00 in annual costs caused by these fires will offset the majority of the added cost of the cords.

It is difficult to put a price tag on the loss of life. The fact that the most of the victims are children, makes this cost to society even greater. 40 people each year die from extension cord fires. An additional 12 lives are lost from electrocution. The ground fault protection provided down stream of the extension cord will prevent additional fires electrocutions, and the related costs of property damage and injuries.

Incorporation into the NEC

There are many precedents for incorporation of this requirement in the code. 440.63 requires either AFCI or LCDI protected cord sets for room air conditioners. Ground fault protection on the cord sets for pressure washers and portable hot tubs are long standing NEC requirements. Immersion protection for hair dryers has been part of the code for years.

The NEC code panels provides the only complete representation of the electrical community. This includes standards organizations, industry trade associations, insurance industry, electrical inspectors, contractors, and electricians. Safety is the primary reason for the code and clearly this is a critical safety issue.

Conclusion

Today's indoor extension cords are cheap. The U.S. Consumer Product Safety Commission (CPSC) recalls hundreds of thousands of extension cords every year. Undersized conductors and fake UL markings are common reasons. Raising the bar on performance to an LCDI protected cord set should reduce the likelihood of recalls.

A serious safety problem continues to exist. A proven, cost effective solution exists. There are many precedents for incorporation of this safety improvement into the NEC including the new requirement for AFCI or LCDI protected cord fires, injuries and reduce property damage and have a positive economic impact on society. Most importantly, adoption of this proposal will save lives!

This proposal was referred by Panel 6 to Article 240 and Article 210 during the last code cycle. None of the panels felt it was in their domain (the opinion of those panels was this is not an overcurrent device nor part of the branch circuit). From the work on the task force, Panel 17 is uniquely aware of the problem and the solution. The submitter respectfully requests that the panel take action on this proposal.

Panel Meeting Action: Reject

Panel Statement: As stated in the panel statement on Proposal 6-97 in the 2004 ROP:

"Use of this device is not prohibited in current Code text. Even though "appliance applications" is not defined, the panel considers this requirement to be unenforceable by an AHJ. This requirement would be more appropriately addressed in the product safety standard.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 8 Negative: 3

Explanation of Negative:

HUDDLESTON, JR., R.: This proposal should have been accepted. The panel continues to allude to the apparent lack of enforceability of this proposal; however, there is precedent set in other NEC sections where enforceability apparently did not come into play (for example, immersion detection devices on hair dryers, as required in 422.21). The simple facts are this - accepting this proposal, or at least accepting in principle with a designated time to allow compliance, would eliminate a significant percentage of house fires due to damaged extension cords. Users of extension cords in residential dwellings are generally untrained and unqualified in terms of electrical training, and they simply do not know the implications of running a cord under a rug or pushing a bed up against a plug and outlet. The National Fire Protection Association (NFPA), which is the organization that publishes the National Electrical Code, would certainly seem to be interested in preventing house fires. The panel expressed concerns about someone modifying one of these extension cords and removing the leakage detection device; this again is a cop-out and is not a legitimate concern. What if someone removed a GFCI breaker and replaced it with a standard circuit breaker? What if someone cut the end off of the hair dryer cord and installed a standard plug? This sort of argument does not make sense.

This proposal could have been accepted in principle, and allowed to include other technologies besides leakage current detection; however, this Panel Member believes that leakage current detection may be the best technology available to alleviate the problem of extension cord fires in residential dwellings.

KENT, G.: This proposal should have been accepted in part and principal. Not all extension cords would need to be covered to enhance the safety to most homes using extension cords. Although it will never be acceptable practice to run cords under rugs, etc., it is done and will continue to be done. This is done most often with cords smaller than #14 that are commonly referred to as 'lamp extension cords'. The panel should have accepted the requirement of LCDI protection on these types and sizes of cords.

LAIDLER, W.: This proposal should be accepted outright or at least accepted in part requiring that 18 and 16 gauge parallel cord sets be provided with internal LCDI protection. Many residential electrical fires can be traced to the misuse of electric cords such as overloading, poor maintenance, and running under rugs. Requiring that cord sets be manufactured to provide LCDI protection could help prevent some of these fires. Some Panel members expressed concerns about this proposal; one was that it could not be enforced by an AHJ. That is true, but if the only cord that could be bought and used came with this type of protection it would in most cases be self-enforcing. The other concern was that it would be more appropriate as a product standard rather than a Code requirement. That also may be true, but there are several Code sections that could also be considered product standards such as 422.41 and 440.65. These sections were added to promote safety. This proposal is no different.

6-90 Log #2280 NEC-P06 **Final Action: Accept**
(400.31(A))

Submitter: Susan L. Stene, Underwriters Laboratories

Recommendation: Revise text to read:

400.31 Construction.

(A) Conductors. The conductors shall be ~~8~~ <u>12</u> AWG copper or larger and shall employ flexible stranding.

~~Exception: The size of the insulated ground check conductor of Type G-GC cables shall not be smaller than 10 AWG.~~

Substantiation: The low end of the size range of Types G, G-GC, PPE, and W was extended from 8 AWG to 12 AWG in the 2002 NEC. The rationale used was the need for a 2000-volt rated cord in those smaller sizes that could use the ampacities in Table 400.5(B). At the time of the proposal, the wording in Table 400.4 was revised but the wording in 400.31 was inadvertently overlooked. This proposal resolves that conflict. The ground-check conductor for a 12 AWG Type G-GC is 12 AWG, so the Exception is no longer needed.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

ARTICLE 402 — FIXTURE WIRES

6-91 Log #1470 NEC-P06 **Final Action: Reject**
(402)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in Article 402.
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: The use of fixture wire is not limited to luminaires or lighting fixtures; they are also used within equipment. The action on this proposal should also be forwarded for information to CMPs 2, 3, 5, 8, 9, 10, 12, and 15.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 2
Explanation of Negative:
CLINE, S.: If "fixture" was the word which gave rise to "fixture wires" in the past, then it seems that the term should now be "luminaire wires." It is possible that a different word more inclusive of current applications for these conductors could be better than "luminaire," but "luminaire" is the defined word the Code now uses in place of "fixture." A new word could be done as a Comment should someone have one to suggest. I believe in struggling for uniformity and simplicity in the Code as much as is practically possible.
KENT, G.: See my Explanation of Negative Vote on Proposal 6-5.

6-92 Log #997 NEC-P06 **Final Action: Accept in Principle**
(402.11)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
Fixture wires shall not be used as branch-circuit conductors <u>except as required in 725.27(B)</u>
Substantiation: Edit. Although covered by 90.3, the proposal would be helpful to Code users. A Class I motor control circuit that is not tapped from the load side of a motor circuit protective device (430.72) and has overcurrent protection is a branch circuit.
Panel Meeting Action: Accept in Principle
Revise the section to read as follows:
Fixture wires shall not be used as branch-circuit conductors except as permitted elsewhere in the Code.
Panel Statement: Chapters 1 through 4 apply generally except as amended by Chapters 5, 6, and 7 for the particular conditions. It is not necessary to specifically reference 725.27(B) in 402.11.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

(Note: Sequence 6-93 was not used)

ARTICLE 404 — SWITCHES

9-82 Log #661 NEC-P09 **Final Action: Reject**
(404 and 406)

Submitter: Richard Shackelford, NEO Products Inc.
Recommendation: Add new text as follows:
<u>To cover all exposed termination points such as the screws on the sides of snap switches and receptacles.</u>
Substantiation: The exposed terminals on these devices offer the easiest access for people to come in contact with electricity. With receptacles mounted approximately 16 in. off of the floor, any baby that can crawl can reach high enough. Most covers are removed at some point for cleaning or painting, etc. I think that it offers an unnecessary risk to leave these terminals exposed.
Panel Meeting Action: Reject
Panel Statement: The proposal is not properly submitted as it lacks specific location identification and code language. All exposed terminals are required to be in an enclosure with covers and plates installed. This is a design option that can be addressed in the field where necessary. There is no technical substantiation to support the need for requirements to anticipate the level of misuse anticipated by the submitter.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
BELISLE, R.: Although we agree that the proposal was incorrectly submitted, we cannot ignore the fact that device terminals, receptacles specifically, pose a serious threat to children. NEC requirements in 517.18 (c) reflect the serious nature of receptacle location with respect to children. The panel statement reassures the submitter that a system is not complete without receptacle covers; yet Article 517 goes beyond that to protect children from the risks of accidental contact in a completed installation. Action should be taken to require protected terminations in areas prone to free roaming children, such as schools, daycare facilities and dwelling locations. Perhaps the language used in 517.18(c) could be edited and placed in 406.3 <u>(G)</u> to reflect the submitter's request.

9-83 Log #3146 NEC-P09 **Final Action: Reject**
(404.2(A) and (B))

Submitter: Ian McDonald, Underwriters Laboratories Inc.
Recommendation: Add new text as follows:
404.2 Switch Connections.
(A) Three-Way and Four-Way Switches. Three-way and four-way switches shall be wired so that all switching is done only in the ungrounded circuit conductor. Where in metal raceways or metal-armored cables, wiring between switches and outlets shall be in accordance with 300.20(A).
Exception: Switch loops <u>, three-way and four-way,</u> shall not require a grounded conductor.
<u>(B) Grounded Conductors.</u>
<u>(1) Disconnecting</u> Grounded Conductors. Switches or circuit breakers shall not disconnect the grounded conductor of a circuit.
Exception: A switch or circuit breaker shall be permitted to disconnect a grounded circuit conductor where all circuit conductors are disconnected simultaneously, or where the device is arranged so that the grounded conductor cannot be disconnected until all the ungrounded conductors of the circuit have been disconnected.
<u>(2) Providing Grounded Conductors. A grounded conductor shall be provided in all device boxes to permit connection of switches with a grounded conductor termination.</u>
Substantiation: Present wiring practice does not require a grounded conductor to be wired to device boxes used for installation of switches. Control type switches (such as motion detectors and photoelectric switches) are being used in increasing numbers based on legislation for energy conservation and other factors. These control type switches contain circuitry that uses small levels of sensing current. In many instances, numerous control type switches have been wired on a single branch circuit. To prevent the cumulative control current from flowing through the grounding conductor, a return path using a grounded conductor is needed. The standard for Nonindustrial Photoelectric Switches for Lighting Control, ANSI/UL 773A, is being revised to require a provision of a grounded conductor termination for control current. Requiring a grounded conductor to be wired to the switch box will provide a return path for operational current, and prevent cumulative control current on the grounding conductor.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 9-84.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
OSBORNE, R.: See negative comment on Proposal 9-84.

9-84 Log #1962 NEC-P09 **Final Action: Reject**
(404.2(C) (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Add text to read as follows:
404.2 Switch Connections
<u>(C) Switches Controlling Lighting Loads. Where switches control lighting loads supplied by a grounded general purpose branch circuit a grounded circuit conductor shall be provided at the switch location</u> .
Substantiation: There are electronic control devices that require a standby current to maintain the ready state of the device. This allows immediate switching of the load to the "on" condition. These devices require this standby current when they are in the "off" state, i.e., when no current is flowing to the load. The typical design of these devices may utilize the grounding conductor for the standby current flow. These products are commonly used for lighting control.
In many, if not most installations, a grounded conductor is not provided in the switch box. This forces the design of these control devices to utilize the grounding conductor to conduct the standby current. This has been tacitly acknowledged as an operational necessity by a number of UL Standards, which permit up to a 0.5 ma ground leakage current. The design of the devices available on the market today use this ground leakage provision in the UL standard as the means for providing a path for the standby current that is required for the operation of the product.

The lack of a grounded conductor in the switch box forces the use of the grounding conductor for the operation of the device. Product designers have no reasonable option but to accommodate the lack of a grounded conductor by relying on the grounding conductor. Installers will continue to use the grounding conductor in lieu of the grounded conductor when there is no grounded conductor available in the switch box.

Many lighting control devices are installed as a means of realizing significant energy savings associated with the control of lighting circuits. Due to escalating energy costs and the increased recognition and adoption of energy saving codes, it is expected that there will be a substantial increase in the installation of these products. In order to promote the use of these products, the NEC should recognize an installation practice that requires the appropriate circuit conductor to be available for the standby operation of the control device.

Although the current design of many lighting control devices relies on the grounding conductor for conducting current, adopting this proposed requirement will ensure that future designs will take advantage of the presence of the grounded conductor in the switch box and no longer compel the design of the product or installation practice to use the grounding conductor to conduct the standby current. The availability of a grounded conductor will also promote the design of many new and improved lighting control products.

Panel Meeting Action: Reject

Panel Statement: The proposed requirement is a design issue and is the responsibility of the installer, and the associated cost should be a choice of the consumer, not the code panel. See 90.1(B) and (c)

Switches with grounded circuit connections should only be used where a grounded conductor is present. These devices should not be connected to equipment grounding conductors per Part VI of Article 250.

The panel agrees that this is a concern but that a more appropriate solution would be to require manufacturers of products needing additional grounded conductors to provide appropriate, clearly visible warnings and instructions on their packaging and installation instructions.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 6 Negative: 4

Ballot Not Returned: 1 de Vega, H.

Explanation of Negative:

BELISLE, R.: My notes indicate that CMP-9 was surprised to learn that manufacturers are designing switches that operate with low level currents flowing on the grounded conductor, and when that is not present, by default, the equipment grounding conductor. This appears entirely legal and deemed safe in a singular installation. The problem lies in the fact that most aftermarket switches and homeowner modifications are not installed in just one location, but several throughout the home and the combined effect of what was a safe minimal current on the EGC is now additive to create a serious shock hazard. The submitter's proposal is all-inclusive and probably not necessary for commercial and industrial applications, as wiring methods would typically permit the addition of a grounded conductor to those specific modified locations. The proposal has merit and should be considered with the additional language of " <u>In dwelling locations,</u> switches controlling lighting loads supplied by a grounded general purpose branch circuit…

LEMAY, T.: There are many safety and convenience benefits to the electrical system of an occupancy having a grounded circuit conductor available at an outlet control point when the control point is wired using a cabled wiring method.

There are many control devices currently on the market, such as occupancy sensors, power line carrier devices, and surely more to come that require the use of a grounded circuit conductor for their operation.

There are instances where the branch circuit could be extended from the switch box to provide additional outlets or power to other loads in the area of the switch. There are also instances where the installation of a multi-level controlled luminaire or paddle fan/light assembly are not contemplated at rough in and installed after the fact by the end user, requiring an additional insulated control conductor. This rule would provide for a means to accomplish that task. I have seen where the equipment grounding conductor was used as a part of a switch loop system.

Additionally, devices that use the equipment grounding conductor for their operation produce objectionable leakage current in the ground return path.

OSBORNE, R.: The consensus among panel members is that, for those devices requiring connection to a grounded conductor, it is imperative that a grounded conductor be available at the device location. This position is in full alignment with Article 250 and a long-standing position held by panel 5.

It should be noted that the panel statement is consistent with past decisions by panel 9, which concluded that it is the responsibility of the installer to ensure the appropriate conductors are provided at the device box. However, the panel fails to acknowledge that, without a grounded conductor in a switch box being mandated in Article 404, improper use of the equipment grounding conductor is commonplace when these products are installed retroactively.

It appears that there is a potential correlation issue in that the requirements in Article 250 cannot be satisfied by the decision by panel 9 not to address grounded conductors in switch loops. The TCC needs to take a closer look at this proposal and accompanying comments as they relate to satisfying the requirements of Article 250 to determine if the Code is providing adequate guidance regarding the installation of devices requiring the use of the grounded conductor.

The reality is that control devices which need a return path for inboard control circuitry are becoming much more prevalent in both residential and commercial installations. As the use of these devices increase, the likelihood that unintended current will make its way onto equipment grounding conductors increases. Additionally, proliferation of these devices also increases the likelihood that, based on the cumulative effects of control currents, higher levels of unintended current flow will be present on the equipment grounding conductor.

Acknowledging the ever-increasing use of these devices, the panel should have concluded that it is time to readdress this issue. A step in the right direction would be to "Accept in Principle" the proposal, with additional language that limits the new requirement to only those installations where it is impractical to add the grounded conductor at a future date. The reality of such an exception is that, in most installations where a cable wiring method is used, the grounded conductor will be required. This would include the majority of residential applications where the homeowner, unaware of the safety issues related to current flow on the equipment grounding conductor, would have a grounded conductor available at all switch locations which control lighting loads. This exception would have the opposite affect in most commercial applications where raceways are employed and trained electrical workers appreciate the needed for a grounded conductor. It is in these applications, due to the presence of a raceway, that the installer has the ability to install the required conductor without damage to the building structure or building finish. To address the submitters concerns, the following text is offered for consideration:

Add text to read as follows:

404.2 Switch Connections

<u>(C) Switches Controlling Lighting Loads. Where switches control lighting loads supplied by a grounded general purpose branch circuit, a grounded circuit conductor shall be provided at the switch location.</u>

<u>*Exception: Grounded conductors shall not be required in installations where it is possible to install conductors into the device boxes without damaging the building structure or building finish.*</u>

RUPP, B.: Occupancy sensors are permitted by UL773A to have a current of up to 0.5 ma on the grounding conductor. This is allowed because the operation of an occupancy sensor requires a low level standby current. The standard permits this current on the grounding conductor because in a typical installation there is no grounded circuit conductor in the switch box which can be used as the return conductor for the standby current. An occupancy sensor can be installed in any switch location. It is impractical to expect the customer or installer to anticipate all instances where an occupancy sensor will be installed. Accepting this proposal will insure that a grounded conductor is available at all switch locations which will allow occupancy sensors to use the grounded conductor for conducting standby current instead of using the equipment grounding conductor.

Comment on Affirmative:

HARTWELL, F.: On another proposal (9-60) this panel member took considerable pains to point out the essential requirement of electrical inspection as a component of the electrical safety system. This proposal provides a perfect opportunity to bring in the third component, that of a set of product standards that assure that products used in electrical systems have been manufactured to work in the context of the NEC, which is the installation code. With the correct markings and instructions, these products will be selected and installed, and the systems designed, so the equipment grounding system will not become a routine circuit conductor. It was established at the panel meeting that the applicable standards are already in the process of modification in this area.

9-85 Log #3142 NEC-P09 **Final Action: Reject**
(404.2(C))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for Action in Article 422. This action will be considered by Code-Making Panel 17 as a public comment.

Submitter: Dale Rooney, Municipality of Anchorage

Recommendation: Add new sub-section (C) to read:

(C) Off indication. A switch with a marked off position shall disconnect all ungrounded conductors to the load it controls.

Substantiation: 404.15(B) currently contains this requirement as a construction specification but as such it does not prohibit switches being installed in parallel. Locally, we have seen humidity controls with a marked off position being installed in parallel with a manual switch which also has a marked off position.

Panel Meeting Action: Reject

Panel Statement: CMP-9 recognizes that the proposal raises valid safety concerns. However, the problem relates to servicing the connected equipment. CMP-9 recommends that the Technical Correlating Committee refer this proposal to CMP-17 for possible action in Article 422 relative to field markings and or disconnection requirements that could be mandated for such equipment.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 9 Negative: 1

Ballot Not Returned: 1 de Vega, H.

Explanation of Negative:

BELISLE, R.: The submitter provides adequate substantiation and description of an unsafe installation practice that is currently legal. Although the panel statement states that this is a maintenance issue-requiring field marking, Panel 9 covers Installation practices. This is an allowable practice due to a loophole in the NEC and needs to be corrected. Marking only allows the installer to continue to violate safe installation practices.

It is clearly not intended by the NEC to allow a switch to be in the “OFF” position, yet still energize its connected load. The installer has other options in wiring the parallel installation without using a single pole switch with a marked “off” position.

9-86 Log #1350 NEC-P09 **Final Action: Reject**
(404.3(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: New subsection

(C) Phase Arrangement. The phase arrangement on 3-phase enclosures shall be A, B, C from front to back, top to bottom, or left to right, as viewed from the front of the switchboard or panelboard. The B phase shall be that phase having the higher voltage to ground on 3-phase, 4-wire, delta-connected systems. Other phasing arrangements shall be permitted for additions to existing installations and shall be marked.

Exception: Equipment within the same single section or multisection enclosure as the meter on 3-phase, 4-wire, delta-connected systems shall be permitted to have the same phase configuration as the metering equipment.

Substantiation: This is proposed in an effort to correlate the rules of panelboards and the rules of switches. Similar language can be found in 408.3(E) for panelboards.

Panel Meeting Action: Reject

Panel Statement: This requirement is not needed in this section. The phase arrangement requirements for switchboards, panelboards, and motor control centers are in place to aid the user when additional overcurrent devices are added to an existing assembly. That situation does not exist for switches.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-87 Log #82 NEC-P09 **Final Action: Reject**
(404.4)

Submitter: Joe Riley, City of Arlington
Recommendation: Revise as follows:

Switches shall not be installed within wet locations ~~in a tub or shower space~~ or directly over a bathtub or shower stall measuring 900 m (3 ft) horizontally and vertically to the ceiling from the top of the bathtub rim or shower stall threshold unless installed as part of a listed tub or shower assembly.

Substantiation: Tub and shower spaces for devices is a little vague and up to interpretation. Consistency of electrical device and equipment locations with other parts of the code such as 410.4(D) only makes sense in ensuring electrical safety.

Panel Meeting Action: Reject

Panel Statement: The proposed requirement is excessive. This section has always restricted itself to applications where the switch might be actually subject to a water stream. It never had to do with the issue of a reaching exposure from the tub or shower area. This is intentionally different from receptacles that extend a power circuit (through the attached cord) a significant distance.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-88 Log #974 NEC-P09 **Final Action: Accept in Principle**
(404.4)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence:

A switch or circuit breaker in a wet location ~~or outside a building~~ shall be...(remainder unchanged).

Substantiation: Edit. All locations outside a building are not wet locations. 312.2 doesn’t use the phrase “outside a building” (or structure, which is not included in this rule) and this section goes beyond the requirements of 312.2 The definition of Location, Damp, indicates locations outside a building which are damp, not wet.

Panel Meeting Action: Accept in Principle

Change 404.4 to read as follows:

404.4 Damp or Wet Locations. A surface-mounted switch or circuit breaker in a damp or wet location ~~or outside of a building~~ shall be enclosed in a weatherproof enclosure or cabinet that shall comply with 312.2(A). A flush-mounted switch or circuit breaker in a damp or wet location shall be equipped with a weatherproof cover. Switches shall not be installed within wet locations in tub or shower spaces unless installed as part of a listed tub or shower assembly.

Panel Statement: CMP-9 agrees that all locations outside of buildings are not wet locations, and has rewritten the section to address the differing requirements for damp and wet locations accordingly. The added sentence correlates with 406.8(A) for receptacles with equivalent exposure.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-89 Log #1029 NEC-P09 **Final Action: Accept in Principle**
(404.4)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:

A switch or circuit breaker in a wet location ~~or outside of a building~~ shall be enclosed...(remainder unchanged).

Substantiation: All locations outside are not wet locations per definition of Location, Wet in Article 100. Present wording equates outside of a building with a wet location. 312.2(A) only requires enclosures (cabinets, cut-out boxes) in wet locations to be weatherproof. Circuit breakers and switches are installed in cabinets or cut-out boxes per definition of panelboard in Article 100. Section 314.15(A) only requires (snap switch) boxes in wet (not damp) locations to be listed for wet locations. Switches and circuit breakers installed outside of structures which are not “buildings” per se and in a damp location are not required by this section to be weatherproof. 225.22 only requires raceways on exteriors of buildings to be raintight in wet locations.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 9-88.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-90 Log #2244 NEC-P09 **Final Action: Reject**
(404.4)

Submitter: Donald A. Ganiere, Ottawa, IL
Recommendation: Revise as follows:

404.4 Wet Locations. A switch or circuit breaker in a wet location or outside of a building shall be enclosed in a weatherproof enclosure or cabinet that shall comply with 312.2(A). Switches shall not be installed within or directly over a bathtub or shower stall ~~wet locations in tub or shower spaces~~ unless installed as part of a listed tub or shower assembly.

Substantiation: The current wording would permit the installation of a switch directly above a bathtub if that space was said to be a dry or damp location. This proposed change uses the wording from 406.8(C).

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any definitive technical substantiation that a problem exists with the present wording.

All exposed terminals are required to be in an enclosure with covers and plates installed. This is a design option that can be addressed in the field where necessary. There is no technical substantiation to support the need for requirements to anticipate the level of misuse anticipated by the submitter.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

Comment on Affirmative:

HARTWELL, F.: Although the action to reject is appropriate, it appears that a word-processing mistake was made by staff with respect to pasting the Panel Statement, the second paragraph of which duplicates that given for the action on unrelated Proposal 9-97. The proposal is functionally similar (although less far-reaching) to Proposal 9-87 and the same statement would apply. The submitter of this proposal and ROP users should refer to the statement on Proposal 9-87 for the correct technical basis for rejection.

9-91 Log #662 NEC-P09 **Final Action: Reject**
(404.8)

Submitter: Richard Shackelford, NEO Products Inc.
Recommendation: Revise text to read as follows:

To offer an alternative method to separate devices with voltages exceeding 300 volts other than a securely installed barrier, such as an insulated band on each device or electrical tape to prevent contact between devices.

Substantiation: The most commonly used partition is a metal plate. Even though the plate when fastened to the box becomes bonded, an insulator on each device is a safer application. The screws on the devices are no longer exposed, preventing accidental shorting between terminals. Using an insulator whether it is tape or an approved insulating band in no way inhibits or detracts from the grounding of the devices.

Panel Meeting Action: Reject

Panel Statement: An insulator installed on switches such as tape could be inadvertantly removed, or not replaced when devices are replaced. Additionally, a permanent barrier prevents this occurance.

The panel rejects this proposal as it does not comply with the NEC Manual of Style, 3.2.1.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-92 Log #3406 NEC-P09 **Final Action: Accept**
(404.8(C) (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Insert a new 404.8(C) as follows:
(C) Multipole Snap Switches. A multipole, general use snap switch shall not be permitted to be fed from more than a single circuit unless it is listed and marked as a two-circuit or three-circuit switch, or unless its voltage rating is not less than the nominal line-to-line voltage of the system supplying the circuits.
Substantiation: The device industry still shows no inclination to mark two-pole switches "2-circuit", and thereby allow their use on two circuits with a total voltage spread within the switch rating. Representatives generally declare their willingness to act promptly if there were market demand. Unfortunately, the submitter strongly suspects the lack of demand is a result of lack of knowledge, and not any lack of applications. In other words, installers are routinely installing these switches and inspectors are accepting them for want of any observable hazard. A routinely available 277-volt rated two-pole snap switch used to control two 120-volt circuits within the ampere rating of the switch to control related equipment, such as two oil burners, is a completely reasonable application. It can be frustrated, usually only on paper, by the UL Guide Card restriction. If this proposal is accepted, UL will have to revisit the Guide Card information, and the problem will disappear. Note that under the terms of this proposal, as soon as the potential line-to-line voltage exceeded that of the switch, the enhanced marking provisions would still apply.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-93 Log #1153 NEC-P09 **Final Action: Accept in Principle**
(404.9(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
<u>The metal yoke or strap</u> of snap switches, including dimmer and similar control switches, shall be effectively grounded and shall provide a means to ground metal faceplates, whether or not a metal faceplate is installed. Snap switches shall be considered effectively grounded if either of the following conditions is met: (1) The <u>metal yoke or strap of the</u> switch is mounted with metal screws to a <u>grounded</u> metal box <u>or enclosure</u> or to a nonmetallic box <u>or enclosure</u> with an integral <u>grounded</u> means used for grounding the <u>switch</u> ~~device~~ .
Substantiation: Edit. Some switches have nonmetallic mounting yokes. Enclosures other than "boxes" should be included. The metal box (and enclosure) and the integral means for grounding should be specified as being grounded.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 9-18.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
HARTWELL, F.: Specifically, the submitter and readers should review item 3 of the 13-part set of actions taken under Proposal 9-18.

9-94 Log #1541 NEC-P09 **Final Action: Accept in Principle**
(404.9(B))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding Task Group for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 404 and revise text as shown for the affected NEC sections.
404.9(B): (B) Grounding. Snap switches, including dimmer and similar control switches, shall be ~~effectively~~ <u>grounded in either of the methods provided in (1) or (2) below</u> and shall provide a means to ground metal faceplates, whether or not a metal faceplate is installed. Snap switches shall be considered ~~effectively~~ grounded if either of the following conditions is met:
Substantiation: 404.9(B): The definition is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." This section is revised to be more prescriptive.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.
The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."
The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.
This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.
The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 9-18.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-95 Log #598 NEC-P09 **Final Action: Reject**
(404.9(B)(1))

Submitter: Robert D. Detter, Phoenix, AZ
Recommendation: Revise 404.9(B)(1) as follows:
The switch is mounted with metal screws to a <u>surface-mounted</u> metal box <u>with at least one of the insulating washers removed</u> or to a nonmetallic box with integral means for grounding devices.
Substantiation: This change would specify a more positive means for providing effective grounding of the snap switch to a metal enclosure. It would parallel a similar requirement for receptacles in 250.146(A). The current code seems to allow switches to be considered effectively grounded, even if there is no solid metal-to-metal contact with the enclosure (i.e., a flush mounted box that is recessed 1/4 in).
Panel Meeting Action: Reject
Panel Statement: The requirements for snap switches are different than those for receptacles, because the reach of a snap switch is essentially its faceplate, whereas the receptacle is an originating point for a quasi-branch circuit extension of indefinite length through a cord plugged into it while it is in use.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
BELISLE, R.: The requirements in 404.9(B) state that a switch shall be "effectively grounded".
The definition of effectively grounded in Article 100, states that it shall be sufficiently low impedance and have sufficient current carrying capacity to prevent the buildup of voltages that may result…
We have trouble believing that a switch mounted on a non-conductive surface, secured to a metal box that is recessed ¼", therefore not touching the switch, meets the requirements of "Effectively grounded". We realize that this requirement is not the same as the requirement for receptacles, but the terminology used in 404.9(B) does not make differentiate for the code user.
The use of the term "effectively grounded" needs to mean the same as it is described in article 100
We believe the requirement should apply to all switch mounting locations, not just surface mounted, as the submitter proposed. The proposal should have been "accepted in principle" after removal of the "surface mounted" requirement.

9-96 Log #2248 NEC-P09 **Final Action: Accept in Principle**
(404.9(B)(1))

Submitter: Joseph Penachio, Joe Penachio Electrician
Recommendation: Revise as follows:
(B) Grounding. Snap switches, including dimmer and similar control switches, shall be effectively grounded and shall provide a means to ground metal faceplates, whether or not a metal faceplate is installed. Snap switches shall be considered effectively grounded if either of the following conditions is met.
(1) The switch is mounted with metal screws to a metal box <u>or device extension, raised cover that is secured to the box with a minimum two 8/32 in. screws and is in direct metal to metal contact to the box,</u> or to a nonmetallic box with integral means for grounding devices.
(2) An equipment grounding conductor or equipment bonding jumper is connected to an equipment grounding termination of the snap switch.
Substantiation: A 4 in. square blank cover is not required to have a bonding jumper installed to ground it to the box because it is considered effectively grounded by being secured by two screws and having metal to metal contact between the box and the cover. In fact, there is more yoke contact to a raised cover than there is from a yoke to a handy box which is allowed as metal-to-metal contact. Being secured by two 8/32 in. screws the extension or raised cover are electrically and mechanically secure. Removing the cover with the switch on it does not pose any danger to a qualified person than if there were a jumper installed.
Panel Meeting Action: Accept in Principle
Revise 404.9(B)(1) as it is incorporated within Proposal 9-18 by adding the words "or metal cover" after the words "metal box" and before the words "that is connected to an equipment grounding conductor …"
The final text of 404.9(B)(1) will read as follows:
(1) The switch is mounted with metal screws to a metal box or metal cover that is connected to an equipment grounding conductor or to a nonmetallic box with integral means for connecting to an equipment grounding conductor.
Panel Statement: The panel action meets the objectives of the submitter, who correctly pointed out the absence of coverage for snap switches mounted in raised covers. As in the case of receptacles in raised covers, the requirements for snap switches are less severe than those for receptacles.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
BELISLE, R.: The proposed action and statement by the panel allows for switches mounted in raised industrial covers to be grounded via the cover, therefore exposing the electrician to a shock hazard when mounting screws become loose, the cover is removed to service the device, take test measurements, or other activities OSHA would allow while energized. Installation of a bonding jumper to the box from the device is a small request in exchange for a safe installation. See my statement for proposal 9- 95 also regarding the effective grounding of a switch.

9-97 Log #2778 NEC-P09 **Final Action: Reject**
(404.10(C) (New))

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.
Recommendation: Add new text to read as follows:
404.10(C) Safeguarding of Termination Screws. <u>Switches shall be installed in a manner that protects the termination screws of the switch from accidental contact with persons or tools after installation.</u>
Substantiation: Switch cover plates are often removed during the construction phase for the purpose of wall finishing. The switches are very often energized at this phase of construction. The switch cover plates are often left off of the devices inadvertently for a period of time, until they are discovered and replaced. This circumstance causes a potential safety problem and exposes workers to possible electrical shock or arc blast. Requiring an approved method of covering the termination screws on the switch after installation will reduce this potential hazard.
Switches are also often times removed from their mountings during maintenance while in the energized state. This is not a recommended practice and power should be tuned off to the switch before its removal. However; we must recognize that some individuals will not take these necessary safety measures and will expose themselves to the risk of electrical shock or arc blast. Requiring a covering over the switch termination screws will reduce the potential of electrical shock and arc blast in these circumstances.
The required covering can be any of numerous methods and will be left up to the AHJ to determine its effectiveness. There is available an inexpensive UP listed plastic snap over cover that will meet these requirements completely in addition to other methods.
Panel Meeting Action: Reject
Panel Statement: All exposed terminals are required to be in an enclosure with covers and plates installed. This is a design option that can be addressed in the field where necessary. There is no technical substantiation to support the need for requirements to anticipate the level of misuse anticipated by the submitter.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
BELISLE, R.: The proposal listed a number of problems with which we concur to be of concern. The intent of the submitter may be met with the following text:
"404.10(C) Exposed Terminals. Switches shall be enclosed so that energized wiring terminals are not exposed to contact.
Exception: Switches with no exposed terminals shall be permitted to be energized for use in the final stages of construction where temporary wiring is removed as required by 590.3(D)".

9-98 Log #522 NEC-P09 **Final Action: Accept in Principle**
(404.12)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
404.12 Grounding of Enclosures. Metal enclosures for switches or circuit breakers shall be grounded as specified in Article 250. Where nonmetallic enclosures are used with metal raceways or metal-armored cables, provision shall be made for grounding continuity. Except as covered in 404.9(B), Exception, nonmetallic boxes for switches shall be installed with a wiring method that provides or includes an equipment ground <u>ing conductor in accordance with 250.118</u> .
Substantiation: This proposal is intended as an editorial revision for clarification.
Panel Meeting Action: Accept in Principle
Panel Statement: CMP-9 concludes that it agrees with the submitter's intent.
See panel action and statement on Proposal 9-18.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
HARTWELL, F.: Specifically, the submitter and readers should review item 4 of the 13-part set of actions taken under Proposal 9-18.

9-99 Log #3162 NEC-P09 **Final Action: Reject**
(404.14(E))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Add FPN as follows:
Dimmer switches may include instructions that reduce their rated wattage where installed in 2 gang or larger boxes.
Substantiation: Often times as an inspector, I see dimmer switches installed where the marked wattage rating is exceeded in ganged switch configurations. When telling contractors or other installers of the requirement most state that they never knew of the derating requirement for ganged installations. All too often instructions are not read, and at present the inspector has only 110.3(B) to refer to. By adding the proposed FPN time could be saved and knowledge imparted.
Panel Meeting Action: Reject
Panel Statement: CMP-9 refers the submitter to 110.3(B). The installer needs to follow the manufacturer's installation instructions.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

ARTICLE 406 — RECEPTACLES, CORD CONNECTORS, AND ATTACHMENT PLUGS (CAPS)

18-8 Log #1529 NEC-P18 **Final Action: Accept in Part**
(406, 410, 600, and 605)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Technical Correlating Committee Task Group on Grounding & Bonding for Comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 406, 410, 600, and 605 as described in the following, relative to the terms bonding and grounding.
406.2(D) Revise 406.2(D) to read as follows:
Isolated Ground Receptacles. Receptacles incorporating an isolated grounding <u>conductor</u> connection intended for the reduction of electrical noise (electromagnetic interference) as permitted in <u>250.146(D)</u> shall be identified by an orange triangle located on the face of the receptacle.
406.2(D)(1) Revise 406.2(D)(1) to read as follows:
Isolated Equipment Grounding Conductor Required. Receptacles so identified shall be used only with <u>equipment</u> grounding conductors that are isolated in accordance with <u>250.146(D)</u> .
406.3(B) Revise 406.3(B) to read as follows:
To Be Grounded. Receptacles and cord connectors that have <u>equipment</u> grounding <u>conductor</u> contacts shall have those contacts effectively grounded.
406.3(C) Revise 406.3(C) to read as follows:

Methods of Grounding. The equipment grounding conductor contacts of receptacles and cord connectors shall be grounded by connection to the equipment grounding conductor of the circuit supplying the receptacle or cord connector.

FPN: For installation requirements for the reduction of electrical noise, see 250.146(D) .

The branch-circuit wiring method shall include or provide an equipment-grounding conductor to which the equipment grounding conductor contacts of the receptacle or cord connector are connected.

FPN No. 1: See 250.118 for acceptable grounding means.

FPN No. 2: For extensions of existing branch circuits, see 250.130 .

406.3(D)(1) Revise 406.3(D)(1) to read as follows:

Grounding-Type Receptacles. Where a grounding means exists in the receptacle enclosure or ~~a~~ an equipment grounding conductor is installed in accordance with 250.130(C) , grounding-type receptacles shall be used and shall be connected to the equipment grounding conductor in accordance with 406.3(C) or 250.130(C) .

406.3(D)(3) Revise 406.3(D)(3) to read as follows:

Non–grounding-Type Receptacles. Where ~~grounding~~ attachment to an equipment grounding conductor ~~means~~ does not exist in the receptacle enclosure, the installation shall comply with (D)(3)(a), (D)(3)(b), or (D)(3)(c). …

406.9(B) Revise 406.9(B) to read as follows:

406.9 Grounding-Type Receptacles, Adapters, Cord Connectors, and Attachment Plugs.

(B) Grounding-Pole Identification. Grounding-type receptacles, adapters, cord connections, and attachment plugs shall have a means for connection of ~~a~~ an equipment grounding conductor to the grounding pole.

406.9(B)(3) Revise 406.9(B)(3) to read as follows:

A similar green-colored connection device, in the case of adapters. The grounding terminal of a grounding adapter shall be a green-colored rigid ear, lug, or similar device. The equipment grounding connection shall be so designed that it cannot make contact with current-carrying parts of the receptacle, adapter, or attachment plug. The adapter shall be polarized.

406.9(B)(4) Revise 406.9(B)(4) to read as follows:

If the terminal for the equipment grounding conductor is not visible, the conductor entrance hole shall be marked with the word *green* or *ground* , the letters *G* or *GR* , a grounding symbol, or otherwise identified by a distinctive green color. If the terminal for the equipment grounding conductor is readily removable, the area adjacent to the terminal shall be similarly marked.

FPN: See FPN Figure 406.9(B)(4) .

406.9(D) Revise 406.9(D) to read as follows:

Grounding-Pole Requirements. Grounding-type attachment plugs and mating cord connectors and receptacles shall be designed such that the equipment grounding connection is made before the current-carrying connections. Grounding-type devices shall be so designed that grounding poles of attachment plugs cannot be brought into contact with current-carrying parts of receptacles or cord connectors.

410.15(B)(3) Revise 410.15(B)(3) to read as follows:

A metal pole shall be provided with ~~a~~ an equipment grounding terminal as follows:

a. A pole with a handhole shall have the equipment grounding terminal accessible from the handhole.

b. A pole with a hinged base shall have the equipment grounding terminal accessible within the base.

410.15(B)(4)Revise 410.15(B)(4) to read as follows:

A metal pole with a hinged base shall have the hinged base and pole ~~bonded together~~ connected to the equipment grounding conductor .

410.18(A) Revise 410.18(A) to read as follows:

Exposed Conductive Parts. Exposed metal parts shall be ~~grounded~~ connected to an equipment grounding conductor or insulated from ~~ground~~ the equipment grounding conductor and other conducting surfaces or be inaccessible to unqualified personnel. Lamp tie wires, mounting screws, clips, and decorative bands on glass spaced at least 38 mm (1 in.) from lamp terminals shall not be required to be grounded.

410.18(B) Revise 410.18(B) to read as follows:

Made of Insulating Material. Luminaires (fixtures) directly wired or attached to outlets supplied by a wiring method that does not provide a ready means for grounding attachment to an equipment grounding conductor shall be made of insulating material and shall have no exposed conductive parts.

410.18(B) Exception No. 1: Revise 410.18(B) Exception No. 1 to read as follows:

Exception No. 1: Replacement luminaires (fixtures) shall be permitted to connect an equipment grounding conductor from the outlet in compliance with 250.130(C). The luminaire (fixture) shall then ~~be grounded in accordance~~ comply with 410.18(A).

410.21 Revise 410.21 to read as follows:

Luminaires (fixtures) and equipment shall be ~~considered grounded where~~ mechanically connected to an equipment grounding conductor as specified in 250.118 and sized in accordance with 250.122.

410.45 Revise 410.45 to read as follows:

All wiring shall be free from short circuits and ~~grounds~~ ground faults and shall be tested for these defects prior to being connected to the circuit.

410.101(D) Revise 410.101(D) to read as follows:

Fittings identified for use on lighting track shall be designed specifically for the track on which they are to be installed. They shall be securely fastened to the track, shall maintain polarization and ~~grounding~~ connections to the equipment grounding conductor , and shall be designed to be suspended directly from the track.

600.7 Revise 600.7 to read as follows:

Grounding Signs and metal equipment of outline lighting systems shall be ~~grounded~~ connected to an equipment grounding conductor .

600.7(A) Revise 600.7(A) to read as follows:

(A) Flexible Metal Conduit Length Listed flexible metal conduit or listed liquidtight flexible metal conduit that encloses the secondary circuit conductor from a transformer or power supply for use with electric discharge tubing shall be permitted as a ~~bonding means~~ the equipment grounding conductor if the total accumulative length of the conduit in the secondary circuit does not exceed 30 m (100 ft).

600.7(B) Revise 600.7(B) to read as follows:

(B) Small Metal Parts Small metal parts not exceeding 50 mm (2 in.) in any dimension, not likely to be energized, and spaced at least 19 mm (3/ 4 in.) from neon tubing shall not require ~~bonding.~~ a connection to an equipment grounding conductor .

600.7(C) Revise 600.7(C) to read as follows:

(C) Nonmetallic Conduit Where listed nonmetallic conduit is used to enclose the secondary circuit conductor from a transformer or power supply and a ~~bonding~~ equipment grounding conductor is required, the ~~bonding~~ equipment grounding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 38 mm (1 1/ 2 in.) from the conduit when the circuit is operated at 100 Hz or less or 45 mm (1 3/ 4 in.) when the circuit is operated at over 100 Hz.

600.7(D) Revise 600.7(D) to read as follows:

(D) ~~Bonding~~ Equipment Grounding Conductors. ~~Bonding~~ Equipment Grounding conductors shall be copper and not smaller than 14 AWG.

600.32(4) Revise 600.32(4) to read as follows:

Spacing from ~~Ground~~ Grounded Parts . Other than at the location of connection to a metal enclosure or sign body, nonmetallic conduit or flexible nonmetallic conduit shall be spaced no less than 38 mm (1 in.) from grounded or bonded parts when the conduit contains a conductor operating at 100 Hz or less, and shall be spaced no less than 45 mm (1 in.) from grounded or bonded parts when the conduit contains a conductor operating at more than 100 Hz.

605.4(1) Revise 605.4(1) to read as follows:

The cord is extra-hard usage type with 12 AWG or larger conductors, with an insulated equipment grounding conductor.

Substantiation: 406.2(D): The word "conductor" was added to more specifically describe the conductor and grounding path being referred to in this section.

406.2(D)(1): The word "equipment" was added to more specifically describe the conductor and grounding path being referred to in this section.

406.3(B): The word "equipment" and "conductor" was added to more specifically describe the contacts grounding path being referred to in this section. This change leaves no room for confusion over the intended use of the equipment grounding conductor.

406.3(C): The word "equipment" and "conductor" was added to more specifically describe the contacts grounding path being referred to in this section. This change leaves no room for confusion over the intended use of the equipment grounding conductor.

406.3(C)(1): The word "equipment" was added to more specifically describe the grounding path being referred to in this section.

406.3(C)(3): The wording "attachment to an equipment grounding conductor" is more consistent with the proposed definitions of ground and grounding than the wording "grounding connection" The wording was changed to more prescriptively specify the path being referred to in this subsection. Grounding means is determined by attachment to equipment grounding conductor.

406.9(B): The word "equipment" was added to more specifically describe the grounding path being referred to in this section.

406.9(B)(3): The word "equipment" was added to more specifically describe the grounding path being referred to in this section.

406.9(B)(4): The word "equipment" was added to more specifically describe the grounding path being referred to in this section.

406.9(D): The word "equipment" was added to more specifically describe the grounding path being referred to in this section.

410.15(B)(3): The word "equipment" was added to more specifically describe the grounding path being referred to in this section.

410.15(B)(4): Wording was changed to specifically describe the intended connection to ground.

410.18(A): The wording was changed to specifically describe the grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

410.18(B): The wording was changed to specifically describe the grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

410.18(B) Exception No. 1: Wording was remove to simplify the exception. If the connection complies with 410.18(A) there is no need here to specify grounding.

410.21: The use of "equipment grounding conductor" accurately describes a grounding connection without further explanation.

410.45: The use of "ground faults" more accurately describes the fault condition tested.

410.101(D): Using the wording "connections to the equipment grounding conductor" accurately describes the intentional connection to ground.

600.7: Using the wording "connected to an equipment grounding conductor" accurately describes the intentional connection to ground.

600.7(A): The use of "the equipment grounding conductor" accurately describes the intended grounding objective.

600.7(B): The use of "the equipment grounding conductor" accurately describes the intended grounding objective.

600.7(C): The use of "equipment grounding" accurately describes the intended grounding objective.

600.7(D): The use of "equipment grounding" accurately describes the intended grounding objective.

600.32(4): The use of "Grounded Parts" accurately describes the intended NEC requirement.

605.4(1): The wording was changed to specifically describe the insulated grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Part

Revise Articles 406, 410, 600, and 605 as described in the following, relative to the terms bonding and grounding.

406.2(D) Revise 406.2(D) to read as follows:

Isolated Ground Receptacles. Receptacles incorporating an isolated grounding conductor connection intended for the reduction of electrical noise (electromagnetic interference) as permitted in 250.146(D) shall be identified by an orange triangle located on the face of the receptacle.

406.2(D)(1) Revise 406.2(D)(1) to read as follows:

Isolated Equipment Grounding Conductor Required. Receptacles so identified shall be used only with equipment grounding conductors that are isolated in accordance with 250.146(D) .

406.3(B) Revise 406.3(B) to read as follows:

To Be Grounded. Receptacles and cord connectors that have equipment grounding conductor contacts shall have those contacts effectively grounded.

406.3(C) Revise 406.3(C) to read as follows:

Methods of Grounding. The equipment grounding conductor contacts of receptacles and cord connectors shall be grounded by connection to the equipment grounding conductor of the circuit supplying the receptacle or cord connector.

FPN: For installation requirements for the reduction of electrical noise, see 250.146(D) .

The branch-circuit wiring method shall include or provide an equipment-grounding conductor to which the equipment grounding conductor contacts of the receptacle or cord connector are connected.

FPN No. 1: See 250.118 for acceptable grounding means.

FPN No. 2: For extensions of existing branch circuits, see 250.130 .

406.3(D)(1) Revise 406.3(D)(1) to read as follows:

Grounding-Type Receptacles. Where a grounding means exists in the receptacle enclosure or ~~a~~ an equipment grounding conductor is installed in accordance with 250.130(C) , grounding-type receptacles shall be used and shall be connected to the equipment grounding conductor in accordance with 406.3(C) or 250.130(C) .

406.3(C)(3) Revise 406.3(C)(3) to read as follows:

Non–grounding-Type Receptacles. Where ~~grounding~~ attachment to an equipment grounding conductor ~~means~~ does not exist in the receptacle enclosure, the installation shall comply with (D)(3)(a), (D)(3)(b), or (D)(3)(c). …

406.9(B) Revise 406.9(B) to read as follows:

406.9 Grounding-Type Receptacles, Adapters, Cord Connectors, and Attachment Plugs.

(B) Grounding-Pole Identification. Grounding-type receptacles, adapters, cord connections, and attachment plugs shall have a means for connection of ~~a~~ an equipment grounding conductor to the grounding pole.

406.9(B)(3) Revise 406.9(B)(3) to read as follows:

A similar green-colored connection device, in the case of adapters. The grounding terminal of a grounding adapter shall be a green-colored rigid ear, lug, or similar device. The equipment grounding connection shall be so designed that it cannot make contact with current-carrying parts of the receptacle, adapter, or attachment plug. The adapter shall be polarized.

406.9(B)(4) Revise 406.9(B)(4) to read as follows:

If the terminal for the equipment grounding conductor is not visible, the conductor entrance hole shall be marked with the word *green* or *ground* , the letters *G* or *GR* , a grounding symbol, or otherwise identified by a distinctive green color. If the terminal for the equipment grounding conductor is readily removable, the area adjacent to the terminal shall be similarly marked.

FPN: See FPN Figure 406.9(B)(4) .

406.9(D) Revise 406.9(D) to read as follows:

Grounding-Pole Requirements. Grounding-type attachment plugs and mating cord connectors and receptacles shall be designed such that the equipment grounding connection is made before the current-carrying connections. Grounding-type devices shall be so designed that grounding poles of attachment plugs cannot be brought into contact with current-carrying parts of receptacles or cord connectors.

410.15(B)(3) Revise 410.15(B)(3) to read as follows:

A metal pole shall be provided with ~~a~~ an equipment grounding terminal as follows:

a. A pole with a handhole shall have the equipment grounding terminal accessible from the handhole.

b. A pole with a hinged base shall have the equipment grounding terminal accessible within the base.

410.18(A) Revise 410.18(A) to read as follows:

Exposed Conductive Parts. Exposed metal parts shall be ~~grounded~~ connected to an equipment grounding conductor or insulated from ~~ground~~ the equipment grounding conductor and other conducting surfaces or be inaccessible to unqualified personnel. Lamp tie wires, mounting screws, clips, and decorative bands on glass spaced at least 38 mm (1 in.) from lamp terminals shall not be required to be grounded.

410.18(B) Revise 410.18(B) to read as follows:

Made of Insulating Material. Luminaires (fixtures) directly wired or attached to outlets supplied by a wiring method that does not provide a ready means for grounding attachment to an equipment grounding conductor shall be made of insulating material and shall have no exposed conductive parts.

410.18(B) Exception No. 1: Revise 410.18(B) Exception No. 1 to read as follows:

Exception No. 1: Replacement luminaires (fixtures) shall be permitted to connect an equipment grounding conductor from the outlet in compliance with 250.130(C). The luminaire (fixture) shall then ~~be grounded in accordance~~ comply with 410.18(A).

410.21 Revise 410.21 to read as follows:

Luminaires (fixtures) and equipment shall be ~~considered grounded where~~ mechanically connected to an equipment grounding conductor as specified in 250.118 and sized in accordance with 250.122.

410.45 Revise 410.45 to read as follows:

All wiring shall be free from short circuits and ~~grounds~~ ground faults and shall be tested for these defects prior to being connected to the circuit.

410.101(D) Revise 410.101(D) to read as follows:

Fittings identified for use on lighting track shall be designed specifically for the track on which they are to be installed. They shall be securely fastened to the track, shall maintain polarization and ~~grounding~~ connections to the equipment grounding conductor , and shall be designed to be suspended directly from the track.

600.7 Revise 600.7 to read as follows:

Grounding Signs and metal equipment of outline lighting systems shall be ~~grounded~~ connected to an equipment grounding conductor .

600.32(4) Revise 600.32(4) to read as follows:

Spacing from ~~Ground~~ Grounded Parts . Other than at the location of connection to a metal enclosure or sign body, nonmetallic conduit or flexible nonmetallic conduit shall be spaced no less than 38 mm (1 in.) from grounded or bonded parts when the conduit contains a conductor operating at 100 Hz or less, and shall be spaced no less than 45 mm (1 in.) from grounded or bonded parts when the conduit contains a conductor operating at more than 100 Hz.

605.4(1) Revise 605.4(1) to read as follows:

The cord is extra-hard usage type with 12 AWG or larger conductors, with an insulated equipment grounding conductor.

Panel Statement: The changes in Section 600.7(A) through (D) were not accepted because they did not appropriately differentiate between bonding on the secondary side of the power supply or transformer on the neon sign and equipment grounding. Also, the changes in Section 410.15(B)(4) were not accepted because bonding is the correct term.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

ARTICLE 406 — RECEPTACLES, CORD CONNECTORS, AND ATTACHMENT PLUGS (CAPS)

18-9 Log #420d NEC-P18 **Final Action: Reject**
(406.2(C))

Submitter: John Brouzakis, John's Electric

Recommendation: Discontinue use of all aluminum and copper clad wire in homes, business, and industry. Discontinue using aluminum bus bars in breaker panels and MCC panels. Aluminum and copper clad wire and bus bars are still being used in homes, business and industry.

Substantiation: I've seen aluminum or copper clad wire connections to 240 volt a.c. circuits such as on ranges, dryers and other circuits become loose or corroded and start arcing and burn the wire.

Some breaker panels in basements with aluminum bus bars corrode and start arcing where the breaker plugs into the bus bar. On one job, I had to remove all the breakers, clean the bus bar and replace some of the breakers.

These are just a couple of problems that I experienced with people using AL or copper clad wire and panels with AL bus bars. These situations could have turned into electrical fires with loss of life and property. I believe only copper wire and bus bars should be used in homes, buildings and industry.

When I see AL or copper clad wiring inside a home, I tell the owner it should be replaced with copper. I would appreciate it if you discontinue the usage of aluminum and copper clad wire inside homes, business and industry in your next code.

Panel Meeting Action: Reject

Panel Statement: CMP 18 does not have jurisdiction over whether or not to permit the use of aluminum or copper clad aluminum as a conductor.

However, even if another CMP should decide to prohibit such use, CMP 18 would continue to include the requirements in 406.2(C) because replacement receptacles would be required to be installed on all legacy installations of such conductors and 406.2(C) contains appropriate requirements for such installations and the substantiation did not address this issue.

Further, CMP 18 refers the submitter to the 2005 Directory on the NFPA website and specifically to the Regulations Governing Committee Projects, Section 4-3.3, requiring that proposals include proposed text.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-10 Log #1997 NEC-P18 **Final Action: Reject**
(406.2(D))

Submitter: Robert Schuerger, EYP Mission Critical Facilities, Inc.

Recommendation: Revise as follows:

406.2(D) ~~Isolated~~ <u>Insulated Grounding</u> Receptacles. Receptacles incorporating ~~an isolated~~ grounding connection <u>purposely insulated from the receptacle mounting means</u> , intended for the reduction...

(1) ~~Isolated~~ <u>Insulated</u> Equipment Grounding Conductor Required. Receptacles so identified shall be used only with grounding conductors that are ~~isolated~~ <u>insulated</u> in accordance with 250.146(D).

(2) Installation in Nonmetallic Boxes. ~~Isolated~~ <u>Insulated</u> grounding receptacles installed in nonmetallic boxes shall be covered with a nonmetallic faceplate.

Exception: Where an ~~isolated~~ <u>insulated</u> ground receptacle is installed in a nonmetallic box, a metal faceplate shall be permitted if the box contains a feature or accessory that permits the effective grounding of the faceplate.

Substantiation: The use of the term “isolated” has caused confusion which has led to improper and unsafe installations in which a separate grounding electrode and grounding system is installed isolated from the rest of the grounding system of the building. Since the separate grounding system is not properly bonded to the grounding system of the building, a hazardous voltage can be developed between the two grounding systems by an electrical fault or lightning strike.

There have been many cases of this type of installation in the past, with data procession equipment, machine tools and other sensitive electronic equipment. The 2005 edition of IEEE Standard 1100, <u>Recommended Practice for Powering and Grounding Electronic Equipment</u> has “insulated ground receptacle” as the recommended terminology and has recommended the “isolated ground” and “isolated ground receptacle” be avoided.

Panel Meeting Action: Reject

Panel Statement: The requirements of 250.146 are very clear regarding the use of isolated equipment grounding conductors. The panel is not convinced by the substantiation that changing the term “isolated” to “insulated” would correct the problem identified by the submitter and can possibly result in additional misapplication. The basic requirement is in 250.146 and four alternatives are given in 250.146(A) through (D). Section 250 146(D), which covers “isolated receptacles,” is likewise clear that the insulated equipment grounding conductor may be terminated at a panelboard or pass through the panelboard(s) to terminate at the equipment grounding terminal of the applicable derived system or service. Nowhere is it permitted to connect to another grounding electrode. Changing the term for these receptacles from “isolated” to “insulated” would not prevent installers from incorrectly installing the device, but the change may confuse those who are following the Code and installing them correctly.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-11 Log #2279 NEC-P18 **Final Action: Reject**
(406.2(E))

Submitter: Bob Boutin, BE Safe Consultants, Inc.

Recommendation: Add new text to read:

There should be an enhancement to current outlets that would allow them to detect any situation where an appliance is pulling more current than is safe for that specific appliance. Once detected, the outlet would shut off the power to the outlet.

Substantiation: Electrical outlets should be designed to detect if an appliance plugged into the outlet is drawing more current than the appliance is intended to receive. If the outlet senses this overage, the power source should be interrupted. This threshold should be variable, and much more sensitive than circuit breakers currently in homes. Even a relatively small amount of excess current running through an appliance cord (either through an overload situation, arching, or other dangerous conditions) could result in a hazardous situation.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 18-13.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-12 Log #2314 NEC-P18 **Final Action: Reject**
(406.2(E))

Submitter: Mike George, Township of Wilmot

Recommendation: Recommended new wording:

All receptacles shall incorporate Overload Fault Interrupter electrical fire protection.

All residential and commercial structures should incorporate Overload Fault Interrupter technology in all electrical receptacles as a basic standard for electrical fire protection. An Overload Fault Interrupter should be located within an electrical outlet and connects electricity only to valid appliances and disconnects electricity when it detects an electrical overload fault.

Substantiation: The Council of Canadian Fire Marshals and Fire Commissioners and the National Fire Protection Association have published reports on the incidents of fires that indicate that a large portion of fires are caused by electrical appliances. Many of these fires could be prevented. In addition to the reported evidence, my personal experience with fire suppression and prevention spans 32 years, with 30 years in the fire department of the University City of Waterloo and 2 years in the small town of Baden. The last 17 years, I have served as Fire Prevention Officer or Chief Fire Prevention Officer and I am a certified Fire and Explosion Investigator by the National Association of Fire Investigators. <u>Based upon my experiences investigating the sources of fires, I believe that the Overload Fault Interrupter technology can prevent a large number of fires and save many lives.</u>

Many of the electrical fires in my jurisdiction have started in appliances and other devices such as battery chargers, coffee makers, toaster ovens, toasters, fans, motors and air conditioners. The recent widespread use of countertop appliances in the kitchen has increased the percentage of electrically caused fires over 30 years ago. These electrical appliance fires have occurred in residential construction, mobile homes and industrial buildings.

In my 32 years of experience, approximately 25 percent of all the fires I have investigated have been caused by electrical faults. As an investigator, I use the burn pattern to locate the fire source. Many structures have so much fire damage that the cause cannot be proven. Therefore, many of these electrically caused fires must be reported under the source category of “undetermined”.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 18-13.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-13 Log #3562 NEC-P18 **Final Action: Reject**
(406.2(E))

Submitter: Scott Tegler, City of Woodstock

Recommendation: Recommended new wording:

“All receptacles shall incorporate Overload Fault Circuit Interrupter protection.”

All residential and commercial structures should incorporate Overload Fault Circuit Interrupter (OFCI) technology in all electrical receptacles as a basic standard for electrical fire protection. The term OFCI refers to a type of circuit interrupter or disconnect device that activates upon detection of an electrical current overload condition in an electrical device (appliance, power supply, cord) that could elevate wire temperatures high enough to initiate a fire in close-proximity flammables.

This OFCI technology should be implemented in electrical receptacles to be able to detect faults in plugged-in electrical devices. The OFCI should continuously measure the actual current draw and compare it to the normal current draw levels for the device. If the load current exceeds an upper limit for a period of time long enough to overheat the wires, it should disconnect the line voltage from the branch circuit to the associated receptacle plug.

Since some appliances such as refrigerators and coffee makers have two normal operating current levels, the OFCI implementation should have a basic overcurrent trip level, and a second higher trip level with a maximum duration limit. For example, a refrigerator has both a normal cooling mode and a defrost mode. The cooling mode runs an electric motor that drives a refrigerant pump. The defrost mode runs an electric heater element at a significantly higher current draw, but for a limited time. The manufacturer may invoke the defrost mode on an interval or on a condition, based upon the design. With properly selected threshold and duration limits, the OFCI protection would trip on an overheating pump motor condition but not trip on the normal defrost mode current. For a second example, a coffee maker toggles its heating element between on and off in a different duty cycle based upon its mode. Thus, the OFCI protection would trip when the power-on condition continues past a maximum duration time determined by the appliance manufacturer. Due to the complexity of our modern appliances, simple fusing of each appliance is not adequate protection to prevent fires in many cases.

The OFCI trip threshold conditions must match the device plugged into that receptacle. Each receptacle must trip independently for maximum protection. For example, an OFCI protected dual-receptacle outlet should independently detect and disconnect an overload condition in either a 50W wall-mount power supply for a cellular phone (0.5 Amp) plugged into one receptacle or in a 1200W heater (10A) plugged into the other receptacle. Furthermore, each OFCI receptacle must adjust its own trip thresholds and durations automatically to match the characteristics of the electrical device plugged into the receptacle. The electrical device cord-set plug should be encoded with trip-condition data such that the data can be read by detection circuitry in the associated OFCI receptacle. This communication should be adequately robust to withstand reasonable abuse and harsh environmental conditions. For this reason, a non-contact communcation method should be used to transfer the data between the device plug and receptacle.

Substantiation: According to the report "Fire loses in Canada Annual Report, 2001" published by the Council of Canadian Fire Marshals and Fire Commissioners, Canada experiences over 7,400 reported electrical fires each year caused by electrical distribution equipment, appliances and other electronic devices. Of course, with a higher population the US experiences more of these fires. According to the NFPA report "The U.S. Home Product Reports: Appliances and Equipment", by Rohr D. Kimberly of the Fire Analysis and Research Division of NFPA (published in January 2002), between 1994 and 1998, the United States experienced 62,400 reported electrically induced fires per year. Furthermore, these numbers could be understated in two ways.

First, many electrically caused fires cannot be accurately categorized by the fire analysis team. In our city of Woodstock, I have found that over the past 4 1/2 years of investigating we have not had any fire that was able to be conclusively determined to be an electrica; and or electrical equipment fault fire, but that possibility has been a major factor in most of the large loss fires we have experienced. In all, approximately 5 of the 24 major incidents investigated since 2002 have the possibility of being electrically started. With twenty (20) years of firefighting experience, I would say there are many other incidents that most likely wouldn't have been reported (outlets arcing, melting, etc.) because of the reporting protocols and lack of conclusive evidence, therefore, defaulting to undetermined incidents.

The following data is from the Ontario Fire Marshall indicating the number of fires attributed to electrical equipment by year (last 5 years) in the province of Ontario:

2000 - 1082 fires resulting in 40 injuries and 2 deaths, 564 were residential fires

2001 -1221 fires resulting in 38 injuries and 4 deaths, 613 were residential fires

2002 - 1164 fires resulting in 37 injuries and 2 deaths, 635 were residential fires

2003 - 1193 fires resulting in 49 injuries and 2 deaths, 589 were residential fires

2004 - 973 fires resulting in 63 injuries and 0 deaths, 543 were residential fires.

Second, the number of unreported fires dwarfs the number of reported fires. The U.S. Consumer Product Safety Commission, in its 1988 report "Residential Electrical Distribution System Fires", estimates a further 890,000 unreported U.S. electrical fires every year. Using the US-Canada reported fire ratio of 8 to 1, we can estimate that Canada experiences over approximately 111,250 unreported electrically-caused fires, suggesting the total number of electrically-caused house fires in North America could be as high as a million per year.

A majority of these fires are caused by electrical overload faults and overload associated electrical device malfunctions, such as device misuse, device abuse, natural wear and tear, and part breakage. According to Kim Rohr's US report and the "Fire Losses in Canada" report, these fires cause up to 415 deaths (24 in Canada and 391 in the U.S.), 2,226 injuries (325 in Canada and 1,901 in the U.S.) and nearly $1,000,000,000 in direct property loss ($228 million in Canada and approximately $741 million in the U.S.). Indisputably, electrical devices cause too many fires, financial loss, injuries and death. The problems should be addressed as soon as possible by prevention.

OFCI protection could dramatically reduce the loss of life, injury and property each year in North America.

Presently, neither the U.S. nor Canadaian electric codes describe or require a solution to this problem. Circuit breakers and fuse panels protect in-wall wiring against overloads and arcing. However, they cannot adequately protect against fires caused by small appliances and cord overloads. Many electrical devices have 16, 18, 20 and 22 gauge wires inside. The smaller wires can overheat without tripping a 15 Amp circuit breaker. Improper replacement of circuit breakers further weakens protection against electrical device overloads. We have found that homeowners occasionally will replace 15A breakers with 20A or 30A breakers or short out a fuse with a penny on a circuit rated to handle only 15A of current to avoid nuisance tripping on that circuit.

Panel Meeting Action: Reject

Panel Statement: The Panel rejects this proposal for a number of reasons:

1. The proposal does not comply with NFPA Regulations Governing Committee Projects or the NEC Manual of Style (both available to the submitter on the NFPA web site) in that the text provided does not comply with the Manual of Style, for example the use of the word "should".

2. There is nothing in the current edition of the NEC that prohibits such a receptacle. The substantiation raises questions as to its specific applicability to the proposal. Over the past several code cycles, much of the same incident data has been used to support AFCI proposals indicating that the incidents are the result of arcing faults on the interior wiring. The last code cycle, this data was used to support a thermally protected receptacle indicating that the incidents resulted from overheated receptacle contacts or terminals. Now the claim is that the incidents are resulting from electrical overload of connected utilization equipment.

An authoritative clear and unambiguous analysis of the data is necessary to clearly identify the cause of these incidents. Failure to specifically identify cause leads to redundant solutions or, worse solving the wrong problem.

3. This appears to be a proposal that would recommend a "theoretical" product. CMP 18 is not aware of any such product on the market. Nor is CMP 18 aware of any standards or fact finding report covering such a product. Before considering a proposal such as this, CMP 18 would look for information from a standard or fact finding report dealing with performance characteristics such as (but not limited to) the following:

• Endurance
• Capacity to withstand overload and short circuit
• Ability to operate in normal and abnormal temperature ranges
• Ability to withstand surges
• Ability to withstand under-voltages
• Ability to withstand moisture / corrosive atmosphere
• Etc.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-14 Log #1542 NEC-P18 **Final Action: Accept**
(406.3(B))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 406 and revise text as shown for the affected NEC sections.

406.3(B): (B) To Be Grounded. Receptacles and cord connectors that have grounding contacts shall have those contacts ~~effectively~~ connected to an equipment grounding conductor ~~grounded~~ .

Substantiation: 406.3(B): The definition is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." This section has been revised to prescribe the connection to the equipment grounding conductor.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Panel Statement: The panel accepts that the new wording provides the needed clarity of the intent of this section.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-15 Log #2674 NEC-P18 **Final Action: Reject**
(406.3(B))

Submitter: Earl W. Roberts, Reptec

Recommendation: Add a new paragraph to 406.3(B) as follows:

Receptacle outlet circuit testers designed for use in 15A or 20A, 125V, 2P3W receptacles shall display a lighted warning signal when the equipment grounding terminal is energized at line voltage.

Substantiation: All the presently UL - listed receptacle outlet circuit testers give erroneous readings under conditions that have proven fatal to people in several known cases.

All of these testers have a light between the hot and grounded circuit conductor blades, that we will call Light 1, a light between hot and equipment grounding blades, that we will call Light 2, and a light between the grounded circuit conductor and the equipment grounding blades, that we will call Light 3.

Under a normal condition, Lights 1 and 2 would be lit and Light 3 would be off. It is noted that when two terminals are at the SAME voltage, whether zero or 120V, the light will be off. Also, these testers do not differentiate as to which terminal is energized, and which terminal is grounded.

406.3(D) of the 2005 NEC permits the replacement of two-wire receptacles by three-wire receptacles, when protected by GFCIs and properly labeled. It is now possible to have an entire old two-wire home with all three-wire receptacles, and NO equipment grounds.

Black and white wire transposition is a common occurrence in two-wire homes. Since both wires are totally insulated at 600v, the problems were insignificant. Now, the chances of serious shock conditions have greatly increased.

With reversed polarity and an intentional or unintentional connection between the white terminal and the equipment grounding terminal, the equipment grounding terminal is energized at 120V.

Under these conditions, the tester lights are the same as on a correct circuit.

We have built into several UL - listed outlet circuit testers electronic components that warns of this fatal condition. We believe that all of these testers should have this capability.

Panel Meeting Action: Reject

Panel Statement: The panel agrees that this concept identifies a set of multiple circumstances that can result in a safety hazard. However, the panel disagrees that requirements for usage of a device not permanetly connected to the premises wiring system belong in the NEC. The submitter is encouraged to address this issue through the UL 1436 STP.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-16 Log #1396 NEC-P18 **Final Action: Reject**
(406.3(D))

Submitter: George Stolz, II, Pierce, CO

Recommendation: Add new text to read:

(D) Replacement. Replacement of receptacles shall comply with 406.3(D)(1), (2), and (3) as applicable. <u>Receptacles installed to additions to existing branch circuits shall be considered replacements for the purpose of this section.</u>

Substantiation: The section in question (406.3(D)) effectively bends the standard requirements for new installations to provide relief for the installer when dealing with old work. Given the leniency put forth by this section regarding replacement receptacles, it appears that old 2-wire installations, while regrettable, do not present an “imminent danger to occupants” as stated in 80.5(B).

80.5(C) expresses that “Additions...shall not cause a building to become unsafe...”. By expressing explicit guidelines for additions to existing circuits, installers will be forbidden to connect an unbonded EGC between receptacles, decreasing the shock hazard in the event of an unbonded fault. In many cases, these existing circuits are extended to add receptacles to conform with 210.52. The elimination of extension cord use should carry nearly as much importance as EGC’s in this environment.

Panel Meeting Action: Reject

Panel Statement: Section 406.3(D) addresses the installation of replacement receptacles. This proposal addresses the installation of new receptacles. Therefore, this text does not apply to this section. The panel rejects the concept of adding new receptacles to an existing two-wire circuit and applying the provisions for replacement receptacles rules. Replacement receptacles rules are to increase the safety of older two-wire branch circuits where a replacement receptacle is desired. Section 406.3(D)(3) does not address the extension of existing two-wire circuits. The applicable rules for extending two-wire branch circuits are contained in Section 250.130(C) and require the extension to provide an equipment grounding conductor. The references to Sections 80.5(B) and 80.5(C) are now contained in Annex G of the 2005 NEC as 80.9(B) and (C). Annex G is not enforceable unless specifically adopted by local ordinance.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-17 Log #2779 NEC-P18 **Final Action: Reject**
(406.3(E))

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.

Recommendation: Add new text to read as follows:

<u>406.3(E) Safeguarding of Termination Screws. Receptacle outlets shall be installed in a manner that protects the termination screws of the receptacle from accidental contact with persons and tools after installation.</u>

Substantiation: Receptacle cover plates are often removed during the construction phase for the purpose of wall finishing. The receptacles are very often energized at this phase of construction. The receptacle cover plates are often left off of the devices inadvertently for a period of time, until they are discovered and replaced. This circumstance causes a potential safety problem and exposes workers to possible electrical shock or arc blast. Requiring an approved method of covering the termination screws on the receptacle after installation will reduce this potential hazard.

Receptacles are also often times removed from their mounting during maintenance while in the energized state. This is not a recommended practice and power should be turned off to the receptacle before it is removed. However, we must recognize that some individuals will not take these necessary safety measures and will expose themselves to the risk of electrical shock or arc blast. Requiring a covering over the receptacle termination screws will reduce the potential of electrical shock and arc blast in these circumstances.

The required covering can be any of numerous methods available and will be left up to the AHJ to determine its effectiveness. There is available in inexpensive UL listed plastic snap over cover that will meet these requirements completely in addition to other methods.

Panel Meeting Action: Reject

Panel Statement: The substantiation cites a safety problem associated with energized receptacles without proper covers during part of the construction process. CMP 18 points out that this is a violation of Section 314.25 and 406.4(F). The proposal only addresses terminal screws. Other parts of receptacles such as break-off tabs, or terminals to which leads are welded could also be exposed.

The proposer’s substantiation indicates that the recommended practice is to turn off the power to the receptacle before the terminals are exposed. However, the proposer identifies the practice of removing the receptacle while the circuit is energized. The panel does not endorse this unsafe practice. It should be noted that failure to comply is a violation of the applicable OSHA regulations.

Finally, CMP 18 points out the vast range of receptacles is from a 3-wire, 15-ampere, 125-volt to a 5-wire, 60 to 100-ampere, 600-volt receptacles. Presently there are no UL listed snap covers suitable for this application as stated in the substantiation. Placing the responsibility on the AHJ for determining the suitability of the protection method selected to withstand the available voltage and other conditions that may be encountered is an unreasonable expectation.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

COSTELLO, P.: The submitter raises a valid concern in which an individual may be exposed to an electric shock or arc blast when a cover is not properly installed or has been removed for various reasons. The individual exposed is more than likely one that is not aware or has been trained in the hazards that exists in that condition. The submitter’s intent can possibly be met in a number of and variety of ways. The termination screws can be protected with listed products or devices that utilize leads permanently attached to the device. There are other devices that use a snap in connector that offers the level of protection the submitter stated.

Comment on Affirmative:

WELLS, J.: The panel listed a number of concerns with which I concur. What is not published or available for public comment is a suggested alternative proposed by IBEW that was also rejected by the panel. This proposal read as follows:

406.4 Receptacle Mounting.

(F) Exposed Terminals. Receptacles shall be enclosed so that live wiring terminals are not exposed to contact.

<u>Exception: Receptacles with no exposed terminals shall be permitted to be energized for use in the final stages of construction where temporary wiring is removed as required by 590.3(D). Where these receptacles are in use by persons in the final stages of construction, such use shall be in accordance with 590.6.</u>

While this proposal addresses a number of my concerns, in my mind the conflict it does not resolve is the NFPA 70B and OSHA requirements that circuits being worked on be de-energized, except under a very limited set of circumstances, such as when de-energizing would create a greater hazard. Permitting either the original proposal or the IBEW initiated alternative would, I fear encourage working circuits hot exposing workers to shock and arc hazards and employers to OSHA citations.

(Note: Sequence 8-18 was not used)

2-360a Log #427 NEC-P02 **Final Action: Reject**
(406.3(G) (New))

Submitter: Kenneth Wilee, Wilee Electric Inc.

Recommendation: Add new text as follows:

<u>GFCI devices shall be readily accessible.</u>

Substantiation: At times, GFCI devices (i.e., receptacles) are installed behind refrigeration equipment, under hydro-massage tubs and concealed by objects not easily moved. This creates certain inconvenience and possibly a hazard, depending on the load served. These tripped devices cannot be reset reasonably by some people. There is currently no provision to prohibit this in the NEC. I once had to use a broom handle behind a refrigerator.

Panel Meeting Action: Reject

Panel Statement: Requiring these devices to be readily accessible may prove overly restrictive in some cases. The submitter has not provided substantiation that there has been a compromise in safety, only an inconvenience in accessing the device.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

LAROCCA, R.: I do not agree with all of the material provided in the substantiation for Proposal 2-360a, however, I cannot support the Panel's action to reject this proposal.

The expected reliability level of GFCIs is based on the user testing them monthly as contained in the instructions and markings required by the listing. In order for the user to perform the monthly testing, the GFCI needs to be accessible to the user.

18-19 Log #1945 NEC-P18 **Final Action: Reject**

(406.4(D) Exception No. 2)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Delete the following text:

~~Exception No. 2: Listed nonmetallic faceplates that cover the receptacle face to a maximum of 1 mm (0.040 in.) shall be permitted.~~

Substantiation: The NEC serves a valuable purpose, which as stated in article 90.1(A) is, "The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity". The addition of article 406.4(D), Exception No.2 does not conform with the purpose of the Code because it does not offer any safeguarding against hazards arising from the use of electricity. As documented herein, it has the opposite effect because it introduces new hazards. Further, Exception No. 2 creates a conflict with article 406.5, which specifies that "receptacle faceplates shall be installed so as to completely cover the opening and seat against the mounting surface." The intent of article 406.5 is to prevent against an opening in the enclosed area to protect people from live electrical parts that would pose as a shock hazard if contacted. Exception No 2 would allow the introduction of products that, when used in conjunction with some existing receptacles in the electrical infrastructure, would **defeat** the requirement in article 406.5.

The introduction of Exception No. 2 to Article 406.4(D) goes against a Code requirement in place since 1971, requiring the full seating of a plug into a receptacle. It does not provide an enhancement in safety. Further, the text in Exception No. 2 results in a requirement that cannot be enforced by an AHJ as this allows a decorative product to be installed after initial inspection of the electrical system. This lack of control cannot assure that even the 0.040 inch spacer dimension is maintained due to numerous installation factors. The concerns outlined below over the 0.040 inch spacer were not presented to the Code Making Panel since the fact finding report used as technical substantiation to allow this was not submitted in time for public review. This important safety concern, particularly in light of the conflict with another NEC Article, establishes that the intent of the NEC is not being preserved by Exception No. 2. Exception No. 2 would represent an absolute minimum 0.040 inch reduction in plug blade/receptacle contact interaction, that would never be any less and can under the circumstances discussed herein be significantly worse.

IMPROPER PLUG BLADE ENGAGEMENT WITH RECEPTACLE CONTACTS

Exception No. 2 permits a faceplate of insulating material not exceeding 0.040 inches to completely cover the face of a receptacle. Prior to the adoption of this Exception, the NEC required that receptacles and their associated faceplates be installed so that the receptacle is flush with or projects through faceplates of insulating material. Exception No. 2 permits faceplates of insulating material to literally cover the receptacle face, thereby restricting the attachment plug blades from being fully inserted into the receptacle.

Introducing additional space between the receptacle contact and attachment plug can create a potential fire hazard by not allowing full insertion of the attachment plug, resulting in arcing and/or overheating of the receptacle. Hazardous effects of arcing in causing fires was recognized in the adoption of AFCI technology during the 2002 and 2005 Code cycles. Adoption of Exception No. 2 creates an undesirable condition that can introduce arcing in an installation.

It is important to recognize that since the introduction of grounding-type receptacles, literally billions of such receptacles have been installed in this country. There are many different designs of receptacle contacts, and the depth of contacts below the face of the receptacle varies significantly. Similarly, there are different designs of plugs and the length of the attachment plug blades varies by as much as 0.093 inches. In the design of receptacles, manufacturers consider the minimum and maximum length of attachment plug blades and accommodate such variation in determining the appropriate depth of the receptacle contacts.

Receptacle designs do not compensate for a 0.040 inch thickness of additional material interposed between the receptacle contacts and the attachment plug. None of the billions of installed receptacles were designed to take this condition into account. When the plug is mated with the receptacle, the plug blades may not be long enough to compensate for the additional material covering the face of the receptacle. The additional material allows an unanticipated standoff of the plug and can result in a teasing or intermittent condition between the plug blades and receptacle contacts which may produce arcing and overheating. (see two video clips which demonstrate arcing due to teasing of contacts at **http://www.nema.org/FILES/5wd/Teasing Contacts 1.avi** and **http://www.nema.org/FILES/5wd/Teasing Contacts 2.avi**)

This situation can be exacerbated by the use of heavier products, such as transformers, especially those with only two plug blades. Due to the weight of these products, the product has a tendency to "sag" and pull the plug blades out of the receptacle contacts. The plug blades used on these products are designed for full engagement with receptacle contacts. Locating additional material over the receptacle face serves to reduce the engagement of the plug blades and increases the likelihood that the product will "sag" away from the receptacle face, decreasing plug blade/receptacle engagement.

Installation variables can also affect engagement. The reality is that very few receptacles are indeed installed perfectly and the chances of an installation resulting in two to three times the 0.040 inch dimension are more likely than the dimension represented in Exception No. 2. (See photographs #1 through #5 below)

The overall effect of allowing 0.040 inches of material to cover the receptacle face is the same as permitting a plug to be designed with the minimum plug blade length reduced by 0.040 inches. This is unacceptable because receptacles are designed and listed to function properly with plug blades of the minimum specified length. Receptacles may not function as intended if there is any reduction in the plug blade/receptacle contact engagement.

Although it is impossible to assess the entire installed base of receptacles, NEMA is aware of existing designs that would reduce the plug blade penetration into the receptacle contact to a few thousandths of an inch when a 0.040 inch thick cover is installed over the receptacle. Illustration #1 below shows the effect of installing a 0.040 inch thick cover over the face of this receptacle. This illustration represents an actual production model receptacle and a plug with a minimum blade length.

Article 406.4(D) Exception No. 2 presents additional safety concerns. Although providing its intended decorative function, a coverplate can conceal a broken or obviously defective receptacle that should be replaced, or conceal a recessed receptacle installation such as shown in photograph #5. By concealing a broken, defective, or recessed receptacle, no one would be aware of these potentially hazardous conditions.

A receptacle, plug, and wallplate design is a carefully coordinated interface system which insures full and secure plug blade engagement with the receptacles contacts. Exception No. 2 defeats this safe interface.

UL/ANSI and ANSI/NEMA FACEPLATE STANDARDS PROHIBIT IMPROPER ENGAGEMENT

The importance of flush seating of the plug to the receptacle is recognized in two American National Standards - ANSI/UL 514D, Underwriters Laboratories "Standard for Cover Plates for Flush Mounted Wiring Devices", and ANSI/NEMA WD6, the National Electrical Manufacturers Association Standard for "Wiring Devices - Dimensional Specifications". UL 514D, Section 4.1.1 states, "A cover plate or outlet box hood that is used with a receptacle shall not hinder the complete seating of an attachment plug of the type intended for use with the receptacle." When this section was added to the standard, the UL listings of wallplates that interposed material between the plug and receptacle were withdrawn because the reduction in the interaction of plug blades and receptacle contacts effectively invalidates the "listing" of all receptacles.

ANSI/NEMA WD 6 states on page 1 that, "…decorative contours should not preclude the flush seating of a plug into a receptacle." It is evident that both of these standards recognize that there is a potentially unsafe condition created when flush seating of the plug into the receptacle is prevented by a cover.

The significance of insuring flush seating of the plug is also recognized in 406.4(D), but the recent adoption of Exception No. 2 overrides this important requirement. Exception No. 2 is clearly in conflict with both ANSI standards.

CONFLICTING REQUIREMENTS CAN LEAD TO INSTALLATIONS WHICH DO NOT COMPLY WITH THE NEC

406.5 requires faceplates to seat against the mounting surface. 406.4(D) Exception No. 2 permits a 0.040 inch thick cover. Due to varying depths from the bottom of the receptacle mounting yoke to the top face of the receptacle, the cover may not seat against the mounting surface as required by 406.5. Depending on the given cover and receptacle dimensions, installing a cover over the face of the receptacle may result in an installation that either does not comply with 406.5 or does not comply with 406.4(D). The overall depth of the faceplate must exactly match the dimension from the underside of the receptacle yoke to the face of the receptacle. If the depth of the faceplate is greater than the receptacle yoke to face dimension, then the face of the receptacle will not contact the inside surface of the cover. The gap between the receptacle face and the inside surface of the cover results in causing the plug to stand off from the receptacle to a dimension of greater than 0.040 inches, which in practice violates Exception No. 2. If the depth of the faceplate is less than the receptacle yoke to face dimension, then there will be a gap between the faceplate and the wall. These conditions are shown in photographs #6 through #9 and illustration #2 below. Therefore, installations complying with 406.4(D) Exception No. 2 and 406.5 must use covers and receptacles designed to be dimensionally compatible with each other. A single cover design cannot be used with all receptacles. Only a cover of this type that is an exact match with a receptacle will result in an installation that complies with the NEC. This is the receptacle/faceplate combination that is addressed by 406.4(D) Exception No. 1.

Take note that with consideration of certain variables in receptacle design, there can either be a significant gap between the receptacle face and the coverplate that allows arcing to occur, or a gap between the coverplate and the wall, creating a hazardous condition by exposing live parts.

FLAWS IN FACT FINDING REPORT PROVIDED TO CODE PANEL MEMBERS

As previously mentioned, part of the substantiation for Exception No. 2 in the 2005 Code cycle was a fact finding report provided to members of the Code Panel. Unfortunately, this fact finding report did not appear in the public record and could not be examined until after the Code Panel meeting. Review of this report revealed the following significant inadequacies in the testing used to validate the use of the 0.040 inch thick cover.

- The fact finding report evaluated only 4 currently available receptacle models and ignored the hundreds of models of receptacles that are currently installed and in use.
- The fact finding report used an attachment plug that was 1/16” longer than the minimum length permitted.
- The fact finding report did not take into consideration that many molded cords have reduced blade thickness at the tip of the blade.
- No attempt was made in the fact finding report to simulate use with old receptacles that may have abused receptacle contacts with reduced retention.
- The fact finding report erroneously claimed to simulate “end of life” of a receptacle by the laboratory controlled, mechanical insertion and removal of the attachment plug from a receptacle. Typically, end of life occurs in the real world as a result of the abusive yanking out of cords from severe angles thus separating the contacts and sometimes damaging the face.
- No attempt was made in the fact finding report to define the worst case of receptacle with the maximum contact recess, worn contacts or improper installation such that the receptacle does not fit flush with the wall surface.

The fact finding report presented to the Code Making Panel was used to justify that a 0.040 inch spacer over a receptacle would not have an adverse affect on the receptacle and plug interface performance. While the report may have concluded this, the testing to support this was **not** in accordance with the correct and long established test protocol used to evaluate receptacles for listing in the United States. Some key omissions or inaccuracies were the failure to use test gauges; not conducting tests without a ground pin; and not subjecting the products to the specified current level for the overload / resistance to arcing tests. All of these flawed test protocols cannot lead to any indication as to whether a 0.040 inch spacer over the face of a receptacle is compromised or not.

The testing conducted with a 3 wire plug with line blade lengths of 0.690 inches is not indicative of whether or not the retention ability of a receptacle is compromised. ANSI/UL 498 testing is done with line blade gauges of a length of 0.625 inches. The fact finding report’s testing diverging from this protocol produces a favorable condition over real world occurrences in two aspects. There are many products (appliances, transformers, etc.) that utilize two wire plugs. The fact finding report’s test protocol of using a three wire plug enhances the test performance for plug retention by having the ground pin included which increases the plug retention. Compound this with the fact that a longer length plug is used (0.690 versus 0.625 inches), the fact finding report discloses only favorable conditions to demonstrate that retention is not compromised by the introduction of a 0.040 inch spacer. It is essential to consider that the ANSI/UL Standards test protocols are based on actual permissible worst case conditions in the field, which is the allowable use of a plug with 0.625 inch blades. The fact finding report does not disclose permissible worst-case conditions in the field, described herein, which demonstrate that the retention of a plug can be compromised. Plug retention with receptacle contacts is a vital connection in the electrical infrastructure. Intermittent retention can result in arcing, which can lead to fires. The failure of the fact finding report to ascertain if the introduction of a 0.040 inch spacer would introduce this hazard is a serious flaw

The fact finding report failed to conduct the overload/resistance to arcing tests at the ANSI/UL 498 test current levels. The test current levels were established many decades ago and are used to evaluate all listed receptacles in the United States. Receptacle contacts and the product’s enclosure material can not be compromised when subjected to the specified test load (pre-determined value to simulate the aging of a receptacle over its life) that would result in a fire or shock hazard. The test current that is employed on 15 ampere receptacles is 22.5 amperes of D.C. current. The fact finding report’s test protocol was conducted using 11 amperes of current. Again, no conclusions can be reached as to how the introduction of a 0.040 inch spacer over the face of a receptacle would be affected since the testing current levels do not correlate. The fact finding report’s lower test current level was far below the value necessary to determine if a 0.040 inch spacer over the face of the receptacle meets the requirements of UL498.

The UL498 Resistance to Arcing test is conducted to insure that there will be not be any electrical tracking, formation of a carbon conductive path or sustained flaming of the receptacle face material. Exception No. 2 permits a faceplate to completely cover the receptacle face. The faceplate acts as the receptacle face and must comply with the same requirements used to evaluate the receptacle face material. The fact finding report was inadequate in determining the suitability of the cover faceplate material to perform at the same level as a receptacle face. Exception No. 1 to 406.4(D) that requires “Listed kits or assemblies” was adopted specifically to address that the safety performance level was assured even with decorative or functional coverplates.

There is no explanation in the fact finding report as to why more favorable testing conditions were used than what has been standard practice for the evaluation of receptacles. Hence, it would be impossible on these facts alone to draw any conclusion that the introduction of a 0.040 inch spacer over a receptacle would not have a detrimental effect.

It is also important to consider that these are only a couple of examples of where the fact finding report’s test protocol conflicted in a more favorable fashion than what is the long standing practice used to evaluate receptacles. Indeed, the testing in the fact finding report simulated favorable conditions, not “worst case”.

Most importantly, even if the test protocol were conducted in accordance with established standards, it would be impossible to evaluate or even anticipate the safety of all receptacle designs and installations that could potentially be used with a 0.040 inch cover. Exception No. 1 is the only method to ensure this.

As noted below, Underwriters Laboratories also determined that the fact finding report was flawed.

STANDARDS COUNCIL STATEMENT ACKNOWLEDGES TECHNICAL ARGUMENTS

During the July 14, 2004 NFPA Standards Council Meeting there was an appeal dealing with comment 18-12a, which is the comment that resulted in Exception No. 2. (Transcript of meeting provided separately, see transcript pages 156 – 230.) There was significant technical discussion that took place during this meeting that will be of interest to the Code Panel. During the hearing, Underwriters Laboratories provided a review of the technical work that was done in the past that resulted in development of the extensive test and evaluation program that insures full functional engagement between plugs and receptacles. UL commented that the cover plates that interposed material between the plug and receptacle were delisted because, “… there was no way, given the range of plug blades, the range of contact designs, the range receptacle designs, that we could be sure that the product out there was not going to cause a problem.” (page 192, lines 4 – 10 of the transcript.) UL also commented on the inadequacies of the fact finding report that was used to support adoption of Exception No. 2. (UL comments begin on page 186 of the transcript.)

The NFPA Standards Council September 22, 2004 final decision on the appeal included the following statement:

“In conclusion, the Council notes that the presentations to the Council during the appeal demonstrated that some disagreements remain on the technical issues involved in this appeal, and that reasonable minds may differ with the actions of the Panel. As with the TCC, it is not for the Council to itself make judgments and reach conclusions on the technical issues; rather its role is to determine whether the Panel has done so reasonably and in accordance with

NFPA rules. The Council has concluded that the Panel has done so and that its judgment should prevail. This does not mean that the consideration of these issued must end. If the presentations made to the Council deserve further consideration or if new information becomes available, those interested can seek to have Panel 18 consider these matters either through the next revision cycle of the NEC or through a Tentative Interim Amendment (TIA) if deemed to be of an emergency nature."

The Standards Council decision makes it clear that the appeal was upheld on procedural grounds and that reconsideration of the technical issues is appropriate.

CONCLUSION

In view of the additional technical information brought forward during the appeal hearings, and considering the concerns presented in this substantiation, NEMA requests that the panel delete Exception No. 2 to Section 406.4(D).

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel reviewed and considered the proposal and its substantiation together with a presentation made to the panel by TayMac Corporation. In the panels opinion there were conflicts between the proposal with its substantiation and the TayMac Corporation presentation. The TayMac presentation is being included as a part of this panel statement to enable full evaluation and public review.

In order to make a change to the Code, the panel requests that further technical justification and substantiation of the issue be provided.

Note: Supporting material mentioned in this panel statement is available for review at NFPA Headquarters.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 6 Negative: 6

Explanation of Negative:

CARPENTER, F.: The technical substantiation provided with the proposal clearly indicates that Exception No. 2 should be eliminated in the interest of public safety.

COSTELLO, P.: The submitter of the proposal provided significant technical substantiation in his proposal to warrant a change in the current text.

KEMPEL, K.: The substantiation provided by the proposer points out significant technical safety concerns and omissions in the fact-finding report used to support the adoption of Exception 2, during the 2005 Code cycle. The manufacturer's presentation, at the code panel meeting, did not sufficiently address a number of those technical safety concerns. The Panel is being asked to accept the premise that test results presented in the fact-finding report are equivalent to test results that would be expected when performing an investigation in accordance with the ANIS\UL514D standard, when it is clear that the test protocols of these two documents are substantially different. This raises the issue of the credibility of the fact-finding report in general. Therefore, the proposal to delete Exception 2 should be accepted.

LARSON, S.: The substantiation that has been supplied to the panel is helpful but is not sufficiently convincing to make a firm case for either acceptance or rejection of this proposal. Strong and seemingly valid arguments are present on both sides. IEEE hopes that the additional information requested by the panel will be in the form of technical data that can assist the panel in resolving the apparent conflicts in the substantiation, so that a correct decision can be made based on the technical merits of the proposal. The arguments that usage of this style of faceplate introduces no additional hazards related to blade penetration depth are persuasive for those cases where proper receptacle installation practices have been followed. No accident reports have been submitted to the panel that point to usage of these faceplates as the cause of a fire or electrocution. On the other hand, the arguments that the opportunities are high for misuse and misapplication of this product by innocent homeowners and devious contractors are also persuasive. These faceplates may be used to conceal damaged or improperly installed receptacles. At this proposal stage of the code revision process, IEEE has elected to vote against the panel action to reject Proposal 18-19. The possible conflicts with UL514D and NEMA WD6 are an important element in influencing this vote.

WELLS, J.: In the 2005 ROP and ROC stages, I voted to abstain to avoid the appearance of a conflict of interest. I am voting against rejection of this proposal because I believe the substantiation is compelling in depicting substantive safety hazards.

The TayMac "Fact Finding Report" referred to in the NEMA substantiation and the TayMac presentation made at the ROP meeting has not been submitted to NFPA as part of the documentation supporting their position in this Code cycle. I encourage they do so during the comment period. Both CMP 18 and the public should have the opportunity to review all information available on this subject.

The NEMA substantiation raises serious technical deficiencies in the manner in which the testing covered by this report was conducted.

However, the safety concerns raised in the NEMA substantiation are more than whether or not a.040 inch plate covering a receptacle provides sufficient obstruction to the plug to create a safety hazard. This is not merely a.040 inch issue.

NEMA points out that:

● Such a plate can be used to cover an old worn and broken receptacle thereby concealing the hazard.

● Such a plate can be used to cover an improperly recessed receptacle resulting in far more than a.040 inch obstruction.

Neither the presentation nor report submitted by TayMac address these issues. The TayMac web site, however, states in part:

"Decorator Covers improve the appearance of your room in seconds. There is no need to rewire saving you time and money. Throw away the unsightly, outdated, and worn out outlet covers. Decorator Covers give you the designer decorator look you want by covering the old outlet not replacing it."

I could not locate any information on the TayMac website installation guide cautioning the installer about replacing worn, broken receptacles.

The 2002 edition of NFPA 70B <u>Recommended Practice for Electrical Equipment Maintenance</u> states:

18.3 Receptacles.

18.3.1 If the receptacle is badly worn, cracked or broken, or if contacts are exposed, the receptacle should be replaced.

NEMA, I believe, has provided technical documentation about certain risks that may be associated with such a product that merit consideration.

WRIGHT, R.: I disagree with the panel action to reject the proposal to not delete the exception. I feel NEMA presented a compelling case. Loss of Listing is important when safety is involved. During the presentation to the panel there seemed to develop a controversy with the testing procedure, the standard is clear and the current listing organization, I feel, may not take liberty on their behalf with the standard. It was also clear to me when the presenter was asked for a yes or no answer about whether the standard was followed would not directly answer the question.

Hopefully, during the comment period clear and concise information can be submitted to convince the panel to all agree.

Comment on Affirmative:

PIERCE, J.: In addition, insufficient technical substantiation was submitted with regard to why a Nationally Recognized Testing Laboratory (NRTL) should not be allowed to evaluate and list nonmetallic faceplates that cover the receptacle face to a maximum of 1.0 mm. Some debatable details may have been submitted regarding testing nuances in the Trace Laboratories Test Report (Fact Finding Report), but insufficient details were submitted as to why an NRTL should not be allowed to evaluate, test and list such faceplates. Additionally, no data was submitted regarding <u>any</u> recalls from the marketplace of any such faceplates due to confirmed field incident reports of hazards or Consumer Product Safety Commission (CPSC) public notices of increased risk with the use of any such faceplates. If there are documented field incidents with similar faceplates in marketplace; please provide such details and I am sure the CPSC will pursue.

18-19a Log #2197 NEC-P18 **Final Action: Reject**
(406.4(D)(1))

Submitter: P. Bruce King, Stanley Consultants Inc.

Recommendation: Revise as follows:

(1) 2-pole, 3-wire, and 3-pole, 4-wire grounding, blade type receptacles shall have the ground pin oriented on the top for vertical installations, and to the left hand side for horizontal installations.

Substantiation: Reduce potential for fire in all types of buildings by reducing or eliminating the possibility of objects falling onto the current carrying conductor and grounded conductor, which could arc, thereby igniting surrounding materials. The problem has been specifically identified in hospital and residential settings.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 18-21.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

COSTELLO, P.: As this proposal continues to reappear there seems to be real concern as to the direction the code would prefer for a safe installation. A Fine Print Note would serve as a guide for most installations. With direction for the safest use based on the outlets intended use, with general purpose outlets configured with the ground, or grounded conductor in the up position unless the stationary equipment served would be best served with a different configuration based on the cord set and other location consideration.

WELLS, J.: I believe the substantiation, particularly that in Proposal 18-23, is compelling. Our company, believing that where alternative installation choices are available the safer alternative is preferred, stamped "TOP" on some of our receptacles oriented such that the ground was up. Where installers chose to install it ground down, some inspectors, citing Section 110.3(B) forced the contractors to rewire the receptacles with ground up. Regrettably, we were forced to remove the marking.

18-20 Log #667 NEC-P18 **Final Action: Reject**
(406.4(E))

Submitter: Jamie McNamara, Hastings, MN

Recommendation: Revise as follows:

406.4 (E) Receptacles in Countertops and Similar Work Surfaces ~~in Dwelling Units~~ .

Substantiation: This requirement should not be limited to dwellings.

Panel Meeting Action: Reject

Panel Statement: The submitter does not provide sufficient technical substantiation to support expanding this requirement to other than dwelling units and did not provide technical substantiation to support the recommendation as is required by 4-3.3(d) of the NFPA Regulations Governing Committee Projects.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

COSTELLO, P.: While the submitter did not provide the required technical substantiation, I agree with the submitter that the requirement should not be limited to dwelling units. I feel the same hazards exist in any similar location whether it is in a dwelling or non-dwelling location. I can envision a higher risk in locations such as educational facilities with students working on laboratory benches, in lunchrooms or commercial kitchens to name a few. These receptacles in the face up position would be subject to the same laws of gravity of any spilled liquid or conductive materials that may enter it. Perhaps a self closing cover should be the minimum protection for these types of installations when the receptacle is not in use.

SMITH, M.: The submitter brings up a very good point about this requirement being limited to just dwellings. I agree that more information should have been given to substantiate his/her proposal. Yet, I cannot see when the hazard in the dwelling would be eliminated in other occupancies. After much discussion with several design Engineers and Architects, they could not come up with any exception or condition that they would need a device in the countertop in a face up position.

18-21 Log #119 NEC-P18 **Final Action: Reject**
(406.4(G) (New))

Submitter: Gary Mayer, Jackson, MI

Recommendation: This is my proposal for the safe wiring and installation of the standard 120 volt receptacle. Including Ground fault interrupter. I propose that when installing the receptacle it be mounted with the ground terminal to be in the up or top position. I have done it this way for many years now.

Substantiation: If a dead front plug is plugged into the receptacle that has a heavy cord attached to it the weight of the cord will pull the plug down as shown in photo #1 (if the receptacle is installed with the ground terminal in the down position). When this happens, both terminals are exposed. In an industrial or residential setting, this could lead to a dangerous situation. Someone could accidentally come into contact with the energized side of the plug.

In photo #2, the same plug is in the receptacle, however the receptacle has been changed to the ground in the up or top position. Now, even with the weight of the cord pulling down it actually forces the terminals into the receptacle. Now, there is no chance of anyone accidentially coming in contact with the energized terminals.

I have seen may 220 volt dryer plugs wired with the ground terminal in the down position and this is even more dangerous than the 120 volt receptacle.

The same as above also stands for the 220 volt receptacle. It should always be installed with the ground terminal in the up or top position.

With that I will close. In the large scope of things it may seem quite small, but I think it is something that has been overlooked for many years now and it needs to be addressed. It may save someone from a painful shock, or worse. I hope you will consider this suggestion and include it in the NEC.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This proposal does not comply with the Regulations Governing Committee Projects, Section 4-3.3, in that it does not contain recommended text. See www.nfpa.org.

The panel rejects the proposal that receptacles should be mounted with the grounding contact in the up position for vertical installations or the grounded circuit conductor slot in the up position for horizontal installations. The panel has consistently rejected similar proposals and there is no ensurance that the orientation of the receptacle will prevent the type of accident described in the recommendation. The orientation of the grounding contact on the receptacle is installation specific.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

COSTELLO, P.: As this proposal continues to reappear there seems to be real concern as to the direction the code would prefer for a safe installation. A FPN would serve as a guide for most installations. With direction for the safest use based on the outlets intended use, with general purpose outlets configured with the ground, or grounded conductor in the up position unless the stationary equipment served would be best served with a different configuration based on the cord set and other location consideration.

WELLS, J.: I believe the substantiation, particularly that in Proposal 18-23, is compelling. Our company, believing that where alternative installation choices are available the safer alternative is preferred, stamped "TOP" on some of our receptacles oriented such that the ground was up. Where installers chose to install it ground down, some inspectors, citing Section 110.3(B) forced the contractors to rewire the receptacles with ground up. Regrettably, we were forced to remove the marking.

18-22 Log #583 NEC-P18 **Final Action: Reject**
(406.4(G))

Submitter: Robert Tribbie, West Virginia State Fire Marshal's Office

Recommendation: Add new text to read:

406.4(G) Grounding - Type Receptacles. All vertically mounted grounding-type receptacles shall be installed with the blades up. Common practices for installation should be used for receptacles that have grounds in the center.

Substantiation: The National Electrical Code does not state which way grounding-type receptacles are to be installed.

Industry provides many types of cords with "plug in" connectors with neutral positions. However, with today's appliances, devices, and equipment with newer materials, many of these are installed in a "flush mount" position. In this application, the plugs are pre-formed into a space saving design. When these types of plugs are installed in a blade down-position, the natural flow of the trailing cord is disrupted and the trailing cord is then in a position of natural stress. This stress is caused by (once it's plugged in), the trailing cord, which travels in an upward manner, then descends down to a position of where the cord may lay on a surface or become suspended. This action weights the plug to produce a backwards and/or twisting torque upon it. This weighting/torque action could cause the plug to partially back out and expose the ground pin (on top) and the current carrying blades (below) to open air (in a somewhat tilted manner, the ground pin being pulled out prior to the current/carrying blades). This action could cause the cord to become ungrounded. Moreover, in applications where the blades are installed in a downward position, if something were to fall between (or possibly build up between) the receptacle and the plug - the foreign material could cause (a pendulum effect) contact between the ground and the current-carrying parts of the plug. This would energize the equipment ground, possibly damaging the equipment or causing injury.

This statement could also be supported by:

406.9(D) Grounding-Pole Requirements. (second sentence) Which states: "Grounding-type devices shall be so designed that grounding poles of attachment plugs cannot be brought into contact with current-carrying parts of the receptacles or cord connectors."

Furthermore when an appliance, device, or piece of equipment is installed in the "flush mount" position a trailing cord (in the blades down position) could become kinked or pinched behind the installation and hasten the deterioration of the cord.

Although (with the receptacle installed with the blades up) a plug could be subject to the same actions as above, excluding the deterioration of the cord, the results would be different; in that the ground pin would be held in place and the current-carrying blades would come out first. In this instance (with proper installation of the system), if something were to contact the blades the resulting short would trip the circuit breaker. This is less likely to create the pendulum effect described above.

Also, with this installation (blades up), if the plug is sufficiently backed out, the plug could become de-energized while remaining grounded to the last movement.

This statement could be supported by:

406.9(D) Grounding-Pole requirements (first sentence) Which states: "Grounding-type attachment plugs and mating cord connectors and receptacles shall be designed such that the grounding connection is made before the current-carrying connections."

This installation (receptacles installed with the blades up) would not only be safer by intention, it would enhance the connectivity design that is currently supplied by industry in support of 406.9(D).

Panel Meeting Action: Reject

Panel Statement: The panel has consistently rejected similar proposals and there is no assurance that the orientation of the receptacle will prevent the type of accident described in the recommendation. The orientation of the equipment grounding conductor slot on the receptacle is installation specific.

The panel does not agree with the portion of the substantiation concerning the necessity of equipment grounding conductor opening orientation to ensure that the ground will break last. ANSI/UL 498 requires the equipment grounding conductor prong to be longer than the current-carrying,blades and thus ensure it makes first and breaks last regardless of receptacle mounting orientation. Further, the panel points out that there is no industry standard as to the entry point of the cord into attachment plugs.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-23 Log #863 NEC-P18 **Final Action: Reject**
(406.4(G) (New))

Submitter: Ray C. Mullin, Ray C. Mullin Books

Recommendation: Add new text to read:

406.4(G) Receptacles mounted vertically shall have the equipment grounding conductor slot on top. Receptacles mounted horizontally shall have the equipment grounding conductor slot on the left.

Substantiation: I sent this proposal in for previous code cycles. These were rejected. I continue to sincerely believe that the added safety of preventing or reducing the electrical shock hazard and arc-flash burn hazard can be significantly reduced by accepting the above proposal. A very simple, no additional cost code requirement that enhances safety.

It will be easy for electricians to remember how to position the ground slot. Think UL:

U for "up"... L for "left".

Dropping a metal faceplate (chrome, stainless steel, etc.) or other metal object onto a partially inserted male attachment plug cap leads to arc-flashes and/or electrical shock. Metal faceplates do come loose.

Most manufacturers of receptacles are already positioning the equipment grounding slot on top as well as identifying marking on the yoke on their receptacles in conformance to my proposal. See the catalog cuts which I have provided.

With an NEC requirement, UL would no doubt revise their standard...that is if they have not already done so.

Furthermore, positioning the equipment grounding conductor on top would support the requirement in 409.6 which states:

(D) Grounding-Pole Requirements. Grounding-type attachment plus and mating cord connectors and receptacles shall be designed such that the grounding connection is made before the current-carrying connections. Grounding-type devices shall be so designed that grounding poles of attachment plugs cannot be brought into contact with current-carrying parts of receptacles or cord connectors.

Yes, the longer equipment grounding blade helps accomplish the "made before" requirement. Inserting or removing an attachment plug cap from above the receptacle adds to the assurance that the grounding connection will be made before the current-carrying connections.

Just think, added safety at no additional cost! What more could you ask for?

I have provided a number of catalog pages from various receptacle manufacturers. Note the position of the equipment grounding slot.

I ask the Code Making Panel to accept this proposal.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel rejects the proposal that receptacles should be mounted with the grounding contact in the up position for vertical installations or the grounded circuit conductor slot in the up position for horizontal installations. The panel has consistently rejected similar proposals and there is no assurance that the orientation of the receptacle will prevent the type of accident described in the recommendation. The orientation of the grounding contact on the receptacle is installation specific.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

COSTELLO, P.: As this proposal continues to reappear there seems to be real concern as to the direction the code would prefer for a safe installation. A FPN would serve as a guide for most installations. With direction for the safest use based on the outlets intended use, with general purpose outlets configured with the ground, or grounded conductor in the up position unless the stationary equipment served would be best served with a different configuration based on the cord set and other location consideration.

WELLS, J.: I believe the substantiation, particularly in this proposal, is compelling. Our company, believing that where alternative installation choices are available the safer alternative is preferred, stamped "TOP" on some of our receptacles oriented such that the ground was up. Where installers chose to install it ground down, some inspectors, citing Section 110.3 (B), forced the contractors to rewire the receptacles with ground up. Regrettably, we were forced to remove the marking.

18-24 Log #2129 NEC-P18 **Final Action: Reject**
(406.4(G) (New))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

Submitter: Russell LeBlanc, Peterson School of Engineering

Recommendation: Add new section to read:

Voltage between adjacent devices. A receptacle shall not be grouped or ganged in enclosures with other receptacles, snap switches, or similar devices unless they are arranged so that the voltage between adjacent devices does not exceed 300 volts, or unless they are installed in enclosures with permanently installed barriers between adjacent devices.

Substantiation: The same hazard for switches exists for receptacles. See 404.8(B).

Panel Meeting Action: Reject

Panel Statement: The submitter does not provide sufficient technical substantiation nor cite incident reports to support copying the switch requirement of Section 404.8(B) into 406.4(G) for receptacles.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 8 Negative: 4

Explanation of Negative:

COSTELLO, P.: While the submitter did not provide the required technical substantiation, I agree with the submitter that the same hazard exists whether the installation consists with switches or receptacles.

LARSON, S.: The panel should have accepted this proposal. The submitter is correct that the hazards that exist for grouped switches also exist for grouped receptacles where voltage differences over 300 volts are present. The requirements for receptacle mounting should be in Article 406, and should not require the user to refer back to Article 404. The lack of technical substantiation and incident reports, in this case, does not justify rejection of the proposal.

OWENS, T.: The concept of applying the same rules for switches to receptacles is a logical extension of Code language. I think that too much emphasis is placed on providing concrete examples of hazards prior to changing Code language versus providing logically deduced requirements to prevent the hazards from occurring. The question that must be answered concerning this issue is why this requirement was instituted for switches. The second question then becomes whether the reasoning for switch requirements applies to receptacles. I think that both situations are equal and the requirements for both ganged installations must be the same.

I would encourage any person that has details or any incidents involving ganged 277v receptacles to submit them during the comment period for consideration by Panel 18.

SMITH, M.: The submitter has pointed out that the same hazard that occurs with two 277V switches in the same box could occur with devices. I agree that more information should have been given to substantiate his/her proposal. Yet, I can not see when the hazard in the switch installation would be eliminated in devices. After much discussion with several Manufacturers of these devices, they do make a 15 amp 277V duplex receptacle (Example: Hubbell #HBL5302), which if installed next to a second 277V duplex or single receptacles, it could create the same hazard (Voltage between devices exceeding 300V) as in the switches, 404.8(B).

18-25 Log #3337 NEC-P18 **Final Action: Accept**
(406.6(B))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add "or cord connectors" after "receptacle" in the first sentence.

Substantiation: Edit. Cord connectors, a separate entity from receptacles per the article title should be included.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-26 Log #1157 NEC-P18 **Final Action: Reject**
(406.7)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add:

Except the grounding-type plug-in ground-fault circuit interrupters with a movable self-restoring grounding pole as permitted in 406.9(A).

Substantiation: Edit. A grounding type plug-in type GFCI with a movable self-restoring grounding pole is designed specifically to permit use with a non-grounding type receptacle. Which section has precedence?

Panel Meeting Action: Reject

Panel Statement: What is being proposed as an exception is exactly what 406.9 (A) says in positive language which is the preferred method given in the NEC Manual of Style. There is no conflict with 406.7, which deals with noninterchangeability. When a GFCI plug with a moveable, self-restoring ground prong plugs into a two-wire receptacle, it is no longer a grounding type plug.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-28 Log #3639 NEC-P18 **Final Action: Accept in Principle**
(406.8(A))

Submitter: Aaron B. Chase, Leviton Mfg. Co. Inc.

Recommendation: Revise text to read:

406.8 Receptacles in Damp or Wet Locations.

(A) Damp Locations. A receptacle installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is weatherproof when the receptacle is covered (attachment plug cap not inserted and receptacle covers closed).

An installation suitable for wet locations shall also be considered suitable for damp locations.

A receptacle shall be considered to be in a location protected from the weather where located under roofed open porches, canopies, marquees, and the like, and will not be subjected to a beating rain or water runoff.

The receptacle shall be a Listed weather-resistant type.

Substantiation: The protection of outdoor receptacles in damp locations via weatherproof cover plates is commendable. Unfortunately in reality, the outlets intended to be protected are often subjected to exposure to water; UV and impact. The protection of outlets typically used in indoor environments as well is often not afforded this protection as anticipated by the current text of 406.8.

Unfortunately, many of these protective covers are defeated by either the user intentionally or unintentionally breaking off the protective covers. Often in other cases there is a misapplication of the proper cover plate when a vertical closing plate is used in a horizontal application due to limited space after construction was planned out. The submitter has also seen unfortunately in the South Eastern USA a propensity for outlet covers not to be the self closing type. Additionally, 406.8 is misapplied in that the weatherproof enclosure is often used with a product that 406.8(B)(2)(a) addresses as a product needing a wet while-in-use cover. This often results from the homeowner's needs.

Consequentially, receptacles are being exposed to moisture, UV and impact under detrimental conditions (low temperatures). These products have not been constructed or evaluated to being exposed to harsh conditions. An appropriately Listed weather resistant outlet (able to withstand the harsh elements) is needed to address the associated hazards with electrical products and outdoor use. Statistical data* has illustrated the need for a more weather resilient device in spite of the use of protective covers. The inclusion of the proposed additional text in conjunction with the existing code language would address this dangerous condition and noted failure rates.

*A joint NEMA/UL Field study revealed that the greatest number of inoperable GFCI receptacles were located outdoors. The rate of failure was more than double the next highest known location.

Panel Meeting Action: Accept in Principle

In addition to the recommended text, add a new last sentence to read as follows:

This listed weather-resistant requirement shall become effective on January 1, 2011.

Panel Statement: A new last sentence was added to ensure availability.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-29 Log #2105 NEC-P18 **Final Action: Reject**

(406.8(B))

Submitter: Wesley Gerrans, Northwest Kansas Technical College

Recommendation: Option #1

(1) ~~15- and 20-Ampere~~ Receptacles in a Wet Location. ~~15- and 20-ampere, 125- and 250-volt~~ Receptacles installed in a wet location, where the product intended to be plugged into it is not attended while in use or where wet conditions can reasonably be expected to occur during their use, shall have an enclosure that is weatherproof whether or not the attachment plug is inserted.

~~(2) Other Receptacles. All other receptacles installed in a wet location shall comply with (B)(2)(a) or (B)(2)(b).~~

~~(a) A receptacle installed in a wet location, where the product intended to be plugged into it is not attended while in use, shall have an enclosure that is weatherproof whether or not the attachment plug is inserted.~~

(2)(b) A receptacle installed in a wet location, where the product intended to be plugged into it will be attended while in use (e.g., portable tools) and where the conditions that make this a wet location are not expected to occur during the use of the receptacle, shall have an enclosure that is weatherproof when the attachment plug is removed.

Option #2

(1) ~~15- and 20-Ampere~~ Receptacles in a Wet Location. ~~15- and 20-ampere, 125- and 250-volt~~ Receptacles installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug is inserted.

~~(2) Other Receptacles. All other receptacles installed in a wet location shall comply with (B)(2)(a) or (B)(2)(b).~~

~~(a) A receptacle installed in a wet location, where the product intended to be plugged into it is not attended while in use, shall have an enclosure that is weatherproof with the attachment plug inserted or removed.~~

~~(b) A receptacle installed in a wet location, where the product intended to be plugged into it will be attended while in use (e.g., portable tools) shall have an enclosure that is weatherproof when the attachment plug is removed.~~

Substantiation: It seems obvious in 406.(B)(2)(b) in the reference to the "portable tools" and in the 2002 NFPA 70 code, the references in 406.8(B)(2)(a) to sprinkler systems and various lighting is indeed also referring to 15- and 20-ampere 120- and 250-volt receptacles.

As written 406.8(B)(2) now would have to refer to something else. Among the "other" available options are 30 ampere or larger receptacles, 208V-3 phase at any ampere rating, or receptacles for systems operating at more than 250V.

Why would we limit the scope of this section in this way, giving more leniency to receptacles rated with higher ampacity or greater voltage?

This proposal is an attempt to clean up this article so that it conveys the intent of the current code while taking into account the evolution that has taken place in this section over the past couple of decades.

Considering the greater vulnerability of in-use covers to damage because of their additional intrusion into environmental space and recognizing the placement of receptacles in areas where they would not be used while wet conditions exist, (such as those placed in automatic carwash areas to service equipment, on rooftops to service air conditioners or on the sides of homes where subject to direct spray from irrigation equipment or beating rain, etc.) it is my opinion that Option #1 is the more appropriate.

Panel Meeting Action: Reject

Panel Statement: The present wording of 406.8 (B)(1) applies to 15- and 20-ampere receptacles in any wet location and very simply requires a so-called "bubble" cover that is suitable whether or not and attachment plug is inserted. It no longer matters whether it is attended or not attended. The bubble cover must be used.

All other receptacles (other than 15- and 20- ampere) are given alternatives based on whether or not they are expected to be attended while in use.

The proposed wording does not clarify this requirement.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

WELLS, J.: The panel statement has a typo. The first sentence should read: The present wording of 406.8(B)(1) applies to 15- and 20-ampere receptacles in any wet location and very simply requires a so called "bubble" cover that is suitable whether or not ~~and~~ an attachment plug is inserted.

18-30 Log #1351 NEC-P18 **Final Action: Accept**

(406.8(B)(1))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Edit to include all voltage between 120 and 250 volts

15- and 20-ampere, ~~125- and~~ 125 through 250-volt receptacles installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.

Substantiation: Clarification. The receptacle could be a four or five pin twist-lock for a 120/208 Volt circuit.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

WELLS, J.: I believe the panel intended that the wording in 496.8(B)(1) be limited to 125- and 250-volt receptacles. These are the most common types found in general use outside of residences and commercial buildings. The 120/208-volt four or five wire locking receptacles the submitter refers to are intended to be included in 406.8(B)(2).

18-31 Log #2245 NEC-P18 **Final Action: Accept**

(406.8(B)(1))

Submitter: Donald A. Ganiere, Ottawa, IL

Recommendation: Revise as follows:

(1) 15- and 20-Ampere Receptacles in a Wet Location. 15- and 20-ampere, 125- ~~and~~ through 250-volt receptacles installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.

Substantiation: The current rule does not apply to 208 volt receptacles. If there is a hazard with 125 volt and 250 volt receptacles, then it stands to reason that there is a similar hazard with 208 volt receptacles.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

WELLS, J.: I believe the panel intended that the wording in 496.8(B)(1) be limited to 125- and 250-volt receptacles. These are the most common types found in general use outside of residences and commercial buildings. The 120/208-volt four or five wire locking receptacles the submitter refers to are intended to be included in 406.8(B)(2).

18-32 Log #3208 NEC-P18 **Final Action: Reject**

(406.8(B)(1))

Submitter: H. Dean Schumacher, H. Dean Schumacher Electrical Inspections

Recommendation: Eliminate/delete 406.8(B)(1). Revise 406.8(B)(2) to include ALL receptacles.

Substantiation: Residential receptacles wet locations are generally short usage when not attended such as Christmas decorations and have not constituted an endangerment or safety concern.

Panel Meeting Action: Reject

Panel Statement: CMP 18 disagrees with the proposal and opinion expressed in the substantiation. Christmas lighting is often left connected for well over a month. We believe that does not constitute short usage. Garden lighting is left connected for even longer.

The NEMA/UL study referenced in Proposal 18-28 clearly demonstrates that GFCI receptacles are rendered inoperable or are exposed to abusive conditions when not properly covered to prevent water from entering.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-33 Log #3641 NEC-P18 **Final Action: Accept in Principle**

(406.8(B)(1))

Submitter: Aaron B. Chase, Leviton Mfg. Co. Inc.

Recommendation: Revise text to read:

406.8 Receptacles in Damp or Wet Locations.

(B) Wet Locations.

(1) 15- and 20-Ampere Receptacles in a Wet Location. 15- and 20-ampere, 125- and 250-volt receptacles installed in a wet location shall have an enclosure that is weather-proof whether or not the attachment plug cap is inserted. The receptacle shall be a Listed weather-resistant type.

Substantiation: The protection of outdoor receptacles in wet locations via weatherproof cover plates with or without the plug attached is commendable. Unfortunately, the use of these plates is often not achieving the desired effect.

Misapplications, poor installation and assembly, improper installations and improper reinstallations have all led to detrimental effects on outdoor outlets which have led to product failure with the gravest consequences. Additionally, installations that may at one time (initial inspection) would have required a weatherproof plate as described in 406.8(A) often is utilized as if the outlet was being protected by 406.8(B). For example the addition of a new outdoor lighting system or a new fountain or pond would create a misapplication of the NEC after the initial inspection. As a foreseeable hazard this can be addressed by requiring an outdoor weather resistant receptacle would address these concerns. Statistical data* has illustrated the need for a more weather resilient device in spite of the use of protective covers. Including a Listed weather resistant receptacle in coordination with the existing code language requiring the wet location cover plates, would address these hazards and noted failure rates.

*A joint NEMA/UL Field Study revealed that the greatest number of inoperable GFCI receptacles were located outdoors. The rate of failure was more than double the next highest known location.

Panel Meeting Action: Accept in Principle

In addition to the recommended text, add a new last sentence to read as follows:

This listed weather-resistant requirement shall become effective on January 1, 2011.

Panel Statement: A new last sentence was added to ensure availability.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-34 Log #648 NEC-P18 **Final Action: Accept in Principle**

(406.8(B)(1) Exception (New))

Submitter: Larry T. Smith, National Electrical Seminars

Recommendation: Add new text as follows:

(1) 15- and 20-Ampere Receptacles in a Wet Location. 15- and 20-ampere, 125- and 250-volt receptacles installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.

Exception: A receptacle installed in an indoor wet location subject to routine high-pressure spray washing shall be permitted to have an enclosure that is weatherproof when the attachment plug is removed.

Substantiation: High-pressure spray wash cleaning is done on a daily basis in meat packing plants. The cleaning solution is extremely hot and caustic; there is the distinct possibility that it will spray into the enclosure through the cable openings in the in-use cover, causing corrosion to the receptacle, and there is the added danger of foreign materials (blood, etc.) being forced into the enclosure by high-pressure spray.

Panel Meeting Action: Accept in Principle

Modify the proposed exception as follows:

Exception: 15- and 20-ampere, 125- through 250-volt receptacles installed in a wet location and subject to routine high-pressure spray washing shall be permitted to have an enclosure that is weatherproof when the attachment plug is removed.

Panel Statement: The proposed exception was modified to make it clear that the exception applied only to those enclosures addressed in (1). "Indoor" was removed to ensure the exception could be applied to all locations that could have high pressure spray.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-35 Log #3642 NEC-P18 **Final Action: Accept in Principle**

(406.8(B)(2))

Submitter: Aaron B. Chase, Leviton Mfg. Co. Inc.

Recommendation: Revise text to read:

406.8 Receptacles in Damp or Wet Locations.

(B) Wet Locations.

(2) Other Receptacles. All other receptacles installed in a wet location shall comply with (B)(2)(a) or (B)(2)(b). The receptacle shall be a Listed weather-resistant type.

Substantiation: This is a companion proposal to 406.8(B)(1). Please refer to the substantiation under that proposal.

Panel Meeting Action: Accept in Principle

In addition to the recommended text, add a new last sentence to read as follows:

This listed weather-resistant requirement shall become effective on January 1, 2011.

Panel Statement: A new last sentence was added to ensure availability.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-27 Log #83 NEC-P18 **Final Action: Reject**

(406.8(C))

Submitter: Joe Riley, City of Arlington

Recommendation: Revise as follows:

Receptacles shall not be installed within or directly over a bathtub or shower stall measuring 900 m (3 ft) horizontally and vertically to the ceiling from the top of the bathtub rim or shower stall threshold.

Substantiation: Tub and shower spaces for devices is little vague and up to interpretation. Consistency of electrical device and equipment locations with other parts of the code such as

410.4(D) only makes sense in ensuring electrical safety.

Panel Meeting Action: Reject

Panel Statement: Section 406.8(C) is intended to be different from 410.4(D). Cord-connected and similar luminaries are required to be grounded and are not required to be protected by GFCIs. They are, however, prohibited from being installed near or above a tub or shower zone. Receptacles, on the other hand, are required to be both grounded and protected by a GFCI. Further, they are required to be installed at the sink location. In many bathrooms, it is impossible to install a receptacle if it is also prohibited from being installed within 3 feet horizontally of a shower or tub.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-36 Log #590 NEC-P18 **Final Action: Reject**

(406.8(C))

Submitter: Raymond Gendron, Olympia Electric Inc.

Recommendation: Revise text to read as follows:

Receptacles shall not be installed within (5 ft) or over. A bathtub or shower stall recommended (new 5 ft) safe distance.

Substantiation: The problem in question "Bathroom GFCI Receptacles". Question the practice of installation of GFCI receptacles and also TV and phone jacks, adjacent to tubs and shower?

I am aware of 210.52 - 3 - D - Rec Bg sink 3 ft

210.8 - A - 1 + Bathroom

406.8-C = + Bath tub and shower spaces,

but also aware of 550.13 F1 Mobile and Manufactured homes not within 30 in. of tub and shower

also 680.43(A) not within 5 ft of spa and hot tub

680.43 A1(2) + (4) GFCI and permanent barrier

I consider the fact that a very serious shock hazard seems not to be addressed by code.

Not all persons we are trying to safeguard against the use of electrical equipment and appliances have any common sense.

I can picture a TV, phone, radio, hair dryer etc. becoming in contact or by accident submersed in, at a tub or shower location.

It has come too, also considering the fact that GFCI protection not totally dependable when electronic appliances are submersed.

I am also aware of 314.15(A) - damp and wet locations, 404.4 - SW. by tub or shower, 406.8(A) - damp locations, and 406.8(2) - Rec. wet locations.

Is the use of w/p covers the answer? By avoiding the look or asthetics in bathrooms enough to make builder or electrical contractors to move GFCI & TV & Ph outlets a safe distance from tubs and shower locations.

What is a safe distance? 30 ft or 5 ft? or other?

Lately, bathrooms are becoming places to relax, sit in tub, watch TV, read, have phone by tub not to miss a call.

I am greatly concerned of the life safety issue and if only 1 life is saved by your input, I consider this a worthwhile effort.

Is local amendment the answer?

Does 90.4 AHJ come into play?

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 18-27.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

18-37 Log #70 NEC-P18 **Final Action: Accept in Principle**

(406.9(C))

Submitter: Wesley Gerrans, Northwest Kansas Technical College

Recommendation: Revise as follows:

A grounding Terminal ~~or~~ on a grounding type device shall not be used for purposes other than grounding.

Substantiation: I realize this section has had this typographical error for many years. As it reads the effect is to negate 406.9 in its entirety, i.e.; if I can only use a grounding type device for grounding, I cannot use the receptacle adapter, cord connector or attachment plug for its intended purpose.

Panel Meeting Action: Accept in Principle

Revise as follows:

A grounding terminal ~~or~~ on a ~~grounding type device~~ shall not be used for purposes other than grounding.

Panel Statement: The panel has reworded the text for further clarity but disagrees that there was a typographical error.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-39 Log #3115 NEC-P18 **Final Action: Reject**
(406.9(F))

Submitter: Arthur Silverman, General Wire Spring Company
Recommendation: Add a new paragraph (F) to 406.9 as follows:
(F) A listed device that disconnects the equipment grounding conductor internally, either at the power supply cord plug, or within one foot of the plug, where all of the following conditions are met:
1) The plug configuration is 15 or 20 amp., 125 volt, 2P3W.
2) A listed 15 or 20 amp., 125 volt GFCI is installed in the power supply cord, integral with the plug, or within one foot of the plug.
3) The equipment-grounding conductor path is interrupted only when the supply-side of the equipment-grounding conductor is energized at line voltage.
4) The device provides labeling and a clear signal by a light or other means to indicate that the equipment-grounding conductor has been interrupted.
Substantiation:
In spite of the many safety rules in the 2005 NEC, including detailed equipment grounding and bonding and GFCI requirements, people are still being killed by electric shock at the 120-volt level.
Our company manufactures cord-and-plug-connected, heavy-duty plumbing pipe cleaning equipment. The equipment usage often exposes workers to the particularly dangerous combination of water, metal piping, and electricity.
We use nothing but the highest quality electrical equipment as components of our products – three-wire grounding plugs, heavy-duty jacketed cables with an equipment grounding conductor, GFCIs, and motors.
In spite of our quality safety efforts, we find our UL-listed products involved in electrocutions that result from an energized equipment grounding conductor. Typically, there is a gap in the equipment grounding path somewhere back to the grounding electrode, and the equipment grounding conductor becomes energized on the load side of the gap. Under these conditions, the GFCI protection is totally ineffective.
The following fatalities involved this scenario and our products. More detail is available from our office.

Date of Fatality	Location	Number Killed	Comment
8-11-86	Michigan	2	Working on sewer pipes near stream
10-5-98	Texas	1	In ditch with sewer line
9-27-99	Oklahoma	1	Energized wall receptacle grounding terminal
10-12-01	Alabama	1	240v to 120v conversion involved
5-4-03	Texas	1	Homeowner in bathroom – wet floor

We have developed a device that we would like to install on our equipment that would disconnect the equipment-grounding conductor when it is energized. Present NEC wording prevents such a device from being evaluated by a third-party testing laboratory to determine its suitability for listing. Without listing, we cannot install it on our equipment, thereby being deprived of the opportunity to save lives.
Panel Meeting Action: Reject
Panel Statement: The panel agrees that this concept identifies a set of multiple circumstances that can result in a safety hazard. However, the panel disagrees that requirements for usage of a device not permanently connected to the premises wiring system belong in the NEC. The submitter is encouraged to address this issue through the UL STP process.
The panel disagrees with the submitter's proposal to disconnect the equipment grounding conductor only. Any disconnection should involve all circuit conductors.
CMP-18 considers the proposal that the disconnection of the equipment grounding conductor only violates Section 250.4. CMP-18 recommends that this proposal be forwarded to CMP-5 for action.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

18-40 Log #1944 NEC-P18 **Final Action: Accept**
(406.11 (New))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Add text to read as follows:
<u>406.11 Tamper Resistant Receptacles in Dwelling Units. In all areas specified in 210.52, all 125-volt, 15- and 20-ampere receptacles shall be listed tamper resistant receptacles.</u>
Substantiation: 210.52 specifies the areas in dwelling units where receptacles shall be installed. This proposal references those areas.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Panel Statement: The panel is concerned about the possible increased insertion force required for our aging population. The panel requests data concerning the amount of force necessary to insert a plug into the shutter and the amount of force necessary to fully insert a plug into a tamper-resistant receptacle.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
WALL, C.: The submitter of the proposal has provided much data to identify an issue with small children in dwellings and a proposed cost to implement a solution. However, the submitter of the proposal has not provided sufficient technical substantiation to mandate or justify the installation and use of tamper resistant receptacles throughout all dwellings for all cases and in all circumstances. Many dwellings do not contain small children and may only be inhabited by adults, older children, the elderly or adults with physical impediments. Also, there was no evidence provided that the operation of these devices will not or cannot be circumvented by small children. The submitter has not provided a fact-finding report showing the potential reductions of the injuries with the implementation of the proposed solution of having all dwelling unit receptacles as tamper resistant.
The submitter's proposal will also mandate future installations of GFCIs and AFCIs as tamper resistant. The submitter provided no evidence that the use of the current protective devices such as GFCIs and AFCIs has proven totally unreliable in all cases and where they may have been historically installed or used. The submitter did present some anecdotal evidence that receptacle caps could be removed by small children. However, this evidence does not discount the use or effectiveness of receptacle caps in dwellings with small children.
We support the equipment device manufacturers producing tamper resistant receptacles with only a $0.50 premium over standard receptacles. We believe this first step by the device manufacturers to reduce the cost will be a giant step in the use of those devices for future occupancies. However, each dwelling owner needs to have the ability to decide if these devices are appropriate for their circumstances and provide their desired protection. But, there is no justification for such a broad, all encompassing mandate of tamper resistant devices in all dwelling occupancies.
Comment on Affirmative:
COSTELLO, P.: This proposal addresses a long recognized problem in dwelling units. While concerns may come up as to the need for installing tamper resistant receptacles on areas such as fixed appliances, refrigerators, sump pumps and washers, the additional safety that would be there when these plugs are not in use would outweigh the advantages of allowing for exceptions not requiring them.
KEMPEL, K.: The Panel Statement does not reflect the fact that the Panel considered limiting the locations where tamper resistant receptacles are required. It considered locations such as the receptacle for the refrigerator, above stove for a microwave, above kitchen counters, in garages and outdoor locations. Limitations were not included to avoid potential installation errors and the minimal cost difference (based on the info in the substantiation).
LARSON, S.: The panel's deliberation of this issue would benefit from an accurate cost comparison between the standard and tamper-resistant type receptacles manufactured for home use. Also, the panel should clarify that this provision is invoked for new home construction only, and is not intended to be applicable to new work in existing homes, nor to existing homes put on the market for resale. If this is not the case, the panel should make this clarification.
OWENS, T.: The concern that I have with this proposal is the availability of tamper resistant GFCI receptacles. My understanding is that there are none currently available and it is not known whether they will become available prior to adoption of the Code. In most cases, this requirement can be met using GFCI circuit breakers. However, in receptacle replacement conditions, a circuit breaker may not be workable (i.e., a multi-wire branch circuit). This would create a possible conflict within the Code where a receptacle may be required to be both GFCI protected and tamper resistant. I think that this proposal needs to be revisited during the comment stage to ensure that no conflicts or unworkable situations are created.

ARTICLE 408 — SWITCHBOARDS AND PANELBOARDS

9-100 Log #284 NEC-P09 **Final Action: Reject**
(408.3(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
"Location. Conductors and busbars shall be located so as to be free from ~~physical damage~~ blows or abrasion...".
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
The proposed rewording is an attempt at precision. Furthermore, if you don't care to reword it I would then have to fall back to arguing that in that case the term "physical" should be eliminated.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: The use in CMP-9's articles is consistent with the rest of the Code. CMP-9 understands that this is a global proposal and if this terminology changes, it must be evaluated by the Technical Correlating Committee and guidance provided to code making panels so the results will be consistent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-101 Log #362 NEC-P09 **Final Action: Accept in Principle**
(408.4)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the Panel Action on Proposal 9-105. This action will be considered by the Panel as a Public Comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
408.4 Circuit Directory or Circuit Identification. Every circuit and circuit modification shall be legibly identified as to its clear, evident, and specific purpose or use. The identification shall include sufficient detail to allow each circuit to be distinguished from all others. The identification shall be included in a circuit directory that is located on the face or inside of the panel door in the case of a panelboard, and located at each switch on a switchboard. <u>Unused or spare switches or circuit breakers shall be clearly identified as "spare." Additional spaces for switches or circuit breakers in panelboards or switchboards shall not be required to be identified.</u>
Substantiation: The Code currently only requires circuits to be identified as to their purpose. 110.22 does require the disconnecting means to be identified to indicate its purpose, but applies to disconnecting means, which by definition can be devices in addition to and other than overcurrent devices. A rule that requires additional or redundant fused switches or circuit breakers in panelboards or switchboards will provide additional guidance and safety for occupants and workers. Additional spaces in such equipment are typically self-evident as to their purpose.
Panel Meeting Action: Accept in Principle
Change 408.4 to read as follows:
Every circuit and circuit modification shall be legibly identified as to its clear, evident, and specific purpose or use. The identification shall include sufficient detail to allow each circuit to be distinguished from all others. Spare positions that contain unused overcurrent devices or switches shall be described accordingly. The identification shall be included in a circuit directory that is located on the face or inside of the panel door in the case of a panelboard, and located at each switch on a switchboard.
Panel Statement: CMP-9 believes this approach addresses the concerns raised by the submitter but with simpler language.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-102 Log #811 NEC-P09 **Final Action: Reject**
(408.4)

Submitter: Larry Covelli, Lighthouse Electrical Contractor Inc.
Recommendation: Revise text to read as follows:
Every circuit and circuit modification shall be legibly identified at to its clear, evident, and specific purpose or use. <u>In the language used in that household or facility public or private.</u>
Substantiation: When a circuit is identified, it should be in the language spoken in the household or facility public or private. This is a serious safety issue. If you can not read what is written on a panelboard or any circuit directory. The potential for life or limb is current.
Panel Meeting Action: Reject
Panel Statement: The language of the proposal is unenforceable in most situations, as the language of the household may be unknown (i.e., spec. house with no buyer). Additionally, tenants of a residence are a dynamic factor, with no way to anticipate the native language of future residents. Introducing language as a variable in such marking requirements does not increase the safety of the installation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-103 Log #1655 NEC-P09 **Final Action: Reject**
(408.4)

Submitter: John Steinke, Reno, NV
Recommendation: Modify second half of paragraph to read:
"The identification MAY be included in a circuit directory on the door (or face) of a panelboard, OR (new option here) at the specific breaker, either on the face of the breaker, or immediately next to it."
Substantiation: Directories are often poorly placed, arranged so it is unclear just which breakers they refer to, and offer inadequate space to identify the circuit properly.
More important, they often conflict with markings places on the panel, immediately next to the breaker.
I submit that a label next to a breaker is clearer in meaning, and quicker to find, than a directory that may be upside down, and above you, as you hold the panel door open.
Likewise, the application of a label to the face of the breaker itself is not only clear- it remains in place when the door is removed by the electrician. During construction, this practice also allows the electrician to move breakers about without having to worry about what the directory (or prints) may say.
The most current information is always available with this method. Yet, as written, a directory is still required!
Panel Meeting Action: Reject
Panel Statement: The Code permits for the directory to be located on the panel face, which could include markings on each circuit breaker provided they met all the rules for specificity.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-104 Log #3143 NEC-P09 **Final Action: Reject**
(408.4)

Submitter: Dale Rooney, Municipality of Anchorage
Recommendation: Add new exception to read:
Exception: Where multiple circuits serve receptacles in a room or area it shall be permitted to identity the circuit number on the faceplate and the room or area served at the panel.
Substantiation: There are situations where "clear, evident and specific" identification at the panel is difficult without lengthy descriptions. Common practices such as alternating the circuit supplying receptacles around a room, and supplying duplex or double-duplex receptacles with multiple circuits are actually discouraged by the difficulty of identifying them to be "distinguished from all others". This exception provides an alternative that is practical and in many ways better than the general requirement.
Panel Meeting Action: Reject
Panel Statement: The Code requires unique identification on all circuits. For example, a circuit directory that said "Kitchen receptacles (A)" and "Kitchen receptacles (B)" would comply with the Code without any changes, provided the markings were applied in the kitchen accordingly, and the inspector could be persuaded that the markings were likely to be permanent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-105 Log #3407 NEC-P09 **Final Action: Accept in Principle**
(408.4)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the Panel Action on Proposal 9-101. This action will be considered by the Panel as a Public Comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Add the following sentence at the end:
"No circuit shall be distinguished in a manner that depends on transient conditions of occupancy."
Substantiation: CMP 9 did an excellent job in the 2005 cycle when it modernized this rule, however, one concept was missed, and it can easily frustrate the effective use of the rule in many cases. If circuits are identified as "receptacles in Suzie's room" or "lights in Joe's office" the identifications meets the literal text for completeness, for being distinguishable from all others, etc. However, when Suzie leaves home and Joe's business moves to a different address, either or both of which may happen one week after the final inspection, even the most accurate circuit directory becomes entirely unusable unless some local party happens to remember who Suzie and Joe were. This happens repeatedly in the field.
Panel Meeting Action: Accept in Principle
Change 408.4 to read as follows:
Every circuit and circuit modification shall be legibly identified as to its clear, evident, and specific purpose or use. The identification shall include sufficient detail to allow each circuit to be distinguished from all others. The identification shall be included in a circuit directory that is located on the face or inside of the panel door in the case of a panelboard, and located at each switch on a switchboard. No circuit shall be described in a manner that depends on transient conditions of occupancy.
Panel Statement: CMP-9 concludes that it agrees with the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-106 Log #2267 NEC-P09 **Final Action: Reject**
(408.6 (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
408.xx Panelboards shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 407-2002, Recommended Practice for Installing and Maintaining Panelboards, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 408. However, safety would be improved by offering more detailed installation guidance for panelboards.
Panel Meeting Action: Reject
Panel Statement: It is inappropriate to reference a particular guide since there are many installation and maintenance guides from other sources, in particular the manufacturer. The requirement in 110.12 is sufficient.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-107 Log #425 NEC-P09 **Final Action: Reject**
(408.8(A)(1))

Submitter: Mario Mumfrey, Inspection Bureau Inc.
Recommendation: Add text to read as follows:
408.8(A)(1) Deadfront covers of panelboards and switchboards shall be so designed as to remain in place without reliance on its supporting hardware or overcurrent devices.
Substantiation: As these load centers are getting larger to meet other issues in the NEC, the removal of these new large and heavy covers can become a serious safety concern. The degree of difficulty in safely removing or installing these deadfront covers has become an acceptable risk for the experienced. However, this risk should not be extended to the general public, whom the industry is now marketing this equipment to specifically. The danger lies in having to remove or install an average of six screws while attempting to hold the cover, ensuring it does not slip and contract any current carrying parts within the enclosure. This is really a simple inexpensive fix which some have already implemented without the need for code language, understanding fully the safety and liability issues, respectfully.
Panel Meeting Action: Reject
Panel Statement: CMP-9 is uncertain as to submitter's intent for the location of the proposed material. Section 408.8(A)(1) is not the correct Code reference.
Regardless of the intended location, CMP-9 concludes that this is a design/product standard issue. Manufacturers of panels are doing an excellent job in accommodating the objectives set out in the proposal.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
BELISLE, R.: The panel action commends the manufacturers for doing a good job of accommodating the needs of the industry. It appears there should be requirements to ensure that the needs continue to be met, if in fact they are already doing so. My notes reflect that the panel discussion determined there are no requirements regarding independent support for "Panelboard" covers of any weight. UL 67 needs direction from CMP 9 to require independent support such as hinged covers for panelboard covers over 225 amps.

9-108 Log #2571 NEC-P09 **Final Action: Reject**
(408.9 (New))

Submitter: Larry Rogers, Vattertott College-Tulsa / Rep. Vattertott Colleges, NFPR and IAEI Member
Recommendation: Add new text as follows:
Enclosure fronts or faces; All unfinished edges, internally and externally of enclosure faces shall be rounded or de-burred to a smooth finish.
Substantiation: I am using enclosures in a generic form to include panel boards, auxiliary gutters, surface metal raceways, and large junction boxes above 4 11/16. Sharp corners/edges on enclosures have caused thousands of injuries to workmen and also thousands of hours of lost time man hours. Also, damage to the integrity of conductor insulation during installation or inspection is a problem with results of sometimes immediate arc flash or they are found later with a bare hand, which could lead to a fatal shock or serious cut due to jerk reaction. We ask this panel to consider having the manufacturer remove these sharp edges prior to shipment, thus attacking the problem from the start. Sharp edges stay sharp for years.
Panel Meeting Action: Reject
Panel Statement: CMP-9 agrees with the submitter that there are legitimate concerns in this area.
This proposal is a product standards requirement and does not need to be part of the installation code. It is suggested that the submitter propose revisions to the appropriate product standards through the particular standards revision process.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
BELISLE, R.: My notes indicate CMP-9 generally agreed that there is a legitimate concern over the issue relating to sharp edges and worker injuries, yet failed to act due to product standards. We believe the submitter has a valid point, which deserves attention. Product standards are responsible for construction of electrical equipment, but will not change until the NEC changes. If the NEC disallows the practice of sharp edges, Standards will be quick to follow with appropriate changes.
We believe the CMP should act to insert the proposed language into new sections 408.54, falling under the heading of "Construction Specifications"
This location would affect product standards in a positive manner.
Comment on Affirmative:
LEMAY, T.: The submitter's concerns are valid with regard to numerous electrical equipment parts and enclosures having sharp corners and edges that cause accidental injury.
There are many emergency room visits requiring suturing of open wounds caused by accidental impact with these items that could be avoided if efforts were taken to provide for rounded or deburred edges.
I agree with the panel in that this is a product standards issue.

(Note: Sequence 9-110 was not used)

9-111 Log #476 NEC-P09 **Final Action: Reject**
(408.15 (New))

Submitter: Joseph Rossi, Township of Clinton
Recommendation: Add new text to read:
All new one-family, two-family, and multifamily dwellings main circuit breaker panels shall have at least 10 percent free space or a minimum of three open slots.
Substantiation: On most of my inspections for a final of a new house, which are ranging anywhere from $850,000 to $1.55M, I open the panel door and find one free 1/2 breaker available for the new home owner. Square D makes a 30 breaker 200-amp panel, which is very popular in our area. Of course, the first thing the homeowner wants to do is install a pool. Getting a price for a sub panel makes the homeowner think he or she can do it themselves and since many of these homes are back from the road, this temptation makes the permit be bypassed. Next, which is more dangerous, the homeowner's friend who knows a little about electricity thinks, "I can double up on some circuits" or by a whole bunch of thin line breakers and starts to wire up basements and other rooms. Therefore, I feel we would be doing us all a favor by installing this rule.
Panel Meeting Action: Reject
Panel Statement: The NEC is not intended to mandate provisions for future expansion; see 90.1(B).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-112 Log #143 NEC-P09 **Final Action: Reject**
(408.16(B))

Submitter: Alireza Heidariabhari, Cater Bergess
Recommendation: In addition to the requirements of 408.13, a power panelboard with supply conductors that include a neutral and having ~~more~~ less than 10 percent of its overcurrent devices protecting branch circuits rated 30 amperes or less shall be protected by overcurrent...
Substantiation: 408.14(B) describes a power panelboard, by correcting 408.16(B) we will follow the same description in this paragraph.
Panel Meeting Action: Reject
Panel Statement: CMP-9 notes that the proposal is written on a different edition of the Code; in the 2005 NEC, this is 408.36(B). The Code is correctly written; this section addresses power panelboards with a substantial number of small branch circuits that are akin to lighting and appliance branch-circuit panelboards. Only these power panelboards get an individual protection rule. Power panelboards with traditional large feeder loads originating from them are still eligible to be protected by a load calculation under 408.30. This proposal would invert that long-standing allowance without substantiation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-113 Log #130 NEC-P09 **Final Action: Reject**
(408.18(A)(1) (New))

Submitter: Mario Mumfrey, Inspection Bureau Inc.
Recommendation: Add new text to read as follows:
Deadfront covers of panelboards and switchboards shall be so designed as to remain in place without reliance on its supporting hardware or overcorrect devices.
(This proposal is to include the change in 2008 giving notice only in 2005).
Substantiation: As these load centers are getting larger to meet other issues in the NEC, the removal of these new large and heavy covers can become a serious safety concern. The degree of difficulty in safely removing or installing these deadfront covers has become an acceptable risk for the experienced. However, this risk should not be extended to the general public, whom the industry is now marketing this equipment to specifically. The danger lies in having to remove or install an average of 6 screws while attempting to hold the cover, ensuring it does not slip and contact any current carrying parts within the enclosure.
Panel Meeting Action: Reject
Panel Statement: CMP-9 is uncertain as to submitter's intent for the location of the proposed material. Section 408.18(A)(1) is not the correct Code reference.
Regardless of the intended location, CMP-9 concludes that this is a design/ product standard issue. Manufacturers of panels are doing an excellent job in accommodating the objectives set out in the proposal.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-109 Log #674 NEC-P09 **Final Action: Accept in Principle**
(408.24)

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
General new **<u>408.24 High-Leg Identification.</u>**
<u>A panelboard containing a 4-wire, delta-connected system where the midpoint of one phase winding is grounded, shall have the panelboard legibly marked</u> **<u>"Caution B Phase Has _______ Volts to Ground".</u>**
Substantiation: There are numerous reports of injury and property damage due to people not recognizing there is a high leg in the panelboard. This requirement would help maintenance people and installer recognize the conductor and bus bar with the higher voltage to ground. This requirement would eliminate some of the hazards of accidentally connecting outlets to the high leg and causing injury to people and burning up equipment.
Panel Meeting Action: Accept in Principle
C hange 408.3(F) to read as follows:
(F) High-Leg Identification. A switchboard or panelboard containing a 4-wire, delta-connected system where the midpoint of one phase winding is grounded, shall be legibly and permanently field marked.
"Caution _____ Phase Has _____ Volts to Ground"
Change existin g 408.3(F) to be 408.3(G).
Panel Statement: CMP-9 concludes that it agrees with the submitter's intent but was expanded to apply to both switchboards and panelboards. In part, this was the reasoning for locating the text in Part I.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
LEMAY, T.: It has long been assumed that the high leg in a panelboard or switchboard is apparent to electrical engineers, electrical workers, estimators, owners and inspectors. This is clearly not the case. One typically has to either remove the panelboard and measure the voltage or if possible, look at the transformer configuration on the utility pole to determine the type of three phase system that was being used in the premises.
Additionally, the fact remains that there have been numerous pieces of 110 volt equipment that have been damaged because of connection to the phase with higher voltage to ground.
This can be avoided with proper field labeling of panelboards or switchboards that this proposal provides for.

9-114 Log #1154 NEC-P09 **Final Action: Accept**
(408.30)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Insert "Parts II, III, IV, and V" ahead of "Article 220."
Substantiation: Edit. To comply with Style Manual.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-115 Log #2945 NEC-P09 **Final Action: Accept in Principle**
(408.30)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 408.30 as follows:
408.30 General. All panelboards shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Article 220. ~~Panelboards shall be durably marked by the manufacturer with the voltage and the current rating and the number of phases for which they are designed and with the manufacturer's name or trademark in such a manner so as to be visible after installation, without disturbing the interior parts or wiring.~~
~~FPN: See 110.22 for additional requirements.~~
Substantiation: It is proposed to move these construction requirements to Part IV, Construction Requirements so as to be located more appropriately. See the companion proposal.
Panel Meeting Action: Accept in Principle
Insert "Parts II, III, IV, and V" ahead of "Article 220."
Retain the FPN in 408.30.
Panel Statement: See panel action and statement on Proposal 9-123.
The panel changed references to "Parts II, III, IV, and V" to comply with the NEC Manual of Style.
The FPN refers to a field installation practice and not manufacturing; therefore, it needs to be retained in its current location.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-116 Log #1594 NEC-P09 **Final Action: Accept in Principle**
(408.34)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 408.34:
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
Panelboards shall be classified for the purposes of this article as either lighting and appliance branch-circuit panelboards or power panelboards, based on their content. A lighting and appliance branch circuit is a branch circuit that has a connection to the neutral <u>conductor</u> of the panelboard and that has overcurrent protection of 30 amperes or less in one or more conductors.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

In the submitter's text, change "neutral conductor" to "neutral busbar or equivalent connection provisions".

Panel Statement: The change is an editorial preference because the wording chosen more accurately describes the nature of the connection. CMP-9 notes that if Proposal 9-117 is accepted, then the action on this proposal is superseded.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-117 Log #2643 NEC-P09 **Final Action: Accept in Principle**
(408.34, 408.35, and 408.36)

Submitter: Kevin J. Lippert, Eaton Corporation

Recommendation: Delete the following text:

~~408.34 Classification of Panelboards. Panelboards shall be classified for the purpose of this article as either lighting and appliance branch circuit panelboards or power panelboards, based on their content. A lighting and appliance branch circuit is a branch circuit that has a connection to the neutral of the panelboard and that has overcurrent protection of 30 amperes or less in one or more conductors.~~

~~(A) Lighting and Appliance Branch Circuit Panelboard. A lighting and appliance branch circuit panelboard is one having more than 10 percent of its overcurrent devices protecting lighting and appliance branch circuits.~~

~~(B) Power Panelboard. A power panelboard is one having 10 percent or fewer of its overcurrent devices protection lighting and appliance branch circuits.~~

~~408.35 Number of Overcurrent Devices on One Panelboard. Not more than 42 overcurrent devices (other than those provided for in the mains) of a lighting and appliance branch circuit panelboard shall be installed in any one cabinet or cutout box.~~

~~A lighting and appliance branch circuit panelboard shall be provided with physical means to prevent the installation of more overcurrent devices than that number for which the panelboard was designed, rated, and approved.~~

~~For the purpose of this article a 2 pole circuit breaker shall be considered two overcurrent devices; a 3 pole circuit breaker shall be considered three overcurrent devices.~~

408.36 Overcurrent Protection.

~~(A) Lighting and Appliance Branch Circuit Panelboard Individually Protected. Each lighting and appliance branch circuit panelboard shall be individually protected on the supply side by not more than two main circuit breakers or two sets of fuses having a combined rating not greater than that of the panelboard.~~

~~Exception No. 1: Individual protection for alighting and appliance panelboard shall not be required if the panelboard feeder has overcurrent protection not greater than the rating of the panelboard.~~

~~Exception No. 2: For existing installations, individual protection for lighting and appliance branch circuit panelboards shall not be required where such panelboards are used as service equipment in supplying an individual residential occupancy.~~

~~(B) Power Panelboard Protection.~~ In addition to the requirements of 408.30, a ~~power~~ panelboard ~~with supply conductors that include a neutral, and having more than 10 percent of its overcurrent devices protecting branch circuits rated 30 amperes or less,~~ shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

Exception No. 1 : ~~This individual protection shall not be required for a power.~~ A panelboard used as service equipment when not supplying a residential occupancy, may be provided with multiple disconnecting means in accordance with 230.71.

Exception No. 2: A panelboard used as service equipment and supplying an individual residential occupancy, may be individually protected on the supply side by not more than two main circuit breakers or two sets of fuses having a combined rating not greater than that of the panelboard.

Exception No. 3: For existing installations, individual protection for panelboards shall not be required where such panelboards are used as service equipment in supplying an individual residential occupancy.

~~(C)~~ (A) Snap Switches Rated at 30 Amperes or Less. (No change.)

~~(D)~~ (B) Supplied Through a Transformer. (No change.)

~~(E)~~ (C) Delta Breakers. (No change.)

~~(F)~~ (D) Back-Fed Devices. (No change.)

Substantiation: The intent of this proposal is 3-fold: 1) Permit more than 42 circuits in all panelboards; 2) Eliminate the category of "Lighting and Appliance Branch Circuit Panelboard"; and 3) Require that all panelboards (for new installations) be protected on the line side by a single integral or remote main overcurrent protective device (except as presently permitted for service equipment).

A code-making panel Task Group studied this topic for Proposal 9-142 to the 1996 NEC. That resulted in Proposal 9-120 for the 1999 code and included revised material for 384-14 and 384-16 as recorded in NFPA 70 - A98 ROP. Those changes were a "step in the right direction." However, continuing harmonization of codes and product standard requirements, along with the desire to simplify and clarify requirements, indicates that it is now time to "finish the job" on this subject.

As documented by the Task Group, an original (circa 1933) intent of the circuit limitation was to prevent overheating by installing too many rubber-insulated wires in the panelboard. This preceded the present UL 67 Panelboard Standard constructional requirements for Wiring Space, Wiring Gutters and Wire Bending Space. UL 67's thermal test requirements that incorporate "worst-case" loading conditions, coupled with industry advances in conductor insulation, entirely eliminate this as a concern.

As documented by the Task Group, the method to restrict the 42-circuit limitation only to "certain" panelboards results in the category of "Lighting and Appliance Branch Circuit Panelboard." Therefore, if the 42-circuit limitation is lifted, then the category itself is no longer needed. It is ironic that when a panelboard is presently categorized as "power" panelboard, the 42-circuit limitation is no longer a concern. In fact, most domestic panelboard manufacturers make a 2nd design of product without the 42-circuit restriction, and export them for installation in Canada where there is no circuit restriction for any panelboard application.

Lastly, the Task Group report states "the Task Group believes that these panelboards will be safer with main overcurrent protection sized to the panel bussing" and yet not so for "service equipment (which) are likely to have much better supervision and inspection than the same equipment used as remote subpanels." This concern is addressed by requiring overcurrent protection for all panelboards, but retaining the reference to service equipment in 230.71. (Note that this proposal would also exempt existing installations because the intent is not to require a complete panelboard replacement when a circuit is added to this type of existing construction.)

Panel Meeting Action: Accept in Principle

Delete section 408.34.

Delete section 408.35.

Change 408.36 to read as follows:

408.36 Overcurrent Protection. In addition to the requirements of 408.30, a ~~power~~ panelboard ~~with supply conductors that include a neutral, and having more than 10 percent of its overcurrent devices protecting branch circuits rated 30 amperes or less,~~ shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

Exception No. 1: Individual protection shall not be required for a panelboard used as service equipment and containing not more than six overcurrent devices. For the purposes of this exception, the term "overcurrent device" means a single or a multipole circuit breaker, or a single fuse or set of fuses, operable or disconnectable by a single motion of the hand and that supplies a single load.

Exception No. 2: Individual protection shall not be required for a panelboard individually protected on its supply side by not more than two main circuit breakers or two sets of fuses having a combined rating not greater than that of the panelboard. A panelboard wired under this exception shall not contain more than 42 overcurrent devices. For the purposes of this exception, a 2-pole or a 3-pole circuit breaker shall be considered as two or three overcurrent devices, respectively.

Exception No. 3: For existing panelboards, individual protection shall not be required for a panelboard used as service equipment for an individual residential occupancy.

~~(C)~~ (A) Snap Switches Rated at 30 Amperes or Less. (No change.)

~~(D)~~ (B) Supplied Through a Transformer. (No change.)

~~(E)~~ (C) Delta Breakers. (No change.)

~~(F)~~ (D) Back-Fed Devices. (No change.)

Panel Statement: The panel has reworded the exceptions to maintain as much continuity as practical with prior code practice. Exception No. 1 is based on current 408.36(B) Exception, which is intended to recognize a long standing practice of allowing a small panel to be used as service equipment, with large line-to-line loads leaving at this point and a smaller feeder entering the building to supply what formerly was called a lighting and appliance branch circuit panelboard. The limitations now to be built into this exception prevent the extension of this limited practice to what could otherwise become a split-bus panelboard of unlimited size in the future. The six-circuit limit echoes the customary service limitation in 230.71.

Exception No. 2 corresponds to the parent language in 408.36(A). Since prior practice effectively limited these panelboards to 42 circuits, the wording in the panel action carries that limitation forward, but only for these split-bus panels.

Exception No. 3 corresponds to present 408.36(A) Exception No. 2, and it continues without change.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 9 Abstain: 1

Ballot Not Returned: 1 de Vega, H.

Explanation of Abstention:

OSBORNE, R.: It is acknowledged that the classification of panelboards into two types has a long-standing history, with the "42 circuit" limitation for lighting and appliance branch-circuit panelboards prevailing as a well established limit for the maximum number of overcurrent devices. As noted by the submitter, proposals to modify this portion of the Code have been debated for multiple Code cycles. During the 1999 Code revision process, the panel took a conservative approach in revising the requirements, with the intent to have minimal effect on product standards. Of specific mention was that a move as radical as eliminating the differentiation between the two types of panelboards should await more adequate substantiation over the course of the 1999 revision cycle. This proposal brings this issue back before the panel, with a request to "'finish the job' on this subject." With the product standard (UL Standard for Panelboards, UL 67) and the Code in step with one another, effecting a change as fundamental as that proposed has an inherent "chicken and egg" dilemma.

With respect to this specific proposal, it should be understood that changing the Code does not automatically change the product Standard. Requirements for lighting and appliance branch-circuit panelboards, including the 42 circuit limitation, will remain in the product standard regardless of the outcome of this vote. Should the proposal maintain its present status as an "Accept in Principle", this change creates an opportunity for updating the Standard. Safety concerns related to the "declassification" of panelboards can then be identified, debated and resolved during the revision process of the UL standard.

Comment on Affirmative:

LEMAY, T.: This proposal provides for much needed rule changes.

With the evolution of insuring proper wire bending space in panelboards and switchboards, calculations to provide for adequately sized wiring compartments and gutter space and improvement in distribution equipment design, it is clearly a safe improvement to the industry to allow for an increase in the number of overcurrent spaces available in a single panelboard.

Additionally, it would be desirable if the use of tandem breakers was prohibited in new installations and allowed only for the addition of post construction loads.

SENGUPTA, S.: Rewrite Exception no. 2 to clarify the intent of limitation of "split bus" wiring practices to assure installation of no more than 42 circuits.

YOUNG, R.: Panel should consider adding the description "Split-bus" in Exception 2 for clarification. This term is used in the panel statement.

9-118 Log #1747 NEC-P09 **Final Action: Accept in Principle**
(408.35)

Submitter: Robert A. Jones, IEC Texas Gulf Coast
Recommendation: Delete first sentence. Revise second sentence to read:

"A lighting and appliance branch-circuit panelboard shall be provided with physical means to prevent the installation of more overcurrent devices than the number for which the panelboard was ~~designed, rated, and approved~~ listed."

Delete third sentence.

Substantiation: Dwelling units are typically requiring more than 42 spaces for overcurrent devices. Panelboards can be designed for more than 42 spaces and a single panelboard would be more desirable than multiple panelboards. The addition of a sub-panel increases the cost of a dwelling unit and reduces the reliability of the electrical system due to additional electrical connections.
Panel Meeting Action: Accept in Principle
Panel Statement: The first and third sentences are deleted. The change meets the submitter's intent. See panel action and statement on Proposal 9-117.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-119 Log #2947 NEC-P09 **Final Action: Accept in Principle**
(408.35)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 408.35 as follows:

408.35 Number of Overcurrent Devices on One Panelboard. Not more than 42 overcurrent devices (other than those provided for in the mains) of a lighting and appliance branch-circuit panelboard shall be installed in any one cabinet or cutout box.

~~A lighting and appliance branch-circuit panelboard shall be provided with physical means to prevent the installation of more overcurrent devices than that number for which the panelboard was designed, rated, and approved.~~

For the purposes of this article, a 2-pole circuit breaker shall be considered two overcurrent devices; a 3-pole circuit breaker shall be considered three overcurrent devices.

Substantiation: The text indicated for deletion is proposed to be moved to Part IV of Article 408 as the text is construction requirements rather than installation requirements and should be located in that part. See the companion proposal.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel actions and statements on Proposals 9-117 and 9-127.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-120 Log #2949 NEC-P09 **Final Action: Reject**
(408.36)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 408.36 as follows:

408.36 Overcurrent Protection.

(A) Lighting and Appliance Branch-Circuit Panelboard Individually Protected. Each lighting and appliance branch-circuit panelboard shall be individually protected on the supply side by not more than two main circuit breakers or two sets of fuses having a combined rating not greater than that of the panelboard.

Exception No. 1: Individual protection for a lighting and appliance panelboard shall not be required if the panelboard feeder has overcurrent protection not greater than the rating of the panelboard.

Exception No. 2: For existing installations, individual protection for lighting and appliance branch-circuit panelboards shall not be required where such panelboards are used as service equipment in supplying an individual residential occupancy.

(B) Power Panelboard Protection. <u>Power panelboards shall comply with</u> ~~In addition to~~ the requirements of 408.30.

<u>(C) Power Panelboards With Neutral Connections.</u> A power panelboard with supply conductors that include a neutral and having more than 10 percent of its overcurrent devices protecting branch circuits rated 30 amperes or less, shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

Exception: This individual protection shall not be required for a power panelboard used as service equipment with multiple disconnecting means in accordance with 230.71.

Substantiation: None provided.
Panel Meeting Action: Reject
Panel Statement: The new wording is no more clear than the existing text. The proposal contained no substantiation to support the change.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-121 Log #1595 NEC-P09 **Final Action: Accept in Principle**
(408.36(B))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 408.36(B):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(B) Power Panelboard Protection. In addition to the requirements of 408.30, a power panelboard with supply conductors that include a neutral <u>conductor</u>, and having more than 10 percent of its overcurrent devices protecting branch circuits rated 30 amperes or less, shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

In addition to the change in the recommendation, add the following sentence at the end of 408.36(B) to read as follows:

To qualify for this classification, the panelboard shall be supplied by no fewer than two ungrounded conductors that have an equal nominal voltage between them and the neutral conductor, that voltage being less that the nominal voltage between the ungrounded conductors.

Panel Statement: The additional sentence restores the original concept behind this rule that is now upended due to the new neutral definition. If the neutral definition does not pass ballot, then the new final sentence is unnecessary and need not go forward. CMP-9 notes that if Proposal 9-117 remains accepted, then the action on this proposal is superseded.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-122 Log #3546 NEC-P09 **Final Action: Reject**

(408.39)

Submitter: Michael French, Clackamas County

Recommendation: Add new text to read as follows:

<u>408.39 Flush Mounted Panelboards. Where installed in concrete, tile, or other noncombustible material, a flush mounted panelboard shall be installed so that the front edge of the enclosure is not set back of the finished surface more than 6 mm (1/4 in.) Where installed in wood or other combustible material, a flush mounted panelboard shall be installed so that the front edge of the enclosure is flush with, or project forward from the finished surface.</u>

(Renumber existing 408.39, 408.40, and 408.41 to 408.40, 408.41 and 408.42).

Substantiation: Panelboard installed with the front edge of the enclosure set back of the surface of combustible materials present a significant potential fire hazard. This proposed new 408.39 would bring the same level of protection required in 312.3 and 314.20 to Article 408, Part III for panelboards. This will provide for better consistency to the code requirements for installation and inspection of panelboards.

Panel Meeting Action: Reject

Panel Statement: The addition of this text is unnecessary since panelboards are installed in cabinet or cutout boxes. The requirements in Article 312 already apply.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-123 Log #2946 NEC-P09 **Final Action: Accept in Principle**

(408.40)

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Create a new 408.40 to include the text proposed to be relocated from 408.30 as follows:

<u>408.40 Panelboard Marking. Panelboards shall be durably marked by the manufacturer with the voltage and the current rating and the number of phases for which they are designed and with the manufacturer's name or trademark in such a manner so as to be visible after installation, without disturbing the interior parts or wiring.</u>

<u>FPN: See 110.22 for additional requirements.</u>

Renumber the existing sections.

Substantiation: This text proposed for relocation here contains requirements applicable to the construction of panelboards and should be located in Part IV of Article 408 rather than in the parts of the article that has installation rules.

Panel Meeting Action: Accept in Principle

Create a new section 408.58 to include the text proposed to be relocated from 408.30 as follows:

408.58 Panelboard Marking. Panelboards shall be durably marked by the manufacturer with the voltage and the current rating and the number of phases for which they are designed and with the manufacturer's name or trademark in such a manner so as to be visible after installation, without disturbing the interior parts or wiring.

Retain FPN in 408.30.

Panel Statement: The panel relocated the submitter's text to 408.58 as the text pertains to the construction of panelboards.

The FPN provides guidance regarding field marking procedures, and should not be in Part IV.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-124 Log #1596 NEC-P09 **Final Action: Accept**

(408.40 Exception)

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 408.40 Exception:

Change "(may be a neutral)" to "or neutral conductors"

The revised text would appear as follows:

Grounding conductors shall not be connected to a terminal bar provided for grounded conductors ~~(may be a neutral)~~ <u>or neutral conductors</u> unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Article 250.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Panel Statement: Note that the change is in the second paragraph of 408.40 and not in 408.40 Exception.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-125 Log #1998 NEC-P09 **Final Action: Reject**

(408.40 Exception)

Submitter: Robert Schuerger, EYP Mission Critical Facilities, Inc.

Recommendation: Revise as follows:

Exception: Where an ~~isolated~~ <u>insulated</u> equipment grounding conductor is provided as permitted by 250.146(D), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without connection to the panelboard's equipment grounding terminal bar.

Substantiation: The use of the term "isolated" has caused confusion which has led to improper and unsafe installations in which a separate grounding electrode and grounding system is installed isolated from the rest of the grounding system of the building. Since the separate grounding system is not properly bonded to the grounding system of the building, a hazardous voltage can be developed between the two grounding systems by an electrical fault or lightning strike.

There have been many cases of this type of installation in the past, with data procession equipment, machine tools and other sensitive electronic equipment. The 2005 edition of IEEE Standard 1100, <u>Recommended Practice for Powering and Grounding Electronic Equipment</u> has "insulated ground receptacle" as the recommended terminology and has recommended the "isolated ground" and "isolated ground receptacle" be avoided.

Panel Meeting Action: Reject

Panel Statement: This usage must follow 250.146(D), which presently uses the term "isolated."

CMP-9 note to the Technical Corrolating Committee that if and only if, CMP-5 changes 250.146(D), then this proposal is accepted.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-126 Log #2913 NEC-P09 **Final Action: Reject**
(408.41)

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Revise as follows:
408.41 Grounded and Grounding Conductor Terminations. Each grounded and grounding conductor shall terminate within the panelboard in an individual terminal that is not also used for another conductor.
Exception: Grounded and grounding conductors of circuits with parallel conductors shall be permitted to terminate in a single terminal if the terminal is identified for connection of more than one conductor.
Substantiation: While the importance of the grounded circuit conductor termination was clarified with the addition of this requirement, the quality of the grounding conductor termination is often compromised. Multiple equipment grounding conductors at a single terminal or installed in a single lug is a commonly accepted industry practice.
Since it is necessary that an equipment grounding conductor be present in Type NM cable and installed in nonmetallic conduit, shouldn't that conductor also be properly terminated?
Panel Meeting Action: Reject
Panel Statement: The reason for treating grounded and grounding conductor terminations differently is that grounded conductors routinely carry current and their terminations are tested differently (must pass a heat cycling test). The NEC text reflects this distinction correctly.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-127 Log #2948 NEC-P09 **Final Action: Accept in Principle**
(408.42)

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Create a new 408.42 with the text to be relocated from existing 408.35 as follows:
408.42 Number of Overcurrent Devices in Lighting and Appliance Branch-Circuit Panelboard. A lighting and appliance branch-circuit panelboard shall be provided with physical means to prevent the installation of more than 42 overcurrent devices and not more than that number for which the panelboard was designed, rated, and approved.
Renumber the existing sections.
Substantiation: The new section contains construction requirements proposed to be moved from Part III to Part IV of Article 408 as the text is construction requirements rather than installation requirements and should be located in Part IV. The text should also specifically include the 42-overcurrent-device limitation as presently included in 408.35.
Panel Meeting Action: Accept in Principle
Create a new 408.54 with the text to be relocated from existing 408.35 as follows:
408.54 Maximum Number of Overcurrent Devices. A panelboard shall be provided with physical means to prevent the installation of more overcurrent devices than that number for which the panelboard was designed, rated, and listed.
For the purposes of this section, a 2-pole circuit breaker or fusible switch shall be considered two overcurrent devices; a 3-pole circuit breaker or fusible switch shall be considered three overcurrent devices.
Panel Statement: The panel relocated the submitter's text to 408.54 as the text pertains to the construction of panelboards.
The language was changed to correlate with the language of Proposal 9-117.
Due to the potential increase in the number of circuits, CMP-9 chooses to assure that the maximum number of overcurrent devices is a subject of a listing evaluation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
LEMAY, T.: This proposal provides for much needed rule changes.
With the evolution of insuring proper wire bending space in panelboards and switchboards, calculations to provide for adequately sized wiring compartments and gutter space and improvement in distribution equipment design, it is clearly a safe improvement to the industry to allow for an increase in the number of overcurrent spaces available in a single panelboard.
Additionally, it would be desirable if the use of tandem breakers was prohibited in new installations and allowed only for the addition of post construction loads.

9-128 Log #420c NEC-P09 **Final Action: Reject**
(408.51)

Submitter: John Brouzakis, John's Electric
Recommendation: Discontinue use of all aluminum and copper clad wire in homes, business, and industry. Discontinue using aluminum bus bars in breaker panels and MCC panels. Aluminum and copper clad wire and bus bars are still being used in homes, business and industry.
Substantiation: I've seen aluminum or copper clad wire connections to 240 volt a.c. circuits such as on ranges, dryers and other circuits become loose or corroded and start arcing and burn the wire.
Some breaker panels in basements with aluminum bus bars corrode and start arcing where the breaker plugs into the bus bar. On one job, I had to remove all the breakers, clean the bus bar and replace some of the breakers.
These are just a couple of problems that I experienced with people using AL or copper clad wire and panels with AL bus bars. These situations could have turned into electrical fires with loss of life and property. I believe only copper wire and bus bars should be used in homes, buildings and industry.
When I see AL or copper clad wiring inside a home, I tell the owner it should be replaced with copper. I would appreciate it if you discontinue the usage of aluminum and copper clad wire inside homes, business and industry in your next code.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).
Aluminum connections when properly installed and terminated are safe. Cleaning of bus bars in panels should only be done by following manufacturer's recommendations, as important coating may be removed during any cleaning attempts.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-128a Log #CP904 NEC-P09 **Final Action: Accept**
(408.55 Exception No. 1)

Submitter: Code-Making Panel 9,
Recommendation: 408.55 Exception No. 1
Revise 408.55 Exception No. 1 to read as follows:
Exception No. 1: Either the top or bottom wire-bending space shall be permitted to be sized in accordance with Table 312.6(A) for a panelboard rated 225 amperes or less and designed to contain not over 42 overcurrent devices. For the purposes of this exception, a 2-pole or a 3-pole circuit breaker shall be considered as two or three overcurrent devices, respectively.
Substantiation: CMP-9 has removed the category of "lighting and appliance branch circuit panelboard" from Article 408 by virtue of its action on Proposal 9-117. This proposal correlates the provisions in this exception accordingly. Since prior practice effectively limited these panelboards to 42 circuits, the wording in the panel action carries that limitation forward, along with information from former 408.35 defining how the circuit numbering is to be done.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

ARTICLE 409 — INDUSTRIAL CONTROL PANELS

11-1 Log #1522 NEC-P11 **Final Action: Accept**
(409, 430, 440, and 470)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 409, 430, 440, and 470 as described in the following, relative to the terms bonding and grounding.
409.60: Revise 409.60 to read as follows:
409.60 Grounding. Multisection industrial control panels shall be bonded together with an equipment grounding conductor or an equivalent equipment grounding bus sized in accordance with Table 250.122. Equipment grounding conductors shall ~~terminate on~~ be connected to this equipment grounding bus or to ~~a~~ an equipmen t grounding termination point provided with a single-section industrial control panel.
409.108: Revise 409.108 to read as follows:
409.108 Service-Entrance Equipment. Where used as service equipment, each industrial control panel shall be of the type that is suitable for use as service equipment.

Where a grounded conductor is provided, the industrial control panel shall be provided with a main bonding jumper, sized in accordance with 250.28(D), for connecting the grounded conductor, on its supply side, to the industrial control panel equipment ground bus or equipment ground terminal.

430.96: Revise 430.96 to read as follows:

Multisection motor control centers shall be connected ~~bonded~~ together with an equipment grounding conductor or an equivalent equipment grounding bus sized in accordance with Table 250.122. Equipment grounding conductors shall ~~terminate on~~ be connected to this equipment grounding bus or to a grounding termination point provided in a single-section motor control center.

430.244: Revise 430.244 to read as follows:

Controller enclosures shall be connected to the equipment grounding conductor ~~grounded~~ regardless of voltage. Controller enclosures shall have means for attachment of an equipment grounding conductor termination in accordance with 250.8.

440.61: Revise 440.61 to read as follows:

440.61 Grounding. The enclosures of r ~~R~~ oom air conditioners shall be ~~grounded~~ connected to the equipment grounding conducto r in accordance with 250.110, 250.112, and 250.114.

470.19: Revise 470.19 to read as follows:

470.19 Grounding. Resistor and reactor cases or enclosures shall be connected to the equipment grounding conductor ~~grounded~~ in accordance with Article 250.

Exception: Resistor or reactor cases or enclosures supported on a structure designed to operate at other than ground potential shall not be connected to the equipment grounding conductor ~~grounded~~ .

Substantiation: 409.60: The word "equipment" is inserted to clarify the requirement.

409.108: Added the words "equipment ground" to clarify that this is the equipment ground terminal.

430.96: The change reflects a prescriptive language to clarify the requirements.

The word "equipment" is inserted to clarify the requirement.

430.244: The proposed revision is intended to be more specific as to where the connection of the specified parts is to be made. The equipment grounding conductor, by definition establishes the connection to ground.

440.61: The proposed revision is intended to be more specific as to where the connection of air conditioners is to be made. The words "enclosures of" are added to indicate what part of the room air conditioner needs to be connected to the equipment grounding conductor. The equipment grounding conductor, by definition establishes the connection to ground.

470.19: The proposed revision is intended to be more specific as to where the connection of the specified parts is to be made. The equipment grounding conductor, by definition establishes the connection to ground.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-2 Log #151 NEC-P11 **Final Action: Reject**

(409.2)

Submitter: Dennis Coyne, Farmingdale, NY

Recommendation: In the form of a FPN follow definition of an industrial control panel that a factory assembled combination starter is not an example of an industrial control panel.

Substantiation: Reading definition of industrial control panel 409.2 fits a combination starter, which I think was not the intent of CMP 11.

Panel Meeting Action: Reject

Panel Statement: No recommended text is provided with the proposal as required by 4-3.3(c) of the Regulations Governing Committee Projects.

A combination motor controller can be assembled or applied in different ways that may cause its installation to be evaluated to other articles of the NEC, it may be a combination motor controller unit for a motor control center, or a self-protected combination motor controller, or a series of discrete components that have been assembled together with utilization equipment, or it may be assembled into an industrial control panel. The recommendation is not specific to whose factory is involved relative to the component part(s) being assembled. As such, the panel does not perceive a benefit to the creation of a list of products thought to be installable to other articles of the NEC.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-3 Log #1953 NEC-P11 **Final Action: Accept**

(409.2)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Replace 409.2 as shown:

~~Industrial Control Panel. An assembly of a systematic and standard arrangement of two or more components such as motor controllers, overload relays, fused disconnect switches, and circuit breakers and related control devices such s pushbutton stations, selector switches, timers, switches, control relays, and the like with associated wiring, terminal blocks, pilot lights, and similar components. The industrial control panel does not include the controlled equipment.~~

Industrial Control Panel. An assembly of two or more components consisting of

(a) power circuit components only, such as motor controllers, overload relays, fused disconnect switches, and circuit breakers, or

(b) control circuit components only, such as pushbuttons, pilot lights, selector switches, timers, switches, control relays, or

(c) a combination of power and control circuit components.

These components, with associated wiring and terminals, are mounted on or contained within an enclosure or mounted on a sub-panel. The industrial control panel does not include the controlled equipment.

Note: This a companion proposal to 409.110(3).

Substantiation: The approved method for determining the short circuit current rating of an industrial control panel is based only on power circuit components. However, an industrial control panel consisting only of control circuit components is not required to be marked with a short circuit current rating. The proposal adds clarification to the definition by recognizing that some panels may be constructed solely of control components.

Acceptable mounting locations are specifically identified.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-4 Log #646 NEC-P11 **Final Action: Accept**

(409.21(B))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Revise text to read as follows:

409.21 Overcurrent Protection.

(A) General. Industrial Control Panels shall be provided with overcurrent protection in accordance with Parts I, II, and IX of Article 240.

(B) Location. This protection shall be provided for each incoming supply circuit by either,

(1) An overcurrent protective device located ahead of the industrial control panel or

(2) A single main overcurrent protective device located within the industrial control panel. Where overcurrent protection is provided as part of the industrial control panel, the supply conductors shall be considered either as feeders or taps as covered by 240.21.

Substantiation: This change accommodates the industrial control panels with more than one supply source, e.g., a duplex pump panel.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-5 Log #1688 NEC-P11 **Final Action: Accept in Principle**

(409.21(B)(1))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.

Recommendation: This is a companion proposal to one for 409.21(B)(2).

~~409.21(B)(1) An overcurrent protective device located ahead of the industrial control panel.~~

409.21(B)(1) One or more overcurrent protective devices located ahead of the industrial control panel.

Substantiation: Industrial control panels should be able to have the components protected by more than one overcurrent protective device. The present wording, "An overcurrent...", implies only one overcurrent protective device may be used per control panel. Many times in control panels, such as heat tracing control panels, the controller and relays are located in the control panel and fed from an adjacent panelboard. There may be an unlimited number of controllers in the control panel fed by multiple branch circuit overcurrent protective devices.

Panel Meeting Action: Accept in Principle
Panel Statement: Refer to the panel action on Proposal 11-4, which addresses the submitter's concerns.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-6 Log #1689 NEC-P11 **Final Action: Accept in Principle**
(409.21(B)(2))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: This is a companion proposal to one for 409.21(B)(1).
~~409.21(B)(2) A single main overcurrent protective device located within the industrial control panel.~~ Remainder of paragraph unchanged.
409.21(B)(2) One or more overcurrent protective devices located within the industrial control panel. Remainder of paragraph unchanged.
Substantiation: Industrial control panels should be able to have the components protected by more than one overcurrent protective device.
The present wording, "A single main..." requires a single main overcurrent protective device per control panel. A control panel should be able to be fed with one or more circuits. There shouldn't have to be a main unless the control panel is used as service equipment, where up to six overcurrent protective devices could serve as such.
Panel Meeting Action: Accept in Principle
Panel Statement: Refer to the panel action on Proposal 11-4, which addresses the submitter's concerns.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-7 Log #1955 NEC-P11 **Final Action: Accept**
(409.100)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Correct cross reference in first sentence, as a result of new Table location, as follows:
"Table ~~430.91~~ 110.20 shall be used as the basis for selecting industrial control panel enclosures for use in specific locations other than hazardous (classified) locations."
Substantiation: This is a companion proposal to the proposal to move text from 430.91 and Table 430.91 into a new 110.20. It should be done ONLY IF that proposal is accepted.
Panel Meeting Action: Accept
Panel Statement: The acceptance of this proposal is based on acceptance of Proposal 11-55 to relocate Section 430.91 and Table 430.91 to a new Section 110.20. In the event, the proposal to include this information in Article 110 is not accepted, it is the intention of the panel to retain the current reference to Table 430.91 in Section 409.100.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-8 Log #643 NEC-P11 **Final Action: Reject**
(409.104(B))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise text to read as follows:
409.104 Wiring Space in Industrial Control Panels.
(B) Wire Bending Space. ~~Wire bending space for the main supply terminals shall be in accordance with the requirements in 312.6.~~ Wire bending space within industrial control panels ~~for other terminals~~ shall be in accordance with the requirements in 430.10(B). ~~The gutter space shall comply with 312.8.~~
Substantiation: The first sentence of item (B) contains an incorrect reference to 312.6 and creates a conflict with UL 508A in that 508A uses the values for wire bending space from 430.10(B). The third sentence was deleted because it does not relate to wire bending space from 430.10(B). The third sentence was deleted because it does not relate to wire bending space.
Panel Meeting Action: Reject
Panel Statement: The present wording referring to 312.6 addresses installation issues that 430.10(B) does not. The requirements of 312.6 provide for increased wire bending space for supply terminals and the exception to 312.6 allows an alternate Table 430.10(B) for motor controllers. The panel encourages the submitter to reconsider this and resubmit a public comment.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
TODD, L.: I agree with the submitter that the requirements for the internal sections of control panels should match the requirements in UL 508A. This means that the change recommended in the proposal should be accepted.
WRIGHT, J.: NEMA disagrees with the panel statement regarding the installation issues addressed by 312.6, as opposed to the use of Table 430.10(B). Section 430.10(B) permits the use of Table 430.10(B) for enclosures containing motor controllers, which include the main supply terminals to the motor controller. These enclosures may also contain disconnecting means and branch circuit protective devices, the terminals of which would be the main supply terminals for the equipment in the enclosure. Under 430.10(B), all the terminals in an enclosure containing a motor controller, including the main supply terminals, must meet the wire-bending requirements of Table 430.10(B).
The current reference in section 409.104(B) to 312.6, regarding the main supply terminals, could be misinterpreted to mean that the main supply terminals in an enclosure containing a motor controller must meet the wire-bending requirements of 312.6. This creates confusion concerning the wire bending space required for the main supply terminals in an Industrial Control Panel containing a motor controller. A direct reference to 430.10(B) eliminates that confusion.
The panel did not address the statement concerning the conflict with UL 508A (the UL Standard for Industrial Control Panels). Under that standard, the wire-bending requirements for all field-wiring terminals in any Industrial Control Panel are the same as those contained in Table 430.10(B). Without the proposed change to 409.104(B), listed panels might be turned down by the AHJ.

11-9 Log #644 NEC-P11 **Final Action: Accept**
(409.106 (New))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Add new text as follows:
409.106 Spacings. Spacings between live bare metal parts in feeder circuits shall not be less than specified in Table 430.97.
Exception: The distance shall be permitted to be less than that specified in Table 430.97 at circuit breakers and switches and in listed components installed in industrial control panels.
Substantiation: This section and exception is necessary to allow for field assembly of industrial control panels. This is consistent with 408.56 to allow use of listed components within their listing requirements.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-10 Log #2645 NEC-P11 **Final Action: Accept in Principle**
(409.108)

Submitter: Kevin J. Lippert, Eaton Corporation
Recommendation: Revise text to read:
430.95 Service ~~Entrance~~ Equipment.
The proposal addresses only the title, the actual requirement remains unchanged.
Substantiation: The word "Entrance" should be deleted. Throughout the Code, the term "service entrance" is usually reserved for identifying the service conductors/cables. When referring to equipment, the correct term is "service equipment".
Panel Meeting Action: Accept in Principle
Revise text to read:
409.108 Service ~~Entrance~~ Equipment.
The proposal addresses only the title, the actual requirement remains unchanged.
Panel Statement: The panel has corrected the intended section to be changed, which meets the intent of the submitter.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-11 Log #2157 NEC-P11 **Final Action: Reject**
(409.110)

Submitter: Thomas F. Mueller, Southern Company Services
Recommendation: Revise text to read:
An industrial control panel where applicable shall be marked with the following information that is plainly visible after installation.
Substantiation: In 409.2, it is stated that an industrial control panel can be as little as a two push button station or a selector switch/lamp box. Many, if not all the required marks would be inappropriate for such control stations. For example, it would be ridiculous to place the short circuit current rating on a push button station.
I would prefer that this entire Article 409 be deleted from the code as it does nothing more than to restate rules found in other code sections. But in lieu of that, this change will allow some sanity in its application.

Panel Meeting Action: Reject

Panel Statement: The panel disagrees that markings are not required for simple constructions of industrial control panels. In the scenario presented as substantiation, the markings noted in 409.110(1), (2), (5) and (6) are appropriate. These markings provide a positive indication of the intended conditions/ratings for which the panel was built and installed. The markings are also readily available for use by subsequent users, service personnel, and inspection authorities.

Section 409.110(4), referring to service equipment, already contains the conditional text, so the current text does not require all industrial control panels to comply.

The committee agrees that a shortcircuit current rating for an industrial control panel containing only control circuit devices is unnecessary.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-12 Log #1957 NEC-P11 **Final Action: Accept in Principle**

(409.110(2))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: 409.110 Marking. An industrial control panel shall be marked with the following information that is plainly visible after installation:

(2) Supply voltage, <u>number of</u> phase <u>s</u> , frequency, and full-load current

Note: This is a companion proposal to 409.110(3) and 409.110(5)

Substantiation: Clarification of existing text, to align with the marking requirements of NFPA 79 and UL 508A.

Panel Meeting Action: Accept in Principle

Add text to read as follows:

409.110 Marking. An industrial control panel shall be marked with the following information that is plainly visible after installation:

(2) Supply voltage, <u>number of</u> phase <u>s</u> , frequency, and full-load current <u>for each incoming supply circuit</u>

Panel Statement: The panel has added the words "for each incoming supply circuit" to be consistent with the action taken on Proposal 11-4.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-13 Log #801 NEC-P11 **Final Action: Reject**

(409.110(3))

Submitter: Keith Merrill, Retrofit Electric

Recommendation: Revise text to read as follows:

409.110 Marking. An industrial control panel shall be marked with the following information that is plainly visible after installation:

~~(3) Short-circuit current rating of the industrial control panel based on one of the following:~~

~~a. Short-circuit current rating of a listed and labeled assembly~~

~~b. Short-circuit current rating established utilizing an approved method~~

~~FPN: UL 508A-2001, Supplement SB, is an example of an approved method.~~

Substantiation: I have been an industrial electrician for 11 years and have built or overseen the building of many and various types of electrical control panels of many different sizes and for many different purposes.

I agree with all of the marking requirements of 409.110 with the exception of (3) which requires a short circuit current rating.

My disagreements are for the following reasons:

1. The wording of this requirement is obviously vague as to exactly what it requires. Are we talking about the short-circuit current rating of the main disconnect or exactly what component or components are we needing the short-circuit current rating for?

2. If this is such a critical piece of information than the necessary formula(s) and procedure for determining it should also be stated IN THE TEXT of the article. I have attempted to find this UL 508A-2001 reference without success. UL's web site was no help as I was unable to gain access to this magical formula or procedure.

3. What difference does this really make to anybody? Unless the inspector is capable of performing the necessary calculation they could not possibly determine if the figure was accurate or not anyway. How can they be expected to enforce a requirement that they have no ability to determine the accuracy of? WHO is going to benefit from this requirement or gain any useable advantage from it? In short what purpose does it serve and for who?

4. What does this figure have to do with the safe operation or performance of the panel? None of the panels I have built have it and not one of them has failed because of it. If a panel is built with all UL listed components, and all components are sized and all wiring done according to the NEC, do we have any reason to doubt that the panel will perform in a satisfactory manner? (As in fact thousands of panels are doing at this very moment).

Even if it should fail to do so, who could possibly look at the short-circuit current rating and determine that that was there reason for the failure?

I move that this marking requirement (number 3) and the associated (and worthless) footnote be stricken from the code as TOTALLY SUPERFLUOUS.

Panel Meeting Action: Reject

Panel Statement: Product standards are available. UL 508A, Supplement SB is an example of an approved method. The requirement for a short-circuit current rating does not mandate the use of UL 508A. The panel agrees with the original substantiation presented in the 2005 ROP, number 11-5. Short-circuit current ratings are important safety criteria in the installation and use of industrial control panels.

It is expected that the method used will be consistent with Sections 110.9 and 110.10 where short circuit current ratings of individual components are considered and resolved into a single rating for the industrial control panel.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-14 Log #1954 NEC-P11 **Final Action: Accept in Principle**

(409.110(3))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Add text to read as follows:

409.110 Marking. An industrial control panel shall be marked with the following information that is plainly visible after installation:

3) Short-circuit current rating of the industrial control panel based on one of the following:

a. short circuit current rating of a listed and labeled assembly

b. short circuit current rating established utilizing an approved method

FPN No. <u>1</u> : UL508A-2001 Supplement SB is an example of an approved method.

<u>Exception: Short circuit current rating markings are not required for industrial control panels containing only control circuit components.</u>

<u>FPN No. 2: A control circuit is the circuit of a control apparatus or system that carries the electric signals directing the performance of the controller but does not carry the main power current.</u>

Note: This is a companion proposal to 409.2, 409.110(2) and 409.110(5).

Substantiation: Control circuit devices do not have short-circuit current ratings. FPN No. 2 was added to assist in the identification of components in the control circuit.

Panel Meeting Action: Accept in Principle

Add text to read as follows:

409.110 Marking. An industrial control panel shall be marked with the following information that is plainly visible after installation:

3) Shortcircuit current rating of the industrial control panel based on one of the following:

a. Shortcircuit current rating of a listed and labeled assembly

b. Shortcircuit current rating established utilizing an approved method

FPN: UL508A, ~~2001~~ Supplement SB, is an example of an approved method.

<u>Exception: Shortcircuit current rating markings are not required for industrial control panels containing only control circuit components.</u>

Add a new definition in 409.2 for Control Circuit to read as follows:

<u>Control Circuit. The circuit of a control apparatus or system that carries the electric signals directing the performance of the controller but does not carry the main power current.</u>

Panel Statement: The panel has more appropriately placed the definition contained in the proposed FPN No. 2 in Section 409.2, which meets the intent of the submitter. The panel has also editorially removed the date associated with UL 508A in the existing FPN.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-15 Log #645 NEC-P11 **Final Action: Accept**

(409.110(5))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Revise text to read as follows:

409.110 Marking. An industrial control panel shall be marked with the following information that is plainly visible after installation:

(5) Electrical wiring diagram or the <u>identification</u> number of ~~the index to the electrical drawings showing the~~ <u>a separate</u> electrical wiring diagram <u>or a designation referenced in a separate wiring diagram.</u>

Substantiation: Clarification of existing text.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

ARTICLE 410 — LUMINAIRES (LIGHTING FIXTURES), LAMPHOLDERS, AND LAMPS

18-40a Log #CP1804 NEC-P18 **Final Action: Accept**
(410)

Submitter: Code-Making Panel 18,
Recommendation: First, add a new Section to Part I of Article 410 to read as follows:
410.XX Listing Required. All luminaires, lampholders, and lighting assemblies shall be listed.
Second, modify the following Sections of Article 410:
410.4(D) Bathtub and Shower Areas No parts of cord-connected luminaires ~~(fixtures)~~ , chain-, cable-, or cord-suspended-luminaires ~~(fixtures)~~ , lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing and includes the zone directly over the tub or shower stall. Luminaires ~~(lighting fixtures)~~ located in this zone shall be ~~listed~~ marked for damp locations, or ~~listed~~ marked for wet locations where subject to shower spray.
410.8(B) Luminaire ~~(Fixture)~~ Types Permitted ~~Listed~~ ~~l~~ L uminaires ~~(fixtures)~~ of the following types shall be permitted to be installed in a closet:
410.27(B) Size Unless part of ~~listed~~ decorative lighting assemblies, pendant conductors shall not be smaller than 14 AWG for mogul-base or medium-base screw-shell lampholders or smaller than 18 AWG for intermediate or candelabra-base lampholders.
410-27(C) Twisted or Cabled Pendant conductors longer than 900 mm (3 ft) shall be twisted together where not cabled in a ~~listed~~ lighting assembly.
410.30(C)(1) Cord-Connected Installation A ~~listed~~ luminaire ~~(fixture)~~ or a ~~listed~~ lighting assembly shall be permitted to be cord connected if the following conditions apply:
410.30(C)(1)(2)c Is terminated in a grounding-type attachment plug cap or busway plug, or is a part of a ~~listed~~ lighting assembly incorporating a manufactured wiring system connector in accordance with 604.6(C), or has a luminaire ~~(fixture)~~ assembly with a strain relief and canopy.
410.31 Luminaires ~~(Fixtures)~~ as Raceways
Luminaires ~~(fixtures)~~ shall not be used as a raceway for circuit conductors unless ~~listed and~~ marked for use as a raceway.
410.32 Wiring Supplying Luminaires ~~(Fixtures)~~ Connected Together Luminaires ~~(fixtures)~~ designed for end-to-end connection to form a continuous assembly, or luminaires ~~(fixtures)~~ connected together by recognized wiring methods, shall be permitted to contain the conductors of a 2-wire branch circuit, or one multiwire branch circuit, supplying the connected luminaires ~~(fixtures)~~ and need not be ~~listed~~ marked as a raceway. One additional 2-wire branch circuit separately supplying one or more of the connected luminaires ~~(fixtures)~~ shall also be permitted.
410.33 Branch Circuit Conductors and Ballasts
Branch-circuit conductors within 75 mm (3 in.) of a ballast shall have an insulation temperature rating not lower than 90°C (194°F) unless supplying a luminaire ~~(fixture) listed and~~ marked as suitable for a different insulation temperature.
410.65(B) Fire-Resistant Construction Where a luminaire ~~(fixture)~~ is recessed in fire-resistant material in a building of fire-resistant construction, a temperature higher than 90°C (194°F) but not higher than 150°C (302°F) shall be considered acceptable if the luminaire ~~(fixture)~~ is plainly marked ~~that it is listed~~ for that service.
410.76(B) Combustible Low-Density Cellulose Fiberboard Where a surface-mounted luminaire ~~(fixture)~~ containing a ballast is to be installed on combustible low-density cellulose fiberboard, it shall be ~~listed~~ marked for this condition or shall be spaced not less than 38 mm (1 1/2 in.) from the surface of the fiberboard. Where such luminaires ~~(fixtures)~~ are partially or wholly recessed, the provisions of 410.64 through 410.72 shall apply.
Substantiation: CMP18 concludes that all luminaires, lampholder, and lighting assemblies require listing. Luminaire interior wiring, construction, clearances, suitability for specific locations and conditions, and other safety measures are more properly contained within the product standards. Adding a general requirement for listing removes that requirement in the remaining Sections of Article 410.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CARPENTER, F.: The term “lighting assemblies” is undefined, vague, and likely to lead to a variety of interpretations from different Authorities Having Jurisdiction. Will optional parts that are normally shipped separately from a luminaire be considered to be lighting assemblies which must carry a listing mark? (For instance, visors or vandal guards). Are poles lighting assemblies? Without clearly defined terms, NEMA cannot support this proposal.

18-41 Log #458 NEC-P18 **Final Action: Accept in Principle**
(410)

Submitter: Amos D. Lowrance, Jr., City of Chattanooga, TN
Recommendation: Revise Article 410 to read as follows:

ARTICLE 410 Luminaires (Lighting Fixtures), Lampholders, and Lamps

I. General
410.1 Scope. This article covers luminaires (lighting fixtures), lampholders, pendants, incandescent filament lamps, arc lamps, electric-discharge lamps, decorative lighting products, lighting accessories for temporary seasonal and holiday use, portable flexible lighting products, and the wiring and equipment forming part of such products and lighting installations.

2.2 Definition
Storage Space. The volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 1.8 m (6 ft) or to the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 600 mm (24 in.) from the sides and back of the closet walls, respectively, and continuing vertically to the closet ceiling parallel to the walls at a horizontal distance of 300 mm (12 in.) or the width of the shelf, whichever is greater; for a closet that permits access to both sides of a hanging rod, this space includes the volume below the highest rod extending 300 mm (12 in.) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod.
FPN: See Figure 410.2.

Lighting Track. A manufactured assembly designed to support and energize luminaires (lighting fixtures) that are capable of being readily repositioned on the track. Its length can be altered by the addition or subtraction of sections of track.

410.3 Application of Other Articles. Equipment for use in hazardous (classified) locations shall conform to Articles 500 through 517. Lighting systems operating at 30 volts or less shall conform to Article 411. Arc lamps used in theaters shall comply with 520.61, and arc lamps used in projection machines shall comply with 540.20. Arc lamps used on constant-current systems shall comply with the general requirements of Article 490.

410.4 Live Parts. Luminaires (fixtures), lampholders, and lamps shall have no live parts normally exposed to contact. Exposed accessible terminals in lampholders and switches shall not be installed in metal luminaire (fixture) canopies or in open bases of portable table or floor lamps.
Exception: Cleat-type lampholders located at least 2.5 m (8 ft) above the floor shall be permitted to have exposed terminals.

II. Luminaire (Fixture) Locations

10.10 Luminaires (Fixtures) in Specific Locations.
(A) Wet and Damp Locations Luminaires (fixtures) installed in wet or damp locations shall be installed so that water cannot enter or accumulate in wiring compartments, lampholders, or other electrical parts. All luminaires (fixtures) installed in wet locations shall be marked, ``Suitable for Wet Locations.'' All luminaires (fixtures) installed in damp locations shall be marked, ``Suitable for Wet Locations'' or ``Suitable for Damp Locations.''
(B) Corrosive Locations Luminaires (fixtures) installed in corrosive locations shall be of a type suitable for such locations.
(C) In Ducts or Hoods Luminaires (fixtures) shall be permitted to be installed in commercial cooking hoods where all of the following conditions are met:
(1) The luminaire (fixture) shall be identified for use within commercial cooking hoods and installed such that the temperature limits of the materials used are not exceeded.
(2) The luminaire (fixture) shall be constructed so that all exhaust vapors, grease, oil, or cooking vapors are excluded from the lamp and wiring compartment. Diffusers shall be resistant to thermal shock.
(3) Parts of the luminaire (fixture) exposed within the hood shall be corrosion resistant or protected against corrosion, and the surface shall be smooth so as not to collect deposits and to facilitate cleaning.
(4) Wiring methods and materials supplying the luminaire(s) [fixture(s)] shall not be exposed within the cooking hood.
FPN: See 110.11 for conductors and equipment exposed to deteriorating agents.
D) Bathtub and Shower Areas No parts of cord-connected luminaires (fixtures), chain-, cable-, or cord-suspended-luminaires (fixtures), lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing and includes the zone directly over the tub or shower stall. Luminaires (lighting fixtures) located in this zone shall be listed for damp

locations, or listed for wet locations where subject to shower spray.
E) Luminaires (Fixtures) in Indoor Sports, Mixed-Use, and All-Purpose Facilities Luminaires (fixtures) subject to physical damage, using a mercury vapor or metal halide lamp, installed in playing and spectator seating areas of indoor sports, mixed-use, or all-purpose facilities shall be of the type that protects the lamp with a glass or plastic lens. Such luminaires (fixtures) shall be permitted to have an additional guard.

410.11 Luminaires (Fixtures) Near Combustible Material. Luminaires (fixtures) shall be constructed, installed, or equipped with shades or guards so that combustible material is not subjected to temperatures in excess of 90°C (194°F).

410.12 Luminaires (Fixtures) Over Combustible Material. Lampholders installed over highly combustible material shall be of the unswitched type. Unless an individual switch is provided for each luminaire (fixture), lampholders shall be located at least 2.5 m (8 ft) above the floor or shall be located or guarded so that the lamps cannot be readily removed or damaged.

410.13 Luminaires (Fixtures) in Show Windows. Chain-supported luminaires (fixtures) used in a show window shall be permitted to be externally wired. No other externally wired luminaires (fixtures) shall be used.

410.14 Luminaires (Fixtures) in Clothes Closets.

(A)Luminaire (Fixture) Types Permitted Listed luminaires (fixtures) of the following types shall be permitted to be installed in a closet:
(1) A surface-mounted or recessed incandescent luminaire (fixture) with a completely enclosed lamp
(2) A surface-mounted or recessed fluorescent luminaire (fixture)
(B) Luminaire (Fixture) Types Not Permitted Incandescent luminaires (fixtures) with open or partially enclosed lamps and pendant luminaires (fixtures) or lampholders shall not be permitted.
(C)Location Luminaires (fixtures) in clothes closets shall be permitted to be installed as follows:
(1) Surface-mounted incandescent luminaires (fixtures) installed on the wall above the door or on the ceiling, provided there is a minimum clearance of 300 mm (12 in.) between the luminaire (fixture) and the nearest point of a storage space
(2) Surface-mounted fluorescent luminaires (fixtures) installed on the wall above the door or on the ceiling, provided there is a minimum clearance of 150 mm (6 in.) between the luminaire (fixture) and the nearest point of a storage space
(3) Recessed incandescent luminaires (fixtures) with a completely enclosed lamp installed in the wall or the ceiling, provided there is a minimum clearance of 150 mm (6 in.) between the luminaire (fixture) and the nearest point of a storage space
(4) Recessed fluorescent luminaires (fixtures) installed in the wall or the ceiling, provided there is a minimum clearance of 150 mm (6 in.) between the luminaire (fixture) and the nearest point of a storage space

410.15 Space for Cove Lighting. Coves shall have adequate space and shall be located so that lamps and equipment can be properly installed and maintained.

III. Provisions at Luminaire (Fixture) Outlet Boxes, Canopies, and Pans

410.20 Space for Conductors. Canopies and outlet boxes taken together shall provide adequate space so that luminaire (fixture) conductors and their connecting devices can be properly installed.

410.21 Temperature Limit of Conductors in Outlet Boxes. Luminaires (fixtures) shall be of such construction or installed so that the conductors in outlet boxes shall not be subjected to temperatures greater than that for which the conductors are rated.
Branch-circuit wiring, other than 2-wire or multiwire branch circuits supplying power to luminaires (fixtures) connected together, shall not be passed through an outlet box that is an integral part of a luminaire (fixture) unless the luminaire (fixture) is identified for through-wiring.
FPN:See 410.32 for wiring supplying power to fixtures connected together.

410.22 Outlet Boxes to Be Covered. In a completed installation, each outlet box shall be provided with a cover unless covered by means of a luminaire (fixture) canopy, lampholder, receptacle, or similar device.

410.23 Covering of Combustible Material at Outlet Boxes. Any combustible wall or ceiling finish exposed between the edge of a luminaire (fixture) canopy or pan and an outlet box shall be covered with noncombustible material.

410.24 Connection of Electric-Discharge Luminaires (Lighting Fixtures).
(A) Independent of the Outlet Box Electric-discharge luminaires (lighting fixtures) supported independently of the outlet box shall be connected to the branch circuit through metal raceway, nonmetallic raceway, Type MC cable, Type AC cable, Type MI cable, nonmetallic sheathed cable, or by flexible cord as permitted in 410.56(B) or 410.56(C).
(B) Access to Boxes Electric-discharge luminaires (fixtures) surface mounted over concealed outlet, pull, or junction boxes and designed not to be supported solely by the outlet box shall be provided with suitable openings in the back of the luminaire (fixture) to provide access to the wiring in the box.

IV. Luminaire (Fixture) Supports

410.30 Supports.
(A) General Luminaires (fixtures) and lampholders shall be securely supported. A luminaire (fixture) that weighs more than 3 kg (6 lb) or exceeds 400 mm (16 in.) in any dimension shall not be supported by the screw shell of a lampholder.
(B) Metal or Nonmetallic Poles Supporting Luminaires (Lighting Fixtures) Metal or nonmetallic poles shall be permitted to be used to support luminaires (lighting fixtures) and as a raceway to enclose supply conductors, provided the following conditions are met:
(1) A pole shall have a handhole not less than 50 mm × 100 mm (2 in. × 4 in.) with a raintight cover to provide access to the supply terminations within the pole or pole base.
Exception No. 1: No handhole shall be required in a pole 2.5 m (8 ft) or less in height above grade where the supply wiring method continues without splice or pull point, and where the interior of the pole and any splices are accessible by removing the luminaire (fixture).
Exception No. 2: No handhole shall be required in a pole 6.0 m (20 ft) or less in height above grade that is provided with a hinged base.
(2) Where raceway risers or cable is not installed within the pole, a threaded fitting or nipple shall be brazed, welded, or attached to the pole opposite the handhole for the supply connection.
(3) A metal pole shall be provided with a grounding terminal as follows:
a. A pole with a handhole shall have the grounding terminal accessible from the handhole.
b. A pole with a hinged base shall have the grounding terminal accessible within the base.
Exception to (3): No grounding terminal shall be required in a pole 2.5 m (8 ft) or less in height above grade where the supply wiring method continues without splice or pull, and where the interior of the pole and any splices are accessible by removing the luminaire (fixture).
(4) A metal pole with a hinged base shall have the hinged base and pole bonded together.
(5) Metal raceways or other equipment grounding conductors shall be bonded to the metal pole with an equipment grounding conductor recognized by 250.118 and sized in accordance with 250.122.
(6) Conductors in vertical poles used as raceway shall be supported as provided in 300.19.

410.31 Means of Support.
(A) Outlet Boxes Outlet boxes or fittings installed as required by 314.23 and complying with the provisions of 314.27(A) and 314.27(B) shall be permitted to support luminaires (fixtures).
B) Inspection Luminaires (fixtures) shall be installed such that the connections between the luminaire (fixture) conductors and the circuit conductors can be inspected without requiring the disconnection of any part of the wiring unless the luminaires (fixtures) are connected by attachment plugs and receptacles.
(C) Suspended Ceilings Framing members of suspended ceiling systems used to support luminaires (fixtures) shall be securely fastened to each other and shall be securely attached to the building structure at appropriate intervals. Luminaires (fixtures) shall be securely fastened to the ceiling framing member by mechanical means such as bolts, screws, or rivets. Listed clips identified for use with the type of ceiling framing member(s) and luminaire(s) [fixture(s)] shall also be permitted.
(D) Luminaire (Fixture) Studs Luminaire (fixture) studs that are not a part of outlet boxes, hickeys, tripods, and crowfeet shall be made of steel, malleable iron, or other material suitable for the application.
(E) Insulating Joints Insulating joints that are not designed to be mounted with screws or bolts shall have an exterior metal casing, insulated from both screw connections.
(F) Raceway Fittings Raceway fittings used to support a luminaire(s) [lighting fixture(s)] shall be capable of supporting the weight of the complete fixture assembly and lamp(s).
(G) Busways Luminaires (fixtures) shall be permitted to be connected to busways in accordance with 368.17(C).
(H) Trees Outdoor luminaires (lighting fixtures) and associated equipment shall be permitted to be supported by trees.
FPN No. 1: See 225.26 for restrictions for support of overhead conductors.

FPN No. 2: See 300.5(D) for protection of conductors.

V. Grounding

410.40 General. Luminaires (fixtures) and lighting equipment shall be grounded as required in Article 250 and Part V of this article.

410.41 Exposed Luminaire (Fixture) Parts.

(A) Exposed Conductive Parts Exposed metal parts shall be grounded or insulated from ground and other conducting surfaces or be inaccessible to unqualified personnel. Lamp tie wires, mounting screws, clips, and decorative bands on glass spaced at least 38 mm (1 1/ 2 in.) from lamp terminals shall not be required to be grounded.

(B) Made of Insulating Material Luminaires (fixtures) directly wired or attached to outlets supplied by a wiring method that does not provide a ready means for grounding shall be made of insulating material and shall have no exposed conductive parts.

Exception No. 1: Replacement luminaires (fixtures) shall be permitted to connect an equipment grounding conductor from the outlet in compliance with 250.130(C). The luminaire (fixture) shall then be grounded in accordance with 410.41(A).

Exception No. 2: Where no equipment grounding conductor exists at the outlet, replacement luminaires (fixtures) that are GFCI protected shall not be required to be connected to an equipment grounding conductor.

410.42 Equipment Grounding Conductor Attachment. Luminaires (fixtures) with exposed metal parts shall be provided with a means for connecting an equipment grounding conductor for such luminaires (fixtures).

410.43 Methods of Grounding. Luminaires (fixtures) and equipment shall be considered grounded where mechanically connected to an equipment grounding conductor as specified in 250.118 and sized in accordance with 250.122.

VI. Wiring of Luminaires (Fixtures)

410.50 Luminaire (Fixture) Wiring — General. Wiring on or within fixtures shall be neatly arranged and shall not be exposed to physical damage. Excess wiring shall be avoided. Conductors shall be arranged so that they are not subjected to temperatures above those for which they are rated.

410.51 Polarization of Luminaires (Fixtures). Luminaires (fixtures) shall be wired so that the screw shells of lampholders are connected to the same luminaire (fixture) or circuit conductor or terminal. The grounded conductor, where connected to a screw-shell lampholder, shall be connected to the screw shell.

410.52 Conductor Insulation. Luminaires (fixtures) shall be wired with conductors having insulation suitable for the environmental conditions, current, voltage, and temperature to which the conductors will be subjected.

FPN: For ampacity of luminaire (fixture) wire, maximum operating temperature, voltage limitations, minimum wire size, and so forth, see Article 402.

410.53 Pendant Conductors for Incandescent Filament Lamps.

(A) Support Pendant lampholders with permanently attached leads, where used for other than festoon wiring, shall be hung from separate stranded rubber-covered conductors that are soldered directly to the circuit conductors but supported independently thereof.

(B) Size Unless part of listed decorative lighting assemblies, pendant conductors shall not be smaller than 14 AWG for mogul-base or medium-base screw-shell lampholders or smaller than 18 AWG for intermediate or candelabra-base lampholders.

(C) Twisted or Cabled Pendant conductors longer than 900 mm (3 ft) shall be twisted together where not cabled in a listed assembly.

410.54 Protection of Conductors and Insulation.

(A) Properly Secured Conductors shall be secured in a manner that does not tend to cut or abrade the insulation.

(B) Protection Through Metal Conductor insulation shall be protected from abrasion where it passes through metal.

(C) Luminaire (Fixture) Stems Splices and taps shall not be located within luminaire (fixture) arms or stems.

(D) Splices and Taps No unnecessary splices or taps shall be made within or on a luminaire (fixture).

FPN: For approved means of making connections, see 110.14.

(E) Stranding Stranded conductors shall be used for wiring on luminaire (fixture) chains and on other movable or flexible parts.

(F) Tension Conductors shall be arranged so that the weight of the luminaire (fixture) or movable parts does not put tension on the conductors.

410.55 Cord-Connected Showcases. Individual showcases, other than fixed, shall be permitted to be connected by flexible cord to permanently installed receptacles, and groups of not more than six such showcases shall be permitted to be coupled together by flexible cord and separable locking-type connectors with one of the group connected by flexible cord to a permanently installed receptacle.

The installation shall comply with 410.55(A) through 410.55(E).

(A) Cord Requirements Flexible cord shall be of the hard-service type, having conductors not smaller than the branch-circuit conductors, having ampacity at least equal to the branch-circuit overcurrent device, and having an equipment grounding conductor.

FPN: See Table 250.122 for size of equipment grounding conductor.

(B) Receptacles, Connectors, and Attachment Plugs Receptacles, connectors, and attachment plugs shall be of a listed grounding type rated 15 or 20 amperes.

(C) Support Flexible cords shall be secured to the undersides of showcases such that all of the following conditions are ensured:

(1) The wiring is not exposed to mechanical damage.

(2) The separation between cases is not in excess of 50 mm (2 in.), or more than 300 mm (12 in.) between the first case and the supply receptacle.

(3) The free lead at the end of a group of showcases has a female fitting not extending beyond the case.

(D) No Other Equipment Equipment other than showcases shall not be electrically connected to showcases.

(E) Secondary Circuit(s) Where showcases are cord-connected, the secondary circuit(s) of each electric-discharge lighting ballast shall be limited to one showcase.

410.56 Cord-Connected Lampholders and Luminaires (Fixtures).

(A) Lampholders Where a metal lampholder is attached to a flexible cord, the inlet shall be equipped with an insulating bushing that, if threaded, is not smaller than metric designator 12 (trade size 3/ 8) pipe size. The cord hole shall be of a size appropriate for the cord, and all burrs and fins shall be removed in order to provide a smooth bearing surface for the cord.

Bushing having holes 7 mm (9/ 32 in.) in diameter shall be permitted for use with plain pendant cord and holes 11 mm (13/ 32 in.) in diameter with reinforced cord.

(B) Adjustable Luminaires (Fixtures) Luminaires (fixtures) that require adjusting or aiming after installation shall not be required to be equipped with an attachment plug or cord connector, provided the exposed cord is of the hard-usage or extra-hard-usage type and is not longer than that required for maximum adjustment. The cord shall not be subject to strain or physical damage.

(C) Electric-Discharge Luminaires (Fixtures)

(1) Cord-Connected Installation A listed luminaire (fixture) or a listed assembly shall be permitted to be cord connected if the following conditions apply:

(1) The luminaire (fixture) is located directly below the outlet or busway.

(2) The flexible cord meets all the following:

a. Is visible for its entire length outside the luminaire (fixture)

b. Is not subject to strain or physical damage

c. Is terminated in a grounding-type attachment plug cap or busway plug, or is a part of a listed assembly incorporating a manufactured wiring system connector in accordance with 604.6(C), or has a luminaire (fixture) assembly with a strain relief and canopy

(2) Provided with Mogul-Base, Screw-Shell Lampholders Electric-discharge luminaires (lighting fixtures) provided with mogul-base, screw-shell lampholders shall be permitted to be connected to branch circuits of 50 amperes or less by cords complying with 240.5. Receptacles and attachment plugs shall be permitted to be of a lower ampere rating than the branch circuit but not less than 125 percent of the luminaire (fixture) full-load current.

(3) Equipped with Flanged Surface Inlet Electric-discharge luminaires (lighting fixtures) equipped with a flanged surface inlet shall be permitted to be supplied by cord pendants equipped with cord connectors. Inlets and connectors shall be permitted to be of a lower ampere rating than the branch circuit but not less than 125 percent of the luminaire (fixture) load current.

410.57 Luminaires (Fixtures) as Raceways. Luminaires (fixtures) shall not be used as a raceway for circuit conductors unless listed and marked for use as a raceway.

410.58 Wiring Supplying Luminaires (Fixtures) Connected Together. Luminaires (fixtures) designed for end-to-end connection to form a continuous assembly, or luminaires (fixtures) connected together by recognized wiring methods, shall be permitted to contain the conductors of a 2-wire branch circuit, or one multiwire branch circuit, supplying the connected luminaires (fixtures) and need not be listed as a raceway. One additional 2-wire branch circuit separately supplying one or more of the connected luminaires (fixtures) shall also be permitted.
FPN: See Article 100 for the definition of Multiwire Branch Circuit.

410.59 Branch Circuit Conductors and Ballasts. Branch-circuit conductors within 75 mm (3 in.) of a ballast shall have an insulation temperature rating not lower than 90°C (194°F) unless supplying a luminaire (fixture) listed and marked as suitable for a different insulation temperature.

VII. Construction of Luminaires (Fixtures)

410.60 Combustible Shades and Enclosures. Adequate airspace shall be provided between lamps and shades or other enclosures of combustible material.

410.61 Luminaire (Fixture) Rating.
(A) Marking All luminaires (fixtures) shall be marked with the maximum lamp wattage or electrical rating, manufacturer's name, trademark, or other suitable means of identification. A luminaire (fixture) requiring supply wire rated higher than 60°C (140°F) shall be marked in letters not smaller than 6 mm (1/ 4 in.) high, prominently displayed on the luminaire (fixture) and shipping carton or equivalent.
(B) Electrical Rating The electrical rating shall include the voltage and frequency and shall indicate the current rating of the unit, including the ballast, transformer, or autotransformer.

410.62 Design and Material. Luminaires (fixtures) shall be constructed of metal, wood, or other material suitable for the application and shall be designed and assembled so as to secure requisite mechanical strength and rigidity. Wiring compartments, including their entrances, shall be designed and constructed to permit conductors to be drawn in and withdrawn without physical damage.

410.63 Nonmetallic Luminaires (Fixtures). When luminaire (fixture) wiring compartments are constructed from combustible material, armored or lead-covered conductors with suitable fittings shall be used or the wiring compartment shall be lined with metal.

410.64 Mechanical Strength.
(A) Tubing for Arms Tubing used for arms and stems where provided with cut threads shall not be less than 1.02 mm (0.040 in.) in thickness and, where provided with rolled (pressed) threads, shall not be less than 0.64 mm (0.025 in.) in thickness. Arms and other parts shall be fastened to prevent turning.
(B) Metal Canopies Metal canopies supporting lampholders, shades, and so forth exceeding 4 kg (8 lb), or incorporating attachment-plug receptacles, shall not be less than 0.51 mm (0.020 in.) in thickness. Other canopies shall not be less than 0.41 mm (0.016 in.) if made of steel and not less than 0.51 mm (0.020 in.) if of other metals.
(C) Canopy Switches Pull-type canopy switches shall not be inserted in the rims of metal canopies that are less than 0.64 mm (0.025 in.) in thickness, unless the rims are reinforced by the turning of a bead or the equivalent. Pull-type canopy switches, whether mounted in the rims or elsewhere in sheet metal canopies, shall not be located more than 90 mm (3 1/ 2 in.) from the center of the canopy. Double set-screws, double canopy rings, a screw ring, or equal method shall be used where the canopy supports a pull-type switch or pendant receptacle.
The thickness requirements in the preceding paragraph shall apply to measurements made on finished (formed) canopies.

410.65 Wiring Space. Bodies of luminaires (fixtures), including portable lamps, shall provide ample space for splices and taps and for the installation of devices, if any. Splice compartments shall be of nonabsorbent, noncombustible material.

410.66 Portable Lamps.
(A) General Portable lamps shall be wired with flexible cord recognized by 400.4 and an attachment plug of the polarized or grounding type. Where used with Edison-base lampholders, the grounded conductor shall be identified and attached to the screw shell and the identified blade of the attachment plug.
(B) Portable Handlamps In addition to the provisions of 410.66(A), portable handlamps shall comply with the following:
(1) Metal shell, paper-lined lampholders shall not be used.
(2) Handlamps shall be equipped with a handle of molded composition or other insulating material.
(3) Handlamps shall be equipped with a substantial guard attached to the lampholder or handle.
(4) Metallic guards shall be grounded by means of an equipment grounding conductor run with circuit conductors within the power-supply cord.
(5) Portable handlamps shall not be required to be grounded where supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.

410.67 Cord Bushings. A bushing or the equivalent shall be provided where flexible cord enters the base or stem of a portable lamp. The bushing shall be of insulating material unless a jacketed type of cord is used.

410.68 Tests. All wiring shall be free from short circuits and grounds and shall be tested for these defects prior to being connected to the circuit.

410.69 Live Parts. Exposed live parts within porcelain luminaires (fixtures) shall be suitably recessed and located so as to make it improbable that wires come in contact with them. There shall be a spacing of at least 13 mm (1/ 2 in.) between live parts and the mounting plane of the luminaire (fixture).

VIII. Installation of Lampholders

410.70 Screw-Shell Type. Lampholders of the screw-shell type shall be installed for use as lampholders only. Where supplied by a circuit having a grounded conductor, the grounded conductor shall be connected to the screw shell.

410.71 Double-Pole Switched Lampholders. Where supplied by the ungrounded conductors of a circuit, the switching device of lampholders of the switched type shall simultaneously disconnect both conductors of the circuit.

410.72 Lampholders in Wet or Damp Locations. Lampholders installed in wet or damp locations shall be of the weatherproof type.

IX. Construction of Lampholders

410.80 Insulation. The outer metal shell and the cap shall be lined with insulating material that prevents the shell and cap from becoming a part of the circuit. The lining shall not extend beyond the metal shell more than 3 mm (1/ 8 in.) but shall prevent any current-carrying part of the lamp base from being exposed when a lamp is in the lampholding device.

410.81 Switched Lampholders. Switched lampholders shall be of such construction that the switching mechanism interrupts the electrical connection to the center contact. The switching mechanism shall also be permitted to interrupt the electrical connection to the screw shell if the connection to the center contact is simultaneously interrupted.

X. Lamps and Auxiliary Equipment

410.90 Bases, Incandescent Lamps. An incandescent lamp for general use on lighting branch circuits shall not be equipped with a medium base if rated over 300 watts, or with a mogul base if rated over 1500 watts. Special bases or other devices shall be used for over 1500 watts.

410.91 Electric-Discharge Lamp Auxiliary Equipment.
(A) Enclosures Auxiliary equipment for electric-discharge lamps shall be enclosed in noncombustible cases and treated as sources of heat.
(B) Switching Where supplied by the ungrounded conductors of a circuit, the switching device of auxiliary equipment shall simultaneously disconnect all conductors.

XI. Special Provisions for Flush and Recessed Luminaires (Fixtures)

410.100 General. Luminaires (fixtures) installed in recessed cavities in walls or ceilings shall comply with 410.101 through 410.113.

410.101 Temperature.
(A) Combustible Material Luminaires (fixtures) shall be installed so that adjacent combustible material will not be subjected to temperatures in excess of 90°C (194°F).
(B) Fire-Resistant Construction Where a luminaire (fixture) is recessed in fire-resistant material in a building of fire-resistant construction, a temperature higher than 90°C (194°F) but not higher than 150°C (302°F) shall be considered acceptable if the luminaire (fixture) is plainly marked that it is listed for that service.
(C) Recessed Incandescent Luminaires (Fixtures) Incandescent luminaires (fixtures) shall have thermal protection and shall be identified as thermally protected.
Exception No. 1: Thermal protection shall not be required in a recessed luminaire (fixture) identified for use and installed in poured concrete.

Exception No. 2: Thermal protection shall not be required in a recessed luminaire (fixture) whose design, construction, and thermal performance characteristics are equivalent to a thermally protected luminaire (fixture) and are identified as inherently protected.

410.102 Clearance and Installation.

(A) Clearance

(1) Non-Type IC A recessed luminaire (fixture) that is not identified for contact with insulation shall have all recessed parts spaced not less than 13 mm (1/ 2 in.) from combustible materials. The points of support and the trim finishing off the opening in the ceiling or wall surface shall be permitted to be in contact with combustible materials.

(2) Type IC A recessed luminaire (fixture) that is identified for contact with insulation, Type IC, shall be permitted to be in contact with combustible materials at recessed parts, points of support, and portions passing through or finishing off the opening in the building structure.

(B) Installation Thermal insulation shall not be installed above a recessed luminaire (fixture) or with 75 mm (3 in.) of the recessed luminaire's (fixture's) enclosure, wiring compartment, or ballast unless it is identified for contact with insulation, Type IC.

410.103 Wiring.

(A) General Conductors that have insulation suitable for the temperature encountered shall be used.

(B) Circuit Conductors Branch-circuit conductors that have an insulation suitable for the temperature encountered shall be permitted to terminate in the luminaire (fixture).

(C) Tap Conductors Tap conductors of a type suitable for the temperature encountered shall be permitted to run from the luminaire (fixture) terminal connection to an outlet box placed at least 300 mm (1 ft) from the luminaire (fixture). Such tap conductors shall be in suitable raceway or Type AC or MC cable of at least 450 mm (18 in.) but not more than 1.8 m (6 ft) in length.

XII. Construction of Flush and Recessed Luminaires (Fixtures)

410.110 Temperature. Luminaires (fixtures) shall be constructed such that adjacent combustible material is not subject to temperatures in excess of 90°C (194°F).

410.111 Lamp Wattage Marking. Incandescent lamp luminaires (fixtures) shall be marked to indicate the maximum allowable wattage of lamps. The markings shall be permanently installed, in letters at least 6 mm (1/ 4 in.) high, and shall be located where visible during relamping.

410.112 Solder Prohibited. No solder shall be used in the construction of a luminaire (fixture) box.

410.113 Lampholders. Lampholders of the screw-shell type shall be of porcelain or other suitable insulating materials. Where used, cements shall be of the high-heat type.

XIII. Special Provisions for Electric-Discharge Lighting Systems of 1000 Volts or Less

410.120 General.

(A) Open-Circuit Voltage of 1000 Volts or Less Equipment for use with electric-discharge lighting systems and designed for an open-circuit voltage of 1000 volts or less shall be of a type intended for such service.

(B) Considered as Energized The terminals of an electric-discharge lamp shall be considered as energized where any lamp terminal is connected to a circuit of over 300 volts.

(C) Transformers of the Oil-Filled Type Transformers of the oil-filled type shall not be used.

(D) Additional Requirements In addition to complying with the general requirements for luminaires (lighting fixtures), such equipment shall comply with Part XIII of this article.

(E) Thermal Protection — Fluorescent Luminaires (Fixtures)

(1) Integral Thermal Protection The ballast of a fluorescent luminaire (fixture) installed indoors shall have integral thermal protection. Replacement ballasts shall also have thermal protection integral with the ballast.

(2) Simple Reactance Ballasts A simple reactance ballast in a fluorescent luminaire (fixture) with straight tubular lamps shall not be required to be thermally protected.

(3) Exit Fixtures A ballast in a fluorescent exit luminaire (fixture) shall not have thermal protection.

(4) Egress Luminaires (Fixtures) A ballast in a fluorescent luminaire (fixture) that is used for egress lighting and energized only during a failure of the normal supply shall not have thermal protection.

F) High-Intensity Discharge Luminaires (Fixtures)

(1) Recessed Recessed high-intensity luminaires (fixtures) designed to be installed in wall or ceiling cavities shall have thermal protection and be identified as thermally protected.

(2) Inherently Protected Thermal protection shall not be required in a recessed high-intensity luminaire (fixture) whose design, construction, and thermal performance characteristics are equivalent to a thermally protected luminaire (fixture) and are identified as inherently protected.

(3) Installed in Poured Concrete Thermal protection shall not be required in a recessed high-intensity discharge luminaire (fixture) identified for use and installed in poured concrete.

(4) Recessed Remote Ballasts A recessed remote ballast for a high-intensity discharge luminaire (fixture) shall have thermal protection that is integral with the ballast and be identified as thermally protected.

(5) Metal Halide Lamp Containment Luminaires (fixtures) that use a metal halide lamp other than a thick-glass parabolic reflector lamp (PAR) shall be provided with a containment barrier that encloses the lamp, or shall be provided with a physical means that only allows the use of a lamp that is Type O.

FPN: See ANSI Standard C78.387, American National Standard for Electric Lamps — Metal Halide Lamps, Methods of Measuring Characteristics.

(G) Disconnecting Means In indoor locations, other than dwellings and associated accessory structures, fluorescent luminaires (fixtures) that utilize double-ended lamps and contain ballast(s) that can be serviced in place or ballasted luminaires that are supplied from multiwire branch circuits and contain ballast(s) that can be serviced in place shall have a disconnecting means either internal or external to each luminaire (fixture), to disconnect simultaneously from the source of supply all conductors of the ballast, including the grounded conductor if any. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast.

Exception No. 1: A disconnecting means shall not be required for luminaires (fixtures) installed in hazardous (classified) location(s).

Exception No. 2: A disconnecting means shall not be required for emergency illumination required in 700.16.

Exception No. 3: For cord-and-plug-connected luminaires, an accessible separable connector or an accessible plug and receptacle shall be permitted to serve as the disconnecting means.

Exception No. 4: A disconnecting means shall not be required in industrial establishments with restricted public access where conditions of maintenance and supervision ensure that only qualified persons service the installation by written procedures.

Exception No. 5: Where more than one luminaire is installed and supplied by other than a multiwire branch circuit, a disconnecting means shall not be required for every luminaire when the design of the installation includes locally accessible disconnects, such that the illuminated space cannot be left in total darkness.

410.121 Direct-Current Equipment. Luminaires (fixtures) installed on dc circuits shall be equipped with auxiliary equipment and resistors designed for dc operation. The luminaires (fixtures) shall be marked for dc operation.

410.122 Open-Circuit Voltage Exceeding 300 Volts. Equipment having an open-circuit voltage exceeding 300 volts shall not be installed in dwelling occupancies unless such equipment is designed so that there will be no exposed live parts when lamps are being inserted, are in place, or are being removed.

410.123 Luminaire (Fixture) Mounting.

(A) Exposed Ballasts Luminaires (fixtures) that have exposed ballasts or transformers shall be installed so that such ballasts or transformers will not be in contact with combustible material.

(B) Combustible Low-Density Cellulose Fiberboard Where a surface-mounted luminaire (fixture) containing a ballast is to be installed on combustible low-density cellulose fiberboard, it shall be listed for this condition or shall be spaced not less than 38 mm (1 1/ 2 in.) from the surface of the fiberboard. Where such luminaires (fixtures) are partially or wholly recessed, the provisions of 410.100 through 410.113 shall apply.

FPN: Combustible low-density cellulose fiberboard includes sheets, panels, and tiles that have a density of 320 kg/m 3 (20 lb/ft 3) or less and that are formed of bonded plant fiber material but does not include solid or laminated wood or fiberboard that has a density in excess of 320 kg/m 3 (20 lb/ft 3) or is a material that has been integrally treated with fire-retarding chemicals to the degree that the flame spread in any plane of the material will not exceed 25, determined in accordance with tests for surface burning characteristics of building materials. See ANSI/ASTM E84-1997, Test Method for Surface Burning Characteristics of Building Materials.

410.124 Equipment Not Integral with Luminaire (Fixture).

(A) Metal Cabinets Auxiliary equipment, including reactors, capacitors, resistors, and similar equipment, where not installed as part of a luminaire (lighting fixture) assembly, shall be enclosed in accessible, permanently installed metal cabinets.

(B) Separate Mounting Separately mounted ballasts that are intended for direct connection to a wiring system shall not be required to be separately enclosed.

(C) Wired Luminaire (Fixture) Sections Wired luminaire (fixture) sections are paired, with a ballast(s) supplying a lamp or lamps in both. For interconnection between paired units, it shall be permissible to use metric designator 12 (trade size 3/ 8) flexible metal conduit in lengths not exceeding 7.5 m (25 ft), in conformance with Article 348. Luminaire (fixture) wire operating at line voltage, supplying only the ballast(s) of one of the paired luminaires (fixtures), shall be permitted in the same raceway as the lamp supply wires of the paired luminaires (fixtures).

410.125 Autotransformers. An autotransformer that is used to raise the voltage to more than 300 volts, as part of a ballast for supplying lighting units, shall be supplied only by a grounded system.

410.126 Switches. Snap switches shall comply with 404.14.

XIV. Special Provisions for Electric-Discharge Lighting Systems of More Than 1000 Volts

410.130 General.

(A) Listing Electric-discharge lighting systems with an open-circuit voltage exceeding 1000 volts shall be listed and installed in conformance with that listing.

(B) Dwelling Occupancies Equipment that has an open-circuit voltage exceeding 1000 volts shall not be installed in or on dwelling occupancies.

(C) Live Parts The terminal of an electric-discharge lamp shall be considered as a live part.

(D) Additional Requirements In addition to complying with the general requirements for luminaires (lighting fixtures), such equipment shall comply with Part XIV of this article.

FPN: For signs and outline lighting, see Article 600.

410.131 Control.

(A) Disconnection Luminaires (fixtures) or lamp installation shall be controlled either singly or in groups by an externally operable switch or circuit breaker that opens all ungrounded primary conductors.

(B) Within Sight or Locked Type The switch or circuit breaker shall be located within sight from the luminaires (fixtures) or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position.

410.132 Lamp Terminals and Lampholders. Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders shall be designed so that there are no exposed live parts when lamps are being inserted or removed.

410.133 Transformers.

(A) Type Transformers shall be enclosed, identified for the use, and listed.

(B) Voltage The secondary-circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load conditions.

(C) Rating Transformers shall have a secondary short-circuit current rating of not more than 150 mA if the open-circuit voltage is over 7500 volts, and not more than 300 mA if the open-circuit voltage rating is 7500 volts or less.

(D) Secondary Connections Secondary circuit outputs shall not be connected in parallel or in series.

410.134 Transformer Locations.

(A) Accessible Transformers shall be accessible after installation.

(B) Secondary Conductors Transformers shall be installed as near to the lamps as practicable to keep the secondary conductors as short as possible.

(C) Adjacent to Combustible Materials Transformers shall be located so that adjacent combustible materials are not subjected to temperatures in excess of 90°C (194°F).

410.135 Exposure to Damage. Lamps shall not be located where normally exposed to physical damage.

410.136 Marking. Each luminaire (fixture) or each secondary circuit of tubing having an open-circuit voltage of over 1000 volts shall have a clearly legible marking in letters not less than 6 mm (1/ 4 in.) high reading ``Caution _____ volts.'' The voltage indicated shall be the rated open-circuit voltage.

410.137 Switches. Snap switches shall comply with 404.4.

XV. Lighting Track

410.140 Installation.

(A) Lighting Track Lighting track shall be permanently installed and permanently connected to a branch circuit. Only lighting track fittings shall be installed on lighting track. Lighting track fittings shall not be equipped with general-purpose receptacles.

Connected Load The connected load on lighting track shall not exceed the rating of the track. Lighting track shall be supplied by a branch circuit having a rating not more than that of the track.

(C) Locations Not Permitted Lighting track shall not be installed in the following locations:

(1) Where likely to be subjected to physical damage
(2) In wet or damp locations
(3) Where subject to corrosive vapors
(4) In storage battery rooms
(5) In hazardous (classified) locations
(6) Where concealed
(7) Where extended through walls or partitions
(8) Less than 1.5 m (5 ft) above the finished floor except where protected from physical damage or track operating at less than 30 volts rms open-circuit voltage
(9) Where prohibited by 410.10(D)

(D) Support Fittings identified for use on lighting track shall be designed specifically for the track on which they are to be installed. They shall be securely fastened to the track, shall maintain polarization and grounding, and shall be designed to be suspended directly from the track.

410.141 Heavy-Duty Lighting Track. Heavy-duty lighting track is lighting track identified for use exceeding 20 amperes. Each fitting attached to a heavy-duty lighting track shall have individual overcurrent protection.

410.142 Fastening. Lighting track shall be securely mounted so that each fastening is suitable for supporting the maximum weight of luminaires (fixtures) that can be installed. Unless identified for supports at greater intervals, a single section 1.2 m (4 ft) or shorter in length shall have two supports, and, where installed in a continuous row, each individual section of not more than 1.2 m (4 ft) in length shall have one additional support.

410.143 Construction Requirements.

(A) Construction The housing for the lighting track system shall be of substantial construction to maintain rigidity. The conductors shall be installed within the track housing, permitting insertion of a luminaire (fixture), and designed to prevent tampering and accidental contact with live parts. Components of lighting track systems of different voltages shall not be interchangeable. The track conductors shall be a minimum 12 AWG or equal and shall be copper. The track system ends shall be insulated and capped.

(B) Grounding Lighting track shall be grounded in accordance with Article 250, and the track sections shall be securely coupled to maintain continuity of the circuitry, polarization, and grounding throughout.

XVI. Decorative Lighting and Similar Accessories

410.150 Listing of Decorative Lighting. Decorative lighting and similar accessories used for holiday lighting and similar purposes, in accordance with 590.3(B), shall be listed.
Substantiation: This proposal is to move the definitions in Article 410 to Section 410.2 and renumber Article 410 to accommodate this change and to provide for future additional sections.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 18-43. This proposal addresses the concerns of the submitter.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-43 Log #3179 NEC-P18 **Final Action: Accept**
(410)

Submitter: Michael S. O'Boyle, Lightolier Division of the Genlyte Group, LLC
Recommendation: Add a new Article to read as follows:

ARTICLE 410 Luminaires (Lighting Fixtures), Lampholders, and Lamps

I. General

410.1 Scope. This article covers luminaires (lighting fixtures), lampholders, pendants, incandescent filament lamps, arc lamps, electric-discharge lamps, decorative lighting products, lighting accessories for temporary seasonal and holiday use, portable flexible lighting products, and the wiring and equipment forming part of such products and lighting installations.
410.2 Definitions
Closet Storage Space. The volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 1.8 m (6 ft) or to the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 600 mm (24 in.) from the sides and back of the closet walls, respectively, and continuing vertically to the closet ceiling parallel to the walls at a horizontal distance of 300 mm (12 in.) or the width of the shelf, whichever is greater; for a closet that permits access to both sides of a hanging rod, this space includes the volume below the highest rod extending 300 mm (12 in.) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod.

(Existing Figure 410.8 Closet Storage Space. to be placed here)

Lighting Track. A manufactured assembly designed to support and energize luminaires (lighting fixtures) that are capable of being readily repositioned on the track. Its length can be altered by the addition or subtraction of sections of track.
410.3 Other Articles for Specific-Purpose Luminaires (Lighting Fixtures), Lampholders, and Lamps Luminaires (Lighting Fixtures), Lampholders, and Lamps shall comply with this article and also with the applicable provisions of other articles of this *Code*. The provisions for specific-purpose luminaires listed in Table 410.3 amend or supplement the provisions in this article and shall apply to Luminaires referred therein.

Table 410.3 Specific-Purpose Luminaires (Lighting Fixtures), Lampholders, and Lamps

Equipment	Article	Section
Lighting systems operating at 30 volts or less	411	
Arc lamps used on constant-current systems	490	
Equipment for use in hazardous(Classified) locations	500 through 517	
Arc lamps used in theaters		520.61
Arc lamps used in projection Machines		540.20

410. 5 Live Parts. Luminaires (fixtures), lampholders, and lamps shall have no live parts normally exposed to contact. Exposed accessible terminals in lampholders and switches shall not be installed in metal luminaire (fixture) canopies or in open bases of portable table or floor lamps.
Exception: Cleat-type lampholders located at least 2.5 m (8 ft) above the floor shall be permitted to have exposed terminals.

II. Luminaire (Fixture) Locations

410.10 Luminaires (Fixtures) in Specific Locations.

(A) Wet and Damp Locations. Luminaires (fixtures) installed in wet or damp locations shall be installed so that water cannot enter or accumulate in wiring compartments, lampholders, or other electrical parts. All luminaires (fixtures) installed in wet locations shall be marked, "Suitable for Wet Locations." All luminaires (fixtures) installed in damp locations shall be marked, "Suitable for Wet Locations" or "Suitable for Damp Locations."
(B) Corrosive Locations. Luminaires (fixtures) installed in corrosive locations shall be of a type suitable for such locations.
(C) In Ducts or Hoods. Luminaires (fixtures) shall be permitted to be installed in commercial cooking hoods where all of the following conditions are met:
(1) The luminaire (fixture) shall be identified for use within commercial cooking hoods and installed such that the temperature limits of the materials used are not exceeded.
(2) The luminaire (fixture) shall be constructed so that all exhaust vapors, grease, oil, or cooking vapors are excluded from the lamp and wiring compartment. Diffusers shall be resistant to thermal shock.
(3) Parts of the luminaire (fixture) exposed within the hood shall be corrosion resistant or protected against corrosion, and the surface shall be smooth so as not to collect deposits and to facilitate cleaning.
(4) Wiring methods and materials supplying the luminaire(s) [fixture(s)] shall not be exposed within the cooking hood.
FPN: See 110-1 for conductors and equipment exposed to deteriorating agents.
(D) Bathtub and Shower Areas. No parts of cord-connected luminaires (fixtures), chain-, cable-, or cord-suspended-luminaires (fixtures), lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing and includes the zone directly over the tub or shower stall. Luminaires (lighting fixtures) located in this zone shall be listed for damp locations, or listed for wet locations where subject to shower spray.
(E) Luminaires (Fixtures) in Indoor Sports, Mixed-Use, and All-Purpose Facilities. Luminaires (fixtures) subject to physical damage, using a mercury vapor or metal halide lamp, installed in playing and spectator seating areas of indoor sports, mixed-use, or all-purpose facilities shall be of the type that protects the lamp with a glass or plastic lens. Such luminaires (fixtures) shall be permitted to have an additional guard.
410.~~5.~~11 Luminaires (Fixtures) Near Combustible Material
Luminaires (fixtures) shall be constructed, installed, or equipped with shades or guards so that combustible material is not subjected to temperatures in excess of 90°C (194°F).
410.~~6~~ 12 Luminaires (Fixtures) Over Combustible Material
Lampholders installed over highly combustible material shall be of the unswitched type. Unless an individual switch is provided for each luminaire (fixture), lampholders shall be located at least 2.5 m (8 ft) above the floor or shall be located or guarded so that the lamps cannot be readily removed or damaged.
410.~~7~~ 14 Luminaires (Fixtures) in Show Windows
Chain-supported luminaires (fixtures) used in a show window shall be permitted to be externally wired. No other externally wired luminaires (fixtures) shall be used.
410.~~8~~ 16 Luminaires (Fixtures) in Clothes Closets
~~(A) Definition~~
~~Storage Space The volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 1.8 m (6 ft) or to the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 600 mm (24 in.) from the sides and back of the closet walls, respectively, and continuing vertically to the closet ceiling parallel to the walls at a horizontal distance of 300 mm (12 in.) or the width of the shelf, whichever is greater; for a closet that permits access to both sides of a hanging rod, this space includes the volume below the highest rod extending 300 mm (12 in.) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod.~~
~~(B)~~ (A) Luminaire (Fixture) Types Permitted Listed luminaires (fixtures) of the following types shall be permitted to be installed in a closet:
(1) A surface-mounted or recessed incandescent luminaire (fixture) with a completely enclosed lamp
(2) A surface-mounted or recessed fluorescent luminaire (fixture)
~~(C)~~ (B) Luminaire (Fixture) Types Not Permitted Incandescent luminaires (fixtures) with open or partially enclosed lamps and pendant luminaires (fixtures) or lampholders shall not be permitted. (D) Location Luminaires (fixtures) in clothes closets shall be permitted to be installed as follows:
~~(D)~~ (C) Location Luminaires (fixtures) in clothes closets shall be permitted to be installed as follows:
(1) Surface-mounted incandescent luminaires (fixtures) installed on the wall above the door or on the ceiling, provided there is a minimum clearance of 300 mm (12 in.) between the luminaire (fixture) and the nearest point of a storage space

(2) Surface-mounted fluorescent luminaires (fixtures) installed on the wall above the door or on the ceiling, provided there is a minimum clearance of 150 mm (6 in.) between the luminaire (fixture) and the nearest point of a storage space

(3) Recessed incandescent luminaires (fixtures) with a completely enclosed lamp installed in the wall or the ceiling, provided there is a minimum clearance of 150 mm (6 in.) between the luminaire (fixture) and the nearest point of a storage space

(4) Recessed fluorescent luminaires (fixtures) installed in the wall or the ceiling, provided there is a minimum clearance of 150 mm (6 in.) between the luminaire (fixture) and the nearest point of a storage space

410.~~9~~ 18 Space for Cove Lighting

Coves shall have adequate space and shall be located so that lamps and equipment can be properly installed and maintained.

III. Provisions at Luminaire (Fixture) Outlet Boxes, Canopies, and Pans

410.~~10~~ 20 Space for Conductors

Canopies and outlet boxes taken together shall provide adequate space so that luminaire (fixture) conductors and their connecting devices can be properly installed.

410.~~11~~ 21 Temperature Limit of Conductors in Outlet Boxes

Luminaires (fixtures) shall be of such construction or installed so that the conductors in outlet boxes shall not be subjected to temperatures greater than that for which the conductors are rated.

Branch-circuit wiring, other than 2-wire or multiwire branch circuits supplying power to luminaires (fixtures) connected together, shall not be passed through an outlet box that is an integral part of a luminaire (fixture) unless the luminaire (fixture) is identified for through-wiring.

FPN:See 410.32 for wiring supplying power to fixtures connected together.

410.~~12~~ 22 Outlet Boxes to Be Covered

In a completed installation, each outlet box shall be provided with a cover unless covered by means of a luminaire (fixture) canopy, lampholder, receptacle, or similar device.

410.~~13~~ 23 Covering of Combustible Material at Outlet Boxes

Any combustible wall or ceiling finish exposed between the edge of a luminaire (fixture) canopy or pan and an outlet box shall be covered with noncombustible material.

410.~~14~~ 24 Connection of Electric-Discharge Luminaires (Lighting Fixtures)

(A) Independent of the Outlet Box Electric-discharge luminaires (lighting fixtures) supported independently of the outlet box shall be connected to the branch circuit through metal raceway, nonmetallic raceway, Type MC cable, Type AC cable, Type MI cable, nonmetallic sheathed cable, or by flexible cord as permitted in 410.30(B) or 410.30(C).

(B) Access to Boxes Electric-discharge luminaires (fixtures) surface mounted over concealed outlet, pull, or junction boxes and designed not to be supported solely by the outlet box shall be provided with suitable openings in the back of the luminaire (fixture) to provide access to the wiring in the box.

IV. Luminaire (Fixture) Supports

410.~~15~~ 30 Supports

(A) General Luminaires (fixtures) and lampholders shall be securely supported. A luminaire (fixture) that weighs more than 3 kg (6 lb) or exceeds 400 mm (16 in.) in any dimension shall not be supported by the screw shell of a lampholder.

(B) Metal or Nonmetallic Poles Supporting Luminaires (Lighting Fixtures) Metal or nonmetallic poles shall be permitted to be used to support luminaires (lighting fixtures) and as a raceway to enclose supply conductors, provided the following conditions are met:

(1) A pole shall have a handhole not less than 50 mm × 100 mm (2 in. × 4 in.) with a raintight cover to provide access to the supply terminations within the pole or pole base.

Exception No. 1: No handhole shall be required in a pole 2.5 m (8 ft) or less in height above grade where the supply wiring method continues without splice or pull point, and where the interior of the pole and any splices are accessible by removing the luminaire (fixture).

Exception No. 2: No handhole shall be required in a pole 6.0 m (20 ft) or less in height above grade that is provided with a hinged base.

(2) Where raceway risers or cable is not installed within the pole, a threaded fitting or nipple shall be brazed, welded, or attached to the pole opposite the handhole for the supply connection.

(3) A metal pole shall be provided with a grounding terminal as follows:

a. A pole with a handhole shall have the grounding terminal accessible from the handhole.

b. A pole with a hinged base shall have the grounding terminal accessible within the base.

Exception to (3): No grounding terminal shall be required in a pole 2.5 m (8 ft) or less in height above grade where the supply wiring method continues without splice or pull, and where the interior of the pole and any splices are accessible by removing the luminaire (fixture).

(4) A metal pole with a hinged base shall have the hinged base and pole bonded together.

(5) Metal raceways or other equipment grounding conductors shall be bonded to the metal pole with an equipment grounding conductor recognized by 250.118 and sized in accordance with 250.122.

(6) Conductors in vertical poles used as raceway shall be supported as provided in 300.19.

410.~~16~~ 36 Means of Support

(A) Outlet Boxes Outlet boxes or fittings installed as required by 314.23 and complying with the provisions of 314.27(A) and 314.27(B) shall be permitted to support luminaires (fixtures).

(B) Inspection Luminaires (fixtures) shall be installed such that the connections between the luminaire (fixture) conductors and the circuit conductors can be inspected without requiring the disconnection of any part of the wiring unless the luminaires (fixtures) are connected by attachment plugs and receptacles.

(C) Suspended Ceilings Framing members of suspended ceiling systems used to support luminaires (fixtures) shall be securely fastened to each other and shall be securely attached to the building structure at appropriate intervals. Luminaires (fixtures) shall be securely fastened to the ceiling framing member by mechanical means such as bolts, screws, or rivets. Listed clips identified for use with the type of ceiling framing member(s) and luminaire(s) [fixture(s)] shall also be permitted.

(D) Luminaire (Fixture) Studs Luminaire (fixture) studs that are not a part of outlet boxes, hickeys, tripods, and crowfeet shall be made of steel, malleable iron, or other material suitable for the application.

(E) Insulating Joints Insulating joints that are not designed to be mounted with screws or bolts shall have an exterior metal casing, insulated from both screw connections.

(F) Raceway Fittings Raceway fittings used to support a luminaire(s) [lighting fixture(s)] shall be capable of supporting the weight of the complete fixture assembly and lamp(s).

(G) Busways Luminaires (fixtures) shall be permitted to be connected to busways in accordance with 368.17(C).

(H) Trees Outdoor luminaires (lighting fixtures) and associated equipment shall be permitted to be supported by trees.

FPN No. 1: See 225.26 for restrictions for support of overhead conductors.

FPN No. 2: See 300.5(D) for protection of conductors.

V. Grounding

410.~~17~~ 40 General

Luminaires (fixtures) and lighting equipment shall be grounded as required in Article 250 and Part V of this article.

410.~~18~~ 42 Exposed Luminaire (Fixture) Parts

(A) Exposed Conductive Parts Exposed metal parts shall be grounded or insulated from ground and other conducting surfaces or be inaccessible to unqualified personnel. Lamp tie wires, mounting screws, clips, and decorative bands on glass spaced at least 38 mm (1 1/ 2 in.) from lamp terminals shall not be required to be grounded.

(B) Made of Insulating Material Luminaires (fixtures) directly wired or attached to outlets supplied by a wiring method that does not provide a ready means for grounding shall be made of insulating material and shall have no exposed conductive parts.

Exception No. 1: Replacement luminaires (fixtures) shall be permitted to connect an equipment grounding conductor from the outlet in compliance with 250.130(C). The luminaire (fixture) shall then be grounded in accordance with 410.18(A).

Exception No. 2: Where no equipment grounding conductor exists at the outlet, replacement luminaires (fixtures) that are GFCI protected shall not be required to be connected to an equipment grounding conductor.

410.~~20~~ 44 Equipment Grounding Conductor Attachment

Luminaires (fixtures) with exposed metal parts shall be provided with a means for connecting an equipment grounding conductor for such luminaires (fixtures).

410.~~21~~ 46 Methods of Grounding

Luminaires (fixtures) and equipment shall be considered grounded where mechanically connected to an equipment grounding conductor as specified in 250.118 and sized in accordance with 250.122.

VI. Wiring of Luminaires (Fixtures)

410.~~22~~ 48 Luminaire (Fixture) Wiring — General

Wiring on or within fixtures shall be neatly arranged and shall not be exposed to physical damage. Excess wiring shall be avoided. Conductors shall be arranged so that they are not subjected to temperatures above those for which they are rated.

410.~~23~~ 50 Polarization of Luminaires (Fixtures)

Luminaires (fixtures) shall be wired so that the screw shells of lampholders are connected to the same luminaire (fixture) or circuit conductor or terminal. The grounded conductor, where connected to a screw-shell lampholder, shall be connected to the screw shell.

410.~~24~~ 52 Conductor Insulation

Luminaires (fixtures) shall be wired with conductors having insulation suitable for the environmental conditions, current, voltage, and temperature to which the conductors will be subjected.

FPN: For ampacity of luminaire (fixture) wire, maximum operating temperature, voltage limitations, minimum wire size, and so forth, see Article 402.

410.~~27~~ 54 Pendant Conductors for Incandescent Filament Lamps

(A) Support Pendant lampholders with permanently attached leads, where used for other than festoon wiring, shall be hung from separate stranded rubber-covered conductors that are soldered directly to the circuit conductors but supported independently thereof.

(B) Size Unless part of listed decorative lighting assemblies, pendant conductors shall not be smaller than 14 AWG for mogul-base or medium-base screw-shell lampholders or smaller than 18 AWG for intermediate or candelabra-base lampholders.

(C) Twisted or Cabled Pendant conductors longer than 900 mm (3 ft) shall be twisted together where not cabled in a listed assembly.

410.~~28~~ 56 Protection of Conductors and Insulation

(A) Properly Secured. Conductors shall be secured in a manner that does not tend to cut or abrade the insulation.

(B) Protection Through Metal. Conductor insulation shall be protected from abrasion where it passes through metal.

(C) Luminaire (Fixture) Stems Splices and taps shall not be located within luminaire (fixture) arms or stems.

(D) Splices and Taps. No unnecessary splices or taps shall be made within or on a luminaire (fixture).

FPN: For approved means of making connections, see 110.14.

(E) Stranding. Stranded conductors shall be used for wiring on luminaire (fixture) chains and on other movable or flexible parts.

(F) Tension. Conductors shall be arranged so that the weight of the luminaire (fixture) or movable parts does not put tension on the conductors.

410.~~29~~ 59 Cord-Connected Showcases

Individual showcases, other than fixed, shall be permitted to be connected by flexible cord to permanently installed receptacles, and groups of not more than six such showcases shall be permitted to be coupled together by flexible cord and separable locking-type connectors with one of the group connected by flexible cord to a permanently installed receptacle.

The installation shall comply with 410.29(A) through 410.29(E).

(A) Cord Requirements. Flexible cord shall be of the hard-service type, having conductors not smaller than the branch-circuit conductors, having ampacity at least equal to the branch-circuit overcurrent device, and having an equipment grounding conductor.

FPN: See Table 250.122 for size of equipment grounding conductor.

(B) Receptacles, Connectors, and Attachment Plugs Receptacles, connectors, and attachment plugs shall be of a listed grounding type rated 15 or 20 amperes.

(C) Support Flexible cords shall be secured to the undersides of showcases such that all of the following conditions are ensured:

(1) The wiring is not exposed to mechanical damage.

(2) The separation between cases is not in excess of 50 mm (2 in.), or more than 300 mm (12 in.) between the first case and the supply receptacle.

(3) The free lead at the end of a group of showcases has a female fitting not extending beyond the case.

(D) No Other Equipment. Equipment other than showcases shall not be electrically connected to showcases.

(E) Secondary Circuit(s). Where showcases are cord-connected, the secondary circuit(s) of each electric-discharge lighting ballast shall be limited to one showcase.

410.~~30~~ 62 Cord-Connected Lampholders and Luminaires (Fixtures)

(A) Lampholders. Where a metal lampholder is attached to a flexible cord, the inlet shall be equipped with an insulating bushing that, if threaded, is not smaller than metric designator 12 (trade size 3/ 8) pipe size. The cord hole shall be of a size appropriate for the cord, and all burrs and fins shall be removed in order to provide a smooth bearing surface for the cord.
Bushing having holes 7 mm (9/ 32 in.) in diameter shall be permitted for use with plain pendant cord and holes 11 mm (13/ 32 in.) in diameter with reinforced cord.

(B) Adjustable Luminaires (Fixtures) Luminaires (fixtures) that require adjusting or aiming after installation shall not be required to be equipped with an attachment plug or cord connector, provided the exposed cord is of the hard-usage or extra-hard-usage type and is not longer than that required for maximum adjustment. The cord shall not be subject to strain or physical damage.

(C) Electric-Discharge Luminaires (Fixtures)

(1) Cord-Connected Installation. A listed luminaire (fixture) or a listed assembly shall be permitted to be cord connected if the following conditions apply:

(1) The luminaire (fixture) is located directly below the outlet or busway.

(2) The flexible cord meets all the following:

a. Is visible for its entire length outside the luminaire (fixture)

b. Is not subject to strain or physical damage

c. Is terminated in a grounding-type attachment plug cap or busway plug, or is a part of a listed assembly incorporating a manufactured wiring system connector in accordance with 604.6(C), or has a luminaire (fixture) assembly with a strain relief and canopy

(2) Provided with Mogul-Base, Screw-Shell Lampholders Electric-discharge luminaires (lighting fixtures) provided with mogul-base, screw-shell lampholders shall be permitted to be connected to branch circuits of 50 amperes or less by cords complying with 240.5. Receptacles and attachment plugs shall be permitted to be of a lower ampere rating than the branch circuit but not less than 125 percent of the luminaire (fixture) full-load current.

(3) Equipped with Flanged Surface Inlet Electric-discharge luminaires (lighting fixtures) equipped with a flanged surface inlet shall be permitted to be supplied by cord pendants equipped with cord connectors. Inlets and connectors shall be permitted to be of a lower ampere rating than the branch circuit but not less than 125 percent of the luminaire (fixture) load current.

410.~~31~~ 64 Luminaires (Fixtures) as Raceways

Luminaires (fixtures) shall not be used as a raceway for circuit conductors unless listed and marked for use as a raceway.

410.~~32~~ 65 Wiring Supplying Luminaires (Fixtures) Connected Together

Luminaires (fixtures) designed for end-to-end connection to form a continuous assembly, or luminaires (fixtures) connected together by recognized wiring methods, shall be permitted to contain the conductors of a 2-wire branch circuit, or one multiwire branch circuit, supplying the connected luminaires (fixtures) and need not be listed as a raceway. One additional 2-wire branch circuit separately supplying one or more of the connected luminaires (fixtures) shall also be permitted.

FPN: See Article 100 for the definition of Multiwire Branch Circuit.

410.~~33~~ 68 Branch Circuit Conductors and Ballasts

Branch-circuit conductors within 75 mm (3 in.) of a ballast shall have an insulation temperature rating not lower than 90°C (194°F) unless supplying a luminaire (fixture) listed and marked as suitable for a different insulation temperature.

VII. Construction of Luminaires (Fixtures)

410.~~34~~ 70 Combustible Shades and Enclosures

Adequate airspace shall be provided between lamps and shades or other enclosures of combustible material.

410.~~35~~ 74 Luminaire (Fixture) Rating

(A) Marking All luminaires (fixtures) shall be marked with the maximum lamp wattage or electrical rating, manufacturer's name, trademark, or other suitable means of identification. A luminaire (fixture) requiring supply wire rated higher than 60°C (140°F) shall be marked in letters not smaller than 6 mm (1/ 4 in.) high, prominently displayed on the luminaire (fixture) and shipping carton or equivalent.

(B) Electrical Rating The electrical rating shall include the voltage and frequency and shall indicate the current rating of the unit, including the ballast, transformer, or autotransformer.

410.~~36~~ 76 Design and Material

Luminaires (fixtures) shall be constructed of metal, wood, or other material suitable for the application and shall be designed and assembled so as to secure requisite mechanical strength and rigidity. Wiring compartments, including their entrances, shall be designed and constructed to permit conductors to be drawn in and withdrawn without physical damage.

410.~~37~~ 77 Nonmetallic Luminaires (Fixtures)

When luminaire (fixture) wiring compartments are constructed from combustible material, armored or lead-covered conductors with suitable fittings shall be used or the wiring compartment shall be lined with metal.

410.~~38~~ 78 Mechanical Strength

(A) Tubing for Arms. Tubing used for arms and stems where provided with cut threads shall not be less than 1.02 mm (0.040 in.) in thickness and, where provided with rolled (pressed) threads, shall not be less than 0.64 mm (0.025 in.) in thickness. Arms and other parts shall be fastened to prevent turning.

(B) Metal Canopies Metal canopies supporting lampholders, shades, and so forth exceeding 4 kg (8 lb), or incorporating attachment-plug receptacles, shall not be less than 0.51 mm (0.020 in.) in thickness. Other canopies shall not be less than 0.41 mm (0.016 in.) if made of steel and not less than 0.51 mm (0.020 in.) if of other metals.

(C) Canopy Switches. Pull-type canopy switches shall not be inserted in the rims of metal canopies that are less than 0.64 mm (0.025 in.) in thickness, unless the rims are reinforced by the turning of a bead or the equivalent. Pull-type canopy switches, whether mounted in the rims or elsewhere in sheet metal canopies, shall not be located more than 90 mm (3 1/ 2 in.) from the center of the canopy. Double set-screws, double canopy rings, a screw ring, or equal method shall be used where the canopy supports a pull-type switch or pendant receptacle.

The thickness requirements in the preceding paragraph shall apply to measurements made on finished (formed) canopies.

410.~~39~~ 79 Wiring Space

Bodies of luminaires (fixtures), including portable lamps, shall provide ample space for splices and taps and for the installation of devices, if any. Splice compartments shall be of nonabsorbent, noncombustible material.

410.~~42~~ 82 Portable Lamps

(A) General Portable lamps shall be wired with flexible cord recognized by 400.4 and an attachment plug of the polarized or grounding type.

Where used with Edison-base lampholders, the grounded conductor shall be identified and attached to the screw shell and the identified blade of the attachment plug.

(B) Portable Handlamps In addition to the provisions of 410.42(A), portable handlamps shall comply with the following:

(1) Metal shell, paper-lined lampholders shall not be used.

(2) Handlamps shall be equipped with a handle of molded composition or other insulating material.

(3) Handlamps shall be equipped with a substantial guard attached to the lampholder or handle.

(4) Metallic guards shall be grounded by means of an equipment grounding conductor run with circuit conductors within the power-supply cord.

Portable handlamps shall not be required to be grounded where supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.

410.~~44~~ 84 Cord Bushings

A bushing or the equivalent shall be provided where flexible cord enters the base or stem of a portable lamp. The bushing shall be of insulating material unless a jacketed type of cord is used.

410.~~45~~ 85 Tests

All wiring shall be free from short circuits and grounds and shall be tested for these defects prior to being connected to the circuit.

410.~~46~~ 86 Live Parts

Exposed live parts within porcelain luminaires (fixtures) shall be suitably recessed and located so as to make it improbable that wires come in contact with them. There shall be a spacing of at least 13 mm (1/ 2 in.) between live parts and the mounting plane of the luminaire (fixture).

VIII. Installation of Lampholders

410.~~47~~ 90 Screw-Shell Type

Lampholders of the screw-shell type shall be installed for use as lampholders only. Where supplied by a circuit having a grounded conductor, the grounded conductor shall be connected to the screw shell.

410.~~48~~ 93 Double-Pole Switched Lampholders

Where supplied by the ungrounded conductors of a circuit, the switching device of lampholders of the switched type shall simultaneously disconnect both conductors of the circuit.

410.~~49~~ 96Lampholders in Wet or Damp Locations

Lampholders installed in wet or damp locations shall be of the weatherproof type.

IX. Construction of Lampholders

410.~~50~~ 100Insulation

The outer metal shell and the cap shall be lined with insulating material that prevents the shell and cap from becoming a part of the circuit. The lining shall not extend beyond the metal shell more than 3 mm (1/ 8 in.) but shall prevent any current-carrying part of the lamp base from being exposed when a lamp is in the lampholding device.

410.~~52~~ 102Switched Lampholders

Switched lampholders shall be of such construction that the switching mechanism interrupts the electrical connection to the center contact. The switching mechanism shall also be permitted to interrupt the electrical connection to the screw shell if the connection to the center contact is simultaneously interrupted.

X. Lamps and Auxiliary Equipment

410.~~53~~ 103 Bases, Incandescent Lamps

An incandescent lamp for general use on lighting branch circuits shall not be equipped with a medium base if rated over 300 watts, or with a mogul base if rated over 1500 watts. Special bases or other devices shall be used for over 1500 watts.

410.~~54~~ 104 Electric-Discharge Lamp Auxiliary Equipment

(A) Enclosures Auxiliary equipment for electric-discharge lamps shall be enclosed in noncombustible cases and treated as sources of heat.

(B) Switching Where supplied by the ungrounded conductors of a circuit, the switching device of auxiliary equipment shall simultaneously disconnect all conductors.

XI. Special Provisions for Flush and Recessed Luminaires (Fixtures)

Formal Interpretation 81-6

Reference: Article 410, Part XI

410.~~64~~ 110 General

Luminaires (fixtures) installed in recessed cavities in walls or ceilings shall comply with 410.65 through 410.72.

410.~~65~~ 115 Temperature

(A) Combustible Material Luminaires (fixtures) shall be installed so that adjacent combustible material will not be subjected to temperatures in excess of 90°C (194°F).

(B) Fire-Resistant Construction Where a luminaire (fixture) is recessed in fire-resistant material in a building of fire-resistant construction, a temperature higher than 90°C (194°F) but not higher than 150°C (302°F) shall be considered acceptable if the luminaire (fixture) is plainly marked that it is listed for that service.

(B) Recessed Incandescent Luminaires (Fixtures) Incandescent luminaires (fixtures) shall have thermal protection and shall be identified as thermally protected.

Exception No. 1: Thermal protection shall not be required in a recessed luminaire (fixture) identified for use and installed in poured concrete.

Exception No. 2: Thermal protection shall not be required in a recessed luminaire (fixture) whose design, construction, and thermal performance characteristics are equivalent to a thermally protected luminaire (fixture) and are identified as inherently protected.

410.~~66~~ 116 Clearance and Installation

(A) Clearance

(1) Non-Type IC A recessed luminaire (fixture) that is not identified for contact with insulation shall have all recessed parts spaced not less than 13 mm (1/ 2 in.) from combustible materials. The points of support and the trim finishing off the opening in the ceiling or wall surface shall be permitted to be in contact with combustible materials.

(2) Type IC A recessed luminaire (fixture) that is identified for contact with insulation, Type IC, shall be permitted to be in contact with combustible materials at recessed parts, points of support, and portions passing through or finishing off the opening in the building structure.

(B) Installation Thermal insulation shall not be installed above a recessed luminaire (fixture) or with 75 mm (3 in.) of the recessed luminaire's (fixture's) enclosure, wiring compartment, or ballast unless it is identified for contact with insulation, Type IC.

410.~~67~~ 117 Wiring

(A) General Conductors that have insulation suitable for the temperature encountered shall be used.

(B) Circuit Conductors Branch-circuit conductors that have an insulation suitable for the temperature encountered shall be permitted to terminate in the luminaire (fixture).

Tap Conductors Tap conductors of a type suitable for the temperature encountered shall be permitted to run from the luminaire (fixture) terminal connection to an outlet box placed at least 300 mm (1 ft) from the luminaire (fixture). Such tap conductors shall be in suitable raceway or Type AC or MC cable of at least 450 mm (18 in.) but not more than 1.8 m (6 ft) in length.

XII. Construction of Flush and Recessed Luminaires (Fixtures)

410.~~68~~ 118 Temperature

Luminaires (fixtures) shall be constructed such that adjacent combustible material is not subject to temperatures in excess of 90°C (194°F).

410.~~70~~ 120 Lamp Wattage Marking

Incandescent lamp luminaires (fixtures) shall be marked to indicate the maximum allowable wattage of lamps. The markings shall be permanently installed, in letters at least 6 mm (1/ 4 in.) high, and shall be located where visible during relamping.

410.~~71~~ 121 Solder Prohibited

No solder shall be used in the construction of a luminaire (fixture) box.

410.~~72~~ 122Lampholders

Lampholders of the screw-shell type shall be of porcelain or other suitable insulating materials. Where used, cements shall be of the high-heat type.

XIII. Special Provisions for Electric-Discharge Lighting Systems of 1000 Volts or Less

410.~~73~~ 130 General

(A) Open-Circuit Voltage of 1000 Volts or Less Equipment for use with electric-discharge lighting systems and designed for an open-circuit voltage of 1000 volts or less shall be of a type intended for such service.

(B) Considered as Energized The terminals of an electric-discharge lamp shall be considered as energized where any lamp terminal is connected to a circuit of over 300 volts.

(C) Transformers of the Oil-Filled Type Transformers of the oil-filled type shall not be used.

(D) Additional Requirements In addition to complying with the general requirements for luminaires (lighting fixtures), such equipment shall comply with Part XIII of this article.

(E) Thermal Protection — Fluorescent Luminaires (Fixtures)

(1) Integral Thermal Protection The ballast of a fluorescent luminaire (fixture) installed indoors shall have integral thermal protection. Replacement ballasts shall also have thermal protection integral with the ballast.

(2) Simple Reactance Ballasts A simple reactance ballast in a fluorescent luminaire (fixture) with straight tubular lamps shall not be required to be thermally protected.

(3) Exit Fixtures A ballast in a fluorescent exit luminaire (fixture) shall not have thermal protection.

(4) Egress Luminaires (Fixtures) A ballast in a fluorescent luminaire (fixture) that is used for egress lighting and energized only during a failure of the normal supply shall not have thermal protection.

(F) High-Intensity Discharge Luminaires (Fixtures)

(1) Recessed. Recessed high-intensity luminaires (fixtures) designed to be installed in wall or ceiling cavities shall have thermal protection and be identified as thermally protected.

(2) Inherently Protected Thermal protection shall not be required in a recessed high-intensity luminaire (fixture) whose design, construction, and thermal performance characteristics are equivalent to a thermally protected luminaire (fixture) and are identified as inherently protected.

(3) Installed in Poured Concrete Thermal protection shall not be required in a recessed high-intensity discharge luminaire (fixture) identified for use and installed in poured concrete.

(4) Recessed Remote Ballasts A recessed remote ballast for a high-intensity discharge luminaire (fixture) shall have thermal protection that is integral with the ballast and be identified as thermally protected.

(5) Metal Halide Lamp Containment Luminaires (fixtures) that use a metal halide lamp other than a thick-glass parabolic reflector lamp (PAR) shall be provided with a containment barrier that encloses the lamp, or shall be provided with a physical means that only allows the use of a lamp that is Type O.

FPN: See ANSI Standard C78.387, American National Standard for Electric Lamps — Metal Halide Lamps, Methods of Measuring Characteristics.

(G) Disconnecting Means In indoor locations, other than dwellings and associated accessory structures, fluorescent luminaires (fixtures) that utilize double-ended lamps and contain ballast(s) that can be serviced in place or ballasted luminaires that are supplied from multiwire branch circuits and contain ballast(s) that can be serviced in place shall have a disconnecting means either internal or external to each luminaire (fixture), to disconnect simultaneously from the source of supply all conductors of the ballast, including the grounded conductor if any. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. This requirement shall become effective January 1, 2008.

Exception No. 1: A disconnecting means shall not be required for luminaires (fixtures) installed in hazardous (classified) location(s).

Exception No. 2: A disconnecting means shall not be required for emergency illumination required in 700.16.

Exception No. 3: For cord-and-plug-connected luminaires, an accessible separable connector or an accessible plug and receptacle shall be permitted to serve as the disconnecting means.

Exception No. 4: A disconnecting means shall not be required in industrial establishments with restricted public access where conditions of maintenance and supervision ensure that only qualified persons service the installation by written procedures.

Exception No. 5: Where more than one luminaire is installed and supplied by other than a multiwire branch circuit, a disconnecting means shall not be required for every luminaire when the design of the installation includes locally accessible disconnects, such that the illuminated space cannot be left in total darkness.

410.~~74~~ 134 Direct-Current Equipment

Luminaires (fixtures) installed on dc circuits shall be equipped with auxiliary equipment and resistors designed for dc operation. The luminaires (fixtures) shall be marked for dc operation.

410.~~75~~ 135 Open-Circuit Voltage Exceeding 300 Volts

Equipment having an open-circuit voltage exceeding 300 volts shall not be installed in dwelling occupancies unless such equipment is designed so that there will be no exposed live parts when lamps are being inserted, are in place, or are being removed.

410.~~76~~ 136 Luminaire (Fixture) Mounting

(A) Exposed Ballasts Luminaires (fixtures) that have exposed ballasts or transformers shall be installed so that such ballasts or transformers will not be in contact with combustible material.

(B) Combustible Low-Density Cellulose Fiberboard Where a surface-mounted luminaire (fixture) containing a ballast is to be installed on combustible low-density cellulose fiberboard, it shall be listed for this condition or shall be spaced not less than 38 mm (1 1/ 2 in.) from the surface of the fiberboard. Where such luminaires (fixtures) are partially or wholly recessed, the provisions of 410.64 through 410.72 shall apply.

FPN: Combustible low-density cellulose fiberboard includes sheets, panels, and tiles that have a density of 320 kg/m 3 (20 lb/ft 3) or less and that are formed of bonded plant fiber material but does not include solid or laminated wood or fiberboard that has a density in excess of 320 kg/m 3 (20 lb/ft 3) or is a material that has been integrally treated with fire-retarding chemicals to the degree that the flame spread in any plane of the material will not exceed 25, determined in accordance with tests for surface burning characteristics of building materials. See ANSI/ASTM E84-1997, Test Method for Surface Burning Characteristics of Building Materials.

410.~~77~~ 137 Equipment Not Integral with Luminaire (Fixture)

(A) Metal Cabinets Auxiliary equipment, including reactors, capacitors, resistors, and similar equipment, where not installed as part of a luminaire (lighting fixture) assembly, shall be enclosed in accessible, permanently installed metal cabinets.

(B) Separate Mounting Separately mounted ballasts that are intended for direct connection to a wiring system shall not be required to be separately enclosed.

(C) Wired Luminaire (Fixture) Sections Wired luminaire (fixture) sections are paired, with a ballast(s) supplying a lamp or lamps in both. For interconnection between paired units, it shall be permissible to use metric designator 12 (trade size 3/ 8) flexible metal conduit in lengths not exceeding 7.5 m (25 ft), in conformance with Article 348. Luminaire (fixture) wire operating at line voltage, supplying only the ballast(s) of one of the paired luminaires (fixtures), shall be permitted in the same raceway as the lamp supply wires of the paired luminaires (fixtures).

410.~~78~~ 138 Autotransformers

An autotransformer that is used to raise the voltage to more than 300 volts, as part of a ballast for supplying lighting units, shall be supplied only by a grounded system.

410.~~79~~ 139 Switches

Snap switches shall comply with 404.14.

XIV. Special Provisions for Electric-Discharge Lighting Systems of More Than 1000 Volts

410.~~80~~ 140 General

(A) Listing Electric-discharge lighting systems with an open-circuit voltage exceeding 1000 volts shall be listed and installed in conformance with that listing.

(B) Dwelling Occupancies Equipment that has an open-circuit voltage exceeding 1000 volts shall not be installed in or on dwelling occupancies.

(C) Live Parts The terminal of an electric-discharge lamp shall be considered as a live part.

(D) Additional Requirements In addition to complying with the general requirements for luminaires (lighting fixtures), such equipment shall comply with Part XIV of this article.

FPN: For signs and outline lighting, see Article 600.

410.~~81~~ 141 Control

(A) Disconnection Luminaires (fixtures) or lamp installation shall be controlled either singly or in groups by an externally operable switch or circuit breaker that opens all ungrounded primary conductors.

(B) Within Sight or Locked Type The switch or circuit breaker shall be located within sight from the luminaires (fixtures) or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position.

410.~~82~~ 142 Lamp Terminals and Lampholders

Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders shall be designed so that there are no exposed live parts when lamps are being inserted or removed.

410.~~83~~ 143 Transformers

(A) Type Transformers shall be enclosed, identified for the use, and listed.

(B) Voltage The secondary-circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load conditions.

(C) Rating Transformers shall have a secondary short-circuit current rating of not more than 150 mA if the open-circuit voltage is over 7500 volts, and not more than 300 mA if the open-circuit voltage rating is 7500 volts or less.

(D) Secondary Connections Secondary circuit outputs shall not be connected in parallel or in series.

410.~~84~~ 144Transformer Locations

(A) Accessible Transformers shall be accessible after installation.

(B) Secondary Conductors Transformers shall be installed as near to the lamps as practicable to keep the secondary conductors as short as possible.

C) Adjacent to Combustible Materials Transformers shall be located so that adjacent combustible materials are not subjected to temperatures in excess of 90°C (194°F).

410.~~85~~ 145 Exposure to Damage

Lamps shall not be located where normally exposed to physical damage.

410.~~86~~ 146 Marking
Each luminaire (fixture) or each secondary circuit of tubing having an open-circuit voltage of over 1000 volts shall have a clearly legible marking in letters not less than 6 mm (1/ 4 in.) high reading ``Caution _____ volts.'' The voltage indicated shall be the rated open-circuit voltage.
410.~~87~~ 147 Switches
Snap switches shall comply with 404.4.

XV. Lighting Track

410.~~100~~ 150 Definition
Lighting Track. A manufactured assembly designed to support and energize luminaires (lighting fixtures) that are capable of being readily repositioned on the track. Its length can be altered by the addition or subtraction of sections of track.
410.~~101~~ 151 Installation
(A) Lighting Track Lighting track shall be permanently installed and permanently connected to a branch circuit. Only lighting track fittings shall be installed on lighting track. Lighting track fittings shall not be equipped with general-purpose receptacles.
(B) Connected Load The connected load on lighting track shall not exceed the rating of the track. Lighting track shall be supplied by a branch circuit having a rating not more than that of the track.
(C) Locations Not Permitted Lighting track shall not be installed in the following locations:
(1) Where likely to be subjected to physical damage
(2) In wet or damp locations
(3) Where subject to corrosive vapors
(4) In storage battery rooms
(5) In hazardous (classified) locations
(6) Where concealed
(7) Where extended through walls or partitions
(8) Less than 1.5 m (5 ft) above the finished floor except where protected from physical damage or track operating at less than 30 volts rms open-circuit voltage
(9) Where prohibited by 410.4(D)
(D) Support Fittings identified for use on lighting track shall be designed specifically for the track on which they are to be installed. They shall be securely fastened to the track, shall maintain polarization and grounding, and shall be designed to be suspended directly from the track.

410.~~103~~ 153 Heavy-Duty Lighting Track
Heavy-duty lighting track is lighting track identified for use exceeding 20 amperes. Each fitting attached to a heavy-duty lighting track shall have individual overcurrent protection.
410.~~104~~ 154 Fastening
Lighting track shall be securely mounted so that each fastening is suitable for supporting the maximum weight of luminaires (fixtures) that can be installed. Unless identified for supports at greater intervals, a single section 1.2 m (4 ft) or shorter in length shall have two supports, and, where installed in a continuous row, each individual section of not more than 1.2 m (4 ft) in length shall have one additional support.
410.~~105~~ 155 Construction Requirements
(A) Construction The housing for the lighting track system shall be of substantial construction to maintain rigidity. The conductors shall be installed within the track housing, permitting insertion of a luminaire (fixture), and designed to prevent tampering and accidental contact with live parts. Components of lighting track systems of different voltages shall not be interchangeable. The track conductors shall be a minimum 12 AWG or equal and shall be copper. The track system ends shall be insulated and capped.
Grounding Lighting track shall be grounded in accordance with Article 250, and the track sections shall be securely coupled to maintain continuity of the circuitry, polarization, and grounding throughout.

XVI. Decorative Lighting and Similar Accessories

410.~~110~~ 160 Listing of Decorative Lighting
Decorative lighting and similar accessories used for holiday lighting and similar purposes, in accordance with 590.3(B), shall be listed.

I**Substantiation:** During the 2005 cycle panel meetings a task group was formed to make editorial changes to Article 410 to comply with the Style Manual & Manual of Style:
a. Reformat 410.2 (Other Articles) to tabular style and rename 410.3 & table 410.3.
b. Move any definitions contained in 410 to 410.2 Definitions
c. Renumber Article 410 to make space for the present 410.3 that will be displaced by the action of 1 above and to allow for future additions by creating larger numerical gaps between requirements.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-42 Log #3167 NEC-P18 **Final Action: Accept**
(410, Entire Document)

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Delete the bracketed references to "fixtures", and "fixture".
Substantiation: This terminology was changed to the term Luminaire, and the definition of "Luminaire" as stated in Article 100. There is no definition of "fixture" or "lighting fixture".
In the 2002 Edition of the NEC Handbook the commentary states as follows; "The term luminaire first appeared in the 1996 NEC in a fine print note following 410-1. In the 2002 Code, the term luminaire is used throughout in place of the term lighting fixture".
This proposed change will go a long way to standardize the Code and make it less confusing.
Panel Meeting Action: Accept
Panel Statement: See panel action and statement on Proposal 18-44.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-45 Log #1753 NEC-P18 **Final Action: Accept**
(410.1, 410.3, 410.39, 410.42, 410.44)

TCC Action: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the panel action.
Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Add portable luminaires to differentiate from lamp. Replace the term "portable lamp" with the term " portable luminaire ". Revise text as follows:
410.1 Scope. This article covers luminaires (lighting fixtures), portable luminaires , lampholders, pendants, incandescent filament lamps, arc lamps, electric-discharge lamps, decorative lighting products, lighting accessories for temporary seasonal and holiday use, portable flexible lighting products, and the wiring and equipment forming part of such products and lighting installations.
410.3 Live Parts. Luminaires (fixtures), portable luminaires , lampholders, and lamps shall have no live parts normally exposed to contact. Exposed accessible terminals in lampholders and switches shall not be installed in metal luminaire (fixture) canopies or in open bases of portable table or floor ~~lamps~~ luminaires .
410.39 Wiring Space. Bodies of luminaires (fixtures), including portable ~~lamps~~ luminaires , shall provide ample space for splices and taps and for the installation of devices, if any. Splice compartments shall be of nonabsorbent, noncombustible material.
410.42 Portable ~~Lamps~~ Luminaires .
(A) General. Portable ~~lamps~~ luminaires shall be wired with flexible cord recognized by 400.4 and an attachment plug of the polarized or grounding type. Where used with Edison-base lampholders, the grounded conductor shall be identified and attached to the screw shell and the identified blade of the attachment plug.
410.44 Cord Bushing. A bushing or the equivalent shall be provided where flexible cord enters the base or stem of a portable ~~lamp~~ luminaires . The busing shall be of insulating material unless a jacketed type of cord is used.
Substantiation: The terms "portable lamp" and "lamp" is confusing, as it is not always obvious if the requirement applies to a light source or a lighting system.
The term "luminaire" has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms "fixture" or "lighting fixture", which were terms for fixed lighting systems.
The term "portable luminaire" has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled "Portable Electric Lamps" and is now titled "Portable Electric Luminaires".
Panel Meeting Action: Accept
Panel Statement: Editorially correct luminaires to luminaire in the proposal text of 410.44, Cord Bushing.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-44 Log #2929 NEC-P18 **Final Action: Accept**
(410.1, Entire Document)

TCC Action: The Technical Correlating Committee directs staff to remove all parenthetical reference to fixtures and lighting fixtures throughout the NEC such that the term luminaire is the only term that remains. The Technical Correlating Committee advises that Article Scope statements and Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the panel action. The Technical Correlating Committee further directs that this proposal be sent to Code-Making Panels1 through 20 for information.
Submitter: Frederick L. Carpenter, Lithonia Lighting
Recommendation: Remove the parenthetical references to "lighting fixture(s)" or "fixture(s)" after the word "luminaire" throughout the document.

Substantiation: When the 2002 NEC was published a definition for the term "Luminaire" was added in Article 100. Throughout the document the word "luminaire" was substituted for the term "lighting fixture" and either the words "lighting fixture" or just "fixture" were added in parentheses after the word "luminaire." As an example, Article 410 is titled "Luminaires (Lighting Fixtures), Lampholders, and Lamps". The practice of using the term "luminaire" followed parenthetically by "lighting fixture" or "fixture" was carried over into the 2005 NEC. Now that the term "luminaire" has been used for two complete code cycles, the parenthetical references to "fixture(s)" should no longer be necessary.
Panel Meeting Action: Accept
Panel Statement: The parenthetical use of the term "fixture" in the 2005 NEC was provided to assist in transitioning the replacement term "luminaire." The panel agrees that the transition period be concluded and the parenthetical use of the term be eliminated.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-46 Log #206 NEC-P18 **Final Action: Accept in Principle**
(410.2)

NOTE: The following proposal consists of Comment 18-30 on Proposal 18-52a in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 18-52a was:
Revise 410.2 to read:
"Lighting systems operating at 30 volts or less shall conform to Article 411. Arc lamps used in theaters shall comply with 520.61, and arc lamps used in projection machines shall comply with 540.20. Arc lamps used on constant-current systems shall comply with the general requirements of Article 490."
It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 18-51. See Technical Correlating Committee action on Proposal 18-51. This action will be considered by the Panel as a Public Comment.

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 18-51. See Technical Correlating Committee action on Proposal 18-51. This action will be considered by the Panel as a Public Comment.

Substantiation: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 18-43.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-47 Log #2127 NEC-P18 **Final Action: Reject**
(410.2)

Submitter: Thomas F. Mueller, Southern Company Services
Recommendation: Add another sentence at the end of the paragraph (or within the existing paragraph) that states the following:
Lighting shall conform to the voltage limitations of 210.6, and for outdoor lighting, 225.7.
Substantiation: Article 410 is the place in the code where one would expect to find all the rules concerning lighting. But, 210.6 and 225.7 also explicitly define approved lighting voltages. As such, these sections should be referenced in this article. This change will improve usability of the code.
Panel Meeting Action: Reject
Panel Statement: The arrangement of the Code specified in Section 90.3 makes this reference unnecessary. Section 4.1 of the 2003 NEC Style Manual instructs not to use a reference if the requirement is already covered by Section 90.3.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-48 Log #3192 NEC-P18 **Final Action: Accept**
(410.2)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal and correlate with the action taken on Proposal 18-43. This action will be considered by the Panel as a Public Comment.
Submitter: Donald Cook, Shelby County Development Services
Recommendation: Equipment for use in hazardous (classified) locations shall conform to Articles 500 through 517. Lighting systems operating at 30 volts or less shall conform to Article 411. Arc lamps used in theaters shall comply with 520.61 and arc lamps used in projection machines shall comply with 540.20. ~~Arc lamps used on constant-current systems shall comply with the general requirements of Article 490.~~
Substantiation: Delete the marked text. There is nothing in the general requirements of Article 490, Part I, that applies to arc lamps used on constant-current systems.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-49 Log #3193 NEC-P18 **Final Action: Accept**
(410.2)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal and correlate with the action taken on Proposal 18-43. This action will be considered by the Panel as a Public Comment.
Submitter: Donald Cook, Shelby County Development Services
Recommendation: ~~Equipment for use in hazardous (classified) locations shall conform to Articles 500 through 517.~~ Lighting systems operating at 30 volts or less shall conform to Article 411. ~~Arc lamps used in theaters shall comply with 520.61 and arc lamps used in projection machines shall comply with 540.20.~~ Arc lamps used on constant-current systems shall comply with the general requirements of Article 490.
Substantiation: This proposal deletes the references to applications in Chapter 5 which modify the requirements in Article 410 for luminaires, lampholders and lamps. The text is not needed since NEC 90.3 clearly indicates that requirements in Chapter 5 supplement or modify the general rules found in Chapters 1 through 4.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-50 Log #1433 NEC-P18 **Final Action: Reject**
(410.4(D))

Submitter: Greg Chontow, Hopatcong, NJ
Recommendation: Add new text as follows:
"No parts of wall mounted (luminairers) ,...".
Substantiation: This section previously excluded wall mounted luminaires, yet it can cause an equal life safety issue.
Panel Meeting Action: Reject
Panel Statement: Section 410.4(D) requires luminaires installed within the tub / shower zone to be listed damp or wet location. No evidence that such luminaires have resulted in shock incidents was presented in the substantiation.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-51 Log #1906 NEC-P18 **Final Action: Accept**
(410.4(D))

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: In the last sentence of 410.4(D), delete the phrase "in this zone" and replace it with the phrase "within the actual footprint of the bathtub rim or shower threshold" to read as follows:
"(D) Bathtub and Shower Areas. No parts of cord-connected luminaires (fixtures), chain-, cable-, or cord-suspended-luminaires (fixtures), lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing and includes the ~~zone~~ space directly over the tub or shower stall.
Luminaires (lighting fixtures) located ~~in this zone~~ within the actual outside dimension of the bathtub or shower to a height of 2.5 m (8 ft) vertically from the top of the bathtub rim or shower threshold shall be listed for damp or listed for wet locations where subject to shower spray."
Substantiation: The word "zone" was changed in the last sentence of the first paragraph to make it consistent with the text used in 404.4 for switches and in the title for 406.8 for receptacles. The more appropriate word seems to be space since zone indicates the three-foot space outside of the footprint or space of the actual tub or shower. The text, as presently worded in the 2005 NEC, would imply that the area within three feet from the edge of the bathtub or shower is a wet or damp location requiring the luminaire to be listed for wet or damp locations. This would also logically carry over to any receptacle, switch, or luminaire that was located on the wall within this three ft distance, thus requiring the same wet or damp location rating for these devices or luminaires. Switches and receptacles would then be required to have a weatherproof cover installed. This three-foot area from the edge of the tub or shower is constructed of drywall with regular texture and paint. Any wetness or dampness in this area would cause rapid deterioration of the paint and drywall.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-52 Log #2138 NEC-P18 **Final Action: Reject**
(410.4(D))

Submitter: Michael Briggs, Kichler Lighting
Recommendation: Removal of the verbiage "Luminaires (lighting fixtures) located in this zone shall be listed for damp locations, or listed for wet locations where subject to shower spray", until a special category and testing requirements are developed in UL 1598.
Substantiation: Rational: The allowance of luminaire installation inside a shower area, based on wet location rating, leaves open the possibility of a serious safety hazard due to unintended use of the luminaire. The wet location category is very broad as defined under UL 1598. It covers many different styles of luminaires. Not all wet location rated luminaires where designed for the potential abuse of a shower area. One case in point would be a typical lantern used in many homes as a porch light.
(1) Typical outdoor luminaires employ a water shield to protect electrical components from water exposure. This shield is normally made of un-tempered glass and may be damaged by thermal change or impact force. According to the new version of the luminaire Standard, UL 1598, the water shield is no longer required to be subjected to thermal shock or impact testing. If this water shield were to break, a typical "A" type lamp would shatter exposing the filament to water exposure. This in conjunction with a totally immersed human body poses an extreme shock hazard.
(2) Showers and baths pose a slip hazard as well. When unbalanced, a person will look for a hand hold for support. It is easy to imagine the weight of a human body being applied to the fixture and mounting means. Smaller luminaires are not constructed to support this type of load. Almost all wet location luminaires are mounted directly to a junction box which is limited to a fifty pound force. No such loading or mounting test is required for this type of luminaire.
Panel Meeting Action: Reject
Panel Statement: The submitter presents a worst-case scenario in which the fixture would have to be rated to support the impact load of a falling person to comply with this section. While such a rating is commendable, the panel finds it impractical. Also, by deleting or removing the verbiage located in damp locations and wet locations, the submitter allows any fixture in this area until the standard is changed. The panel encourages the submitter to pursue the special location rating through the UL STP process.
Surface-mounted wet location luminaires are subjected to the rain and/or sprinkler tests, depending on the mounting specifications.
A recessed luminaire intended to be mounted in a covered ceiling is subject to a sprinkler test.
The UL1598 rain and sprinkler test protocol specifies preheating the luminaire 1 hour before exposing it to a spray of cold tap water. This exposes the water shield to thermal stresses it is expected to experience in use.
The impact test referred to never yielded any test failures and was deleted.
There are no field data indicating an increase in shock incidences with these changes.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
O'BOYLE, M.: There is no substantiation to prohibit all luminaires from this area. From the submitter's substantiation, I believe the focus of this proposal was on wall mounted, not ceiling mounted, luminaires. Many wall mounted luminaires are wet locations rated, but not specifically designed for installation in a bath or shower space. The practicality of a wall mounted luminaire for this application is left to the judgment of the installer and AHJ. A special location rating would help installers and AHJs to identify wall mounted luminaires specifically designed for this application.

18-53 Log #2583 NEC-P18 **Final Action: Reject**
(410.4(D), FPN (New))

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Add text to read as follows:
<u>FPN: Examples of luminaires permitted to be located in this zone include but are not limited to recessed fixtures or bath fan/light combinations.</u>
Substantiation: As the current text reads now, the first two sentences imply that no fixtures are to be located in that zone around the tub or shower. Then, the last sentence says that if you do put a fixture there, however, make sure it's listed for that location. By adding the FPN some of this confusion will be alleviated.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the substantiation that all luminaires are excluded by current Code wording. This FPN is redundant.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-54 Log #117 NEC-P18 **Final Action: Reject**
(410.4(D) Exception (New))

Submitter: Brian Roenigk, Citi Electric
Recommendation: Add an exception to allow low voltage (12 volts or less) pendant luminaires inside of the (3 ft) horizontal and below the (8 ft) vertical zone. However, limitations should be set for this exception. Possible limitations could be to allow pendants (low voltage) inside (3 ft) horizontally but, no less than (7 ft) vertically from top of tub, or GFCI protected.
Substantiation: I had a customer with a large bay window next to large bath tub. I wanted to hang a single low volt pendant center over the tub and in the window. Of course, I could not. I believe with low voltage lighting this would not be a hazard. Two examples could be any outdoor low volt landscape or low volt swimming pool lighting that could have similar hazard conditions but are acceptable.
Panel Meeting Action: Reject
Panel Statement: This proposal does not conform to Section 4-3.3 in the NFPA Regulations Governing Committee Projects in that it does not contain recommended text. A low voltage pendant style luminaire may present the same type of safety concerns as other luminaires. The listings covering such products do not anticipate this application.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-55 Log #2013 NEC-P18 **Final Action: Reject**
(410.4(E))

Submitter: Robert Hinson, James D. Hinsen Electrical Contracting Co. Inc.
Recommendation: Revise text to read as follows:
"Luminaires (fixtures) subject to physical damage using mercury vapor, metal halide <u>or compact fluorescent lamps,</u> installed in playing and spectator...".
Substantiation: Even with a protective guard, the compact fluorescent lamp can be damaged causing glass to fall on the players and spectators. This type of fixture should also require a protective lens for safety.
Panel Meeting Action: Reject
Panel Statement: The intent of 410.4(E) is not to protect against the potential for falling glass particles. Rather, the article was added to the code to address the potential for the exposure to excessive UV radiation from the arc-tube of a Metal Halide or Mercury Vapor lamp. If the outer envelope of many commonly available Metal Halide and Mercury Vapor lamps were to be broken, the arc-tube can continue to operate and expose the public to excessive radiation. Compact Fluorescent lamps will not operate with a broken outer envelope; therefore, they do not need to be included in this article.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
KEMPEL, K.: The types of fluorescent lamps used for general and task lighting applications do not emit sufficient UV to be a UV risk to humans.

18-55a Log #1653 NEC-P18 **Final Action: Reject**
(410.8(B)(3) (New))

Submitter: John Steinke, Reno, NV
Recommendation: Add (3) LED's, rope lighting, and compact fluorescents, and any other lighting method may be used, in the following applications:
a) Lights with a surface temperature greater than 150F will be treated as incandescent lights;
b) Lights with a surface temperature of 150F or less will be treated as fluorescents; and,
c) specialty lights may be placed closer than 6" only if listed for the application.
FPN: A fixture, and its' spacing, is to be determined by the type of lamp actually installed.
Substantiation: Changes in lighting have resulted in the existing text being inadequate.
For example, the IAEI treats a 'keyless' lampholder as an incandescent, even if a compact fluorescent bulb is used. (Absent the high temperature, a fluorescent can be placed closer in safety.
Likewise, the code, as written, fails to recognize LED's, rope lights, ILLUMINATED CLOTHES RODS, and other items that already exist- yet pose no threat of fire.
Panel Meeting Action: Reject
Panel Statement: This text as submitted is unenforceable since the AHJ would have no means to determine the maximum surface temperature of the luminaire. There are no luminaires specifically listed and identified for use in closets. See Proposal 18-57 for further information on LED luminaires.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-56 Log #145 NEC-P18 **Final Action: Reject**
(410.8(B)(3) (New))

Submitter: Lee Ward, Ardee Lighting Inc.
Recommendation: Add new text to read as follows:
(3) Surface mounted or wall mounted clothes rod luminaire (fixture) independently tested for suitability.
Substantiation: This luminaire or fixture is intended to supply supplemental low voltage or fluorescent lighting to areas of the closet that cannot be reached by conventional fixtures. This system has been independently tested and listed by UL. The fixture is listed with 3W festoon lamps, or T2/T5 fluorescent is enclosed.
Panel Meeting Action: Reject
Panel Statement: The fluorescent illuminated clothes rod is listed as a surface-mounted fluorescent luminaire. This is a luminaire type specified in 410.8 (B)(2), and it can be installed in accordance 410.8(D)(2). There currently are no tests in the luminaire standard, ANSI/UL 1598, that determine the suitability of a luminaire for use in a clothes closet.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-57 Log #586 NEC-P18 **Final Action: Accept in Principle**
(410.8(B)(3))

Submitter: Greg Fretwell, Blue Light Inspection Services
Recommendation: Add 410.8(B)(3)
"Luminaire incorporating LED technology".
Substantiation: White LEDs are coming into the marketplace and these will probably be evaluated by Nationally Recognized Testing Labs as not providing the ignition capability that has prompted most of 410.8.
If we make it legal they will come.
Panel Meeting Action: Accept in Principle
Revise the recommendation to read as follows:
(3) A surface-mounted or recessed LED luminaire with a completely enclosed light source.
Panel Statement: LEDs are a relatively new and developing light source technology. Individual LEDs typically operate at low temperatures but some LEDs can operate at elevated temperatures. As LED technology advances even the operating temperatures of individual LEDs are not certain. Revising the Code as proposed recognizes the advent of LEDs as a general light source while maintaining the risk of fire at or below existing levels.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-58 Log #1075 NEC-P18 **Final Action: Reject**
(410.8(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
Incandescent luminaires (fixtures) <u>and lampholders</u> with open or partially enclosed lamps, and pendant type luminaires (fixtures) or lampholders shall not be permitted.
Substantiation: A porcelain or plastic lighting fixture in widespread use, with or without an integral switch or receptacle, designed to be mounted on an outlet box is not a "Luminaire" since it has no provision (reflector or lens) for distributing the light, nor for positioning or protecting the lamp. Manufacturers designate these fixtures as lampholders. The lampholders referred to in this section appear to be brass screw-shell type suspended by pendant conductors, which ages ago was common.
Panel Meeting Action: Reject
Panel Statement: The current language in the Code clearly states that lampholders are not permitted in clothes closets. The substantiation is correct. Lampholders were never "fixtures" nor "lighting fixtures" and are not "luminaires."
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-59 Log #418 NEC-P18 **Final Action: Reject**
(410.8(D))

Submitter: Joseph Rossi, Township of Clinton
Recommendation: Add text to read as follows:
In kitchens, pantries, and storage areas:
a. Surface-mounted incandescent luminaries (fixtures) shall have a minimum clearance of 300 mm (12 in.) between the luminaries (fixture) and the nearest point of storage.
b. Surface-mounted fluorescent luminaries (fixtures) shall have a minimum clearance of 150 mm (6 in.) between the luminaries (fixture) and the nearest point of storage.
c. Recessed incandescent luminaries (fixtures) shall have a minimum clearance of 150 mm (6 in.) between the luminaries (fixture) and the nearest point of storage.
d. Recessed fluorescent luminaries (fixtures) shall have a minimum clearance of 150 mm (6 in.) between the luminaries (fixture) and the nearest point of storage.
Substantiation: On one inspection for a final of a new house, I opened a door in the kitchen that was obviously a storage closet. I looked up and saw a surface-mounted incandescent light 4 in. away from the top shelf. I began to write a violation when the electrician asked, "What code is violated." I stated, "410.8". The electrician pointed out to me that 410.8 is for clothes closets and this is a closet for pots and pans. I stated, "Suppose someone puts rags on the top shelf or buys a package of napkins, opens them, and places the remainder on the top shelf with the plastic wrap up against the light." After some discussion, I was forced to agree with him because the code clearly states clothes closets. Nowhere did I find in the NEC anything that prohibits construction of a light in a closet with distance limitation next to storage other than clothes. Therefore, in addition to luminaries location placing fixtures in kitchen pantries should be addressed.
Panel Meeting Action: Reject
Panel Statement: CMP-18 is not aware of any incidents of fire started by luminaires in storage closets. This was not the case with clothes closets. The substantiation provided no incident reports or data that a comparable hazard exists.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-60 Log #1352 NEC-P18 **Final Action: Accept in Principle**
(410.8(D))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Rewrite the text as follows:
(D) Location. The minimum clearance between luminaires installed in clothes closets and the nearest point of a storage space shall be as follows:
(1) 300 mm (12 in.) for surface-mounted incandescent luminaires installed on the wall above the door or on the ceiling
(2) 150 mm (6 in.) for surface-mounted fluorescent luminaires installed on the wall above the door or on the ceiling
(3) 150 mm (6 in.) for recessed incandescent luminaires installed in the wall or the ceiling
150 mm (6 in.) for recessed fluorescent luminaires installed in the wall or the ceiling.
Substantiation: The proposed wording does not change the existing wording's intent, but expresses it in a more concise, easier to understand style.
Panel Meeting Action: Accept in Principle
Revise the proposed text to read as follows:
(D) Location. The minimum clearance between luminaires installed in clothes closets and the nearest point of a storage space shall be as follows:
(1) 300 mm (12 in.) for surface-mounted incandescent or LED luminaires with a completely enclosed light source installed on the wall above the door or on the ceiling
(2) 150 mm (6 in.) for surface-mounted fluorescent luminaires installed on the wall above the door or on the ceiling
(3) 150 mm (6 in.) for recessed incandescent or LED luminaires with a completely enclosed light source installed in the wall or the ceiling
(4) 150 mm (6 in.) for recessed fluorescent luminaires installed in the wall or the ceiling.

Panel Statement: The panel agrees that the submitter has rewritten 410.8(D) into an easier to read format. The panel disagrees with the removal of "completely enclosed lamp" in 410.8(D)(1) & (3) and has included it. The panel has included (4) to complete the list. This action also includes recommendations from Proposal 18-61.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-61 Log #517 NEC-P18 **Final Action: Accept in Principle**
(410.8(D)(2) and (4))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read:
"...fluorescent <u>or LED</u> luminaires...".
Substantiation: The lesser clearances around fluorescent luminaires compared to incandescent are due to lower temperatures, hence lesser risk of combustion. This is at least as true around light-emitting diodes; fixtures based on them arguably require no clearance at all for such reasons.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on 18-60. The panel agrees that luminaires with LED light sources should be acknowledged in Section 410.8. The panel concludes that luminaires with LED light sources should comply with the current requirements for incandescent luminaires in closets because there are some LEDs that produce temperatures equivelant to incandescent lamps.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

Comment on Affirmative:

KEMPEL, K.: A point of clarification is in order. The Panel Statement implies that individual LEDs are capable of operating at temperatures equivalent to an incandescent lamp. This is a misstatement. It should state that there are LED luminaires with operating temperatures similar to incandescent luminaires. It is the external temperatures of the LED luminaire that are of concern not the operating temperature of the individual LED inside it.

18-62 Log #1401 NEC-P18 **Final Action: Reject**
(410.8(D)(5))

Submitter: George Stolz, II, Pierce, CO
Recommendation: Add new text to read:

<u>(D)(5) Lighting outlets blanked for future use installed in the wall or the ceiling, provided there is a minimum clearance of 450 mm (18 in.) between the lighting outlet and the nearest point of a storage space.</u>

Substantiation: Mistakes during layout result in light fixtures encroaching storage space. In many cases, the size of the luminaire to be installed is unknown to the electrician at rough-in, and to the inspector as well. Frequently, when the mistake is discovered at trim, these lighting outlets are blanked to pass inspection (as this section deals only with luminaires, with no restrictions on lighting outlets.) Adding this section will help to reduce illegal installations and ease the burden on electricians and inspectors under unending negative pressure from contractors.

It is highly likely that a homeowner will essentially be handed a fixture that they have purchased with their new home, but cannot be installed by a reputable electrician to code. The homeowner will most likely install the violating fixture in the absence of the AHJ and electrician. The blanked installation has a high potential for becoming the fire hazard that it was attempting to evade.

The header of 410.8 should be revised to “luminaires/lighting outlets in clothes closets” to reflect this change.

Panel Meeting Action: Reject

Panel Statement: This is an installation issue. Section 90.1(C) states that the Code is not a design or instruction manual.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-63 Log #1652 NEC-P18 **Final Action: Reject**
(410.8(D)(5) (New))

Submitter: John Steinke, Reno, NV
Recommendation: Add (5):

Specialty products, such as illuminated clothes rods, may be installed anywhere in the closet, as long as they are approved for the purpose, and installed in accordance with the manufacturers’ directiona and intent.

Substantiation: There are now illuminated rods made for closets. These rods cannot help but place the light closer to the clothing than 6 in.

There have also been additional developements in lighting, such as LEDs, that are not currently recognised by this section, yet may provide safe lighting.

Panel Meeting Action: Reject

Panel Statement: There currently are no tests in the luminaire standard, ANSI/UL 1598, that determine the suitability of a luminaire for use in a clothes closet.

Any luminaire installed in a clothes closet must comply with the installation criteria in 410.8(D).

Also see the panel statement on Proposal 18-56.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-64 Log #3260 NEC-P18 **Final Action: Reject**
(410.10)

Submitter: Mathew Scott, Brighton, MI
Recommendation: Revise text to read as follows:

Canopies and outlet boxes ~~taken~~ added together shall provide adequate space so that luminaire conductors and their connecting devices can be properly installed.

Substantiation: The canopie should be part of the volume required for conductors. Example: This would be necessary when a four inch round metal box that is one half inch deep is used which only has a 5.3 cubic inch capacity.

Panel Meeting Action: Reject

Panel Statement: The word “taken” indicates that the volume of the canopy is to be added to the volume of the outlet box. Therefore no change is needed.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-65 Log #1670 NEC-P18 **Final Action: Accept in Principle**
(410.10(B))

Submitter: Aleah Thompson, Lightolier / Rep. IESNA Museum & Art Gallery Lighting Committee
Recommendation: Revise text to read as follows:

410.101(B)

The connected load on lighting track shall not exceed the rating of the track. Lighting track shall be supplied by a branch circuit having a rating not more than that of the track. <u>The load calculation in 220.43(A) and (B) is not intended to limit the number of feet of track on a single branch circuit nor is it intended to limit the number of fixtures on an individual track.</u>

Substantiation: This is a companion proposal to one made to 220.43(B).

During the 1996 NEC code writing cycle, Code Making Panel 18 found it appropriate to add a FPN to clarify that the track lighting load value of 150VA for every 2 ft was intended solely for purposes of load calculation.

During the 1999 code cycle, the track lighting load value was moved from 410-102 to 220.43(B) in an effort to further clarify that the electrical load per length value applied during load calculation and did not limit the length of track that can be run or the number of fixtures allowed. At that time, the FPN specifically stating this was removed.

Unfortunately, the relocation of the track lighting load value in 220.43(B) has not prevented continued misinterpretation of the code. Many code users, including Authorities Having Jurisdiction as well as lighting professionals, continue to misinterpret the language in 220.43(B) as limiting the length of track that can be run or the number of fixtures allowed.

The addition of the proposed language to 410.101(B) and 220.43(B) would prevent any further misinterpretation, thereby, greatly improving the usability of the code.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Add the following FPN to 410.101(B) to read as follows:

The load calculation in 220.43(B) is not intended to limit the number of feet of track on a single branch circuit nor is it intended to limit the number of fixtures on an individual track.

Panel Statement: The wording as proposed is explanatory and therefore is not appropriate for mandatory text. CMP 18 therefore added the new text as FPN. Section 220.43(B) addresses feeder and service load calculations (and not branch circuit calculations) while Section 410.101(B) addresses connected load, which are two different subjects.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-65a Log #2921 NEC-P18 **Final Action: Reject**
(410.14(B))

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Revise as follows:

(B) Access to Boxes. Electric-discharge luminaires (fixtures) surface mounted over concealed, outlet, pull, or junction boxes and designed not to be supported solely by the outlet box shall be provided with suitable openings in the back of the luminaire (fixture) to provide access to the wiring in the box. <u>This opening shall be provided with an approved bushing or shall have smooth, well-rounded edges which cannot damage the conductors.</u>

Substantiation: Openings in surface mounted luminaires installed over concealed outlet, pull, or junction boxes are often made in the field with a knock-out puller or tin snips. These openings are rough at best and often dangerously sharp.

Panel Meeting Action: Reject

Panel Statement: The outlet box access opening must be provided as part of the listed luminaire. Field modification is not intended or permitted by Section 110.3(B).

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-66 Log #1116 NEC-P18 **Final Action: Reject**
(410.14(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete the word “concealed”.
Substantiation: Edit. The definition of concealed in Article 100 is “inaccessible”. 314.29 requires boxes to be accessible.

Panel Meeting Action: Reject

Panel Statement: The intent of the section is to apply to concealed boxes where the box is inaccessible except by removing the luminaire. Section 314.29 refers to the wiring being accessible in the box, not the box itself.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-67 Log #1133 NEC-P18 **Final Action: Reject**
(410.15(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "raintight" to "weatherproof."
Substantiation: Edit. The FPN to the definition of waterproof in Article 100 indicates "watertight" can be weatherproof where wetness, snow, ice, dust, or temperature extremes are not a factor. Most light poles are installed where these conditions are a factor.
Panel Meeting Action: Reject
Panel Statement: There is no technical substantiation to increase the level of protection for a wet location handhole cover.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-68 Log #479 NEC-P18 **Final Action: Reject**
(410.15(B)(1))

Submitter: Don A. Hursey, Durham County Inspections Department
Recommendation: Revise text to read:
A pole shall have handhole not less than 50 mm × 100 mm (2 in. × 4 in.) with a raintight cover to provide access to the supply terminations and wiring method within the pole or pole base.
Substantiation: Many times the raceway(s) are not accessible from the handhole. They are stubbed up short and not reachable from the handhole, therefore, making them inaccessible without removing the pole.
Panel Meeting Action: Reject
Panel Statement: Section 410.15(B)(1) applies when the pole is used as a raceway. The handhole is to allow access to the supply terminations. It does not require that accessibility to the conduit be provided.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-69 Log #1942 NEC-P18 **Final Action: Accept**
(410.15(B)(1))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise 410.15(B)(1) as follows:
410.15 Supports.
(B) Metal or Nonmetallic Poles Supporting Luminaires (Lighting Fixtures)
(1) A pole shall have a handhole not less than 50 mm x 100 mm (2 in. x 4 in.) with a ~~raintight~~ cover suitable for use in wet locations to provide access to the supply terminations within the pole or pole base.
Substantiation: The word "raintight" is not appropriate in this section. This application calls for the same degree of protection afford by a box or enclosure in any typical wet location. The word "raintight" in this paragraph provides no useful distinction from "wet location".
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-70 Log #836 NEC-P18 **Final Action: Accept in Principle**
(410.16(B))

Submitter: Stephen W. Drayton, Eastern Idaho Electrical JATC / Rep. IBEW Local 915, IAEI Southcoast Division
Recommendation: Renumber 410.16(B) and relocate as 410.14(C) in its present wording.
Substantiation: We contend that this statement is not properly located in Part IV - Luminaire (Fixture) Supports, and would be more logically located in Part III - Provisions at Luminaire (Fixture) Outlet Boxes, Canopies, and Pans. This change would make finding this information easier.
Panel Meeting Action: Accept in Principle
Relocate existing Code text from Section 410.16(B) to a new section within Article 410, Part I.
Panel Statement: The panel agrees with the submitter that relocating 410.16(B) will improve usability. The panel disagrees with the submitter's proposed relocation to a new Section 410.14(C) because this would restrict the requirement to electric discharge luminaires only and no substantiation to so limit the requirement has been provided. This is a general requirement and more appropriately belongs within Part I. In moving 410.16(B) the panel intends no substantative change in the requirement.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-71 Log #3466 NEC-P18 **Final Action: Reject**
(410.16(C))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:
410.16(C) Suspended Ceilings. Framing members...shall also be permitted. A lay-in luminaire shall not be required to be attached to the ceiling framing member if the luminaire is independently supported by dedicated support wires attached to the building structures.
Substantiation: It is necessary to include this new information to help the installer meet one set of rules and not two. The NEC should recognize that not all the lay-in luminaires are only supported by the ceiling grid itself.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide technical substantiation to support the recommendation as is required by 4-3.3(d) of the NFPA Regulations Governing Committee Projects. See www.nfpa.org.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-72 Log #1040 NEC-P18 **Final Action: Reject**
(410.17)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete, or revise as follows:
Luminaires (fixtures) and lighting equipment to ~~shall~~ be grounded shall be grounded as required ~~in Article 250 and~~ Part V of this article and in accordance with applicable provisions of this Code.
Substantiation: Edit. To comply with the Style Manual. 400.2 uses the phrase "applicable provisions". This is already covered by 90.3. Grounding requirements should also apply where grounding is done by choice and not required. 90.2(A)(3) covers installations required or not: 250.1(1) covers permitted grounding.
Panel Meeting Action: Reject
Panel Statement: The current language clearly and succinctly expresses the general requirement for grounding luminaires. The proposed wording does not improve upon it.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-73 Log #280 NEC-P18 **Final Action: Reject**
(410.22)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
"410.22 Luminaire (Fixture) Wiring — General. Wiring on or within fixtures shall be neatly arranged and shall not be exposed to ~~physical damage~~ crushing or abrasion...".
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
The proposed rewording is an attempt at precision. If you don't care to reword I would then argue that in that case the term "physical" should be eliminated. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code. The use of "physical damage" is in accordance with the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-74 Log #1660 NEC-P18 **Final Action: Reject**
(410.29)

Submitter: Thomas Al-Yasha, Thomas Electric
Recommendation: Individual showcases, other than fixed, shall be permitted to be connected by flexible cord to permanently installed GFCI receptacles,and groups of not more than six such showcases shall be permitted to be coupled together by a flexible cord and separable locking-type connectors with one of the group connected by flexible cord to a permanently installed GFCI protected receptacle.
The installation shall comply with 410.29(A) through (E).
Substantiation: The current method of branch circuit protection does not ensure the safety of customers, especially under damp or wet locations, those that would exist after rain or snow.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide technical substantiation to support the recommendation as is required by 4-3.3(d) of the NFPA Regulations Governing Committee Projects. See www.nfpa.org.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-75 Log #965 NEC-P18 **Final Action: Accept**
(410.29(C)(1))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change “mechanical” to “physical.”
Substantiation: Edit. Physical damage is the phrase usually used in this Code. Different terms for the same thing may cause confusion. 430.10(C)(2)(b) uses the term “physical damage.”
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-76 Log #279 NEC-P18 **Final Action: Reject**
(410.30(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
“410.30(B)...The cord shall not be subject to strain ~~or physical damage,~~ crushing, twisting or abrasion.. .”.
Substantiation: Use of the word “physical” is superfluous– the purpose is obvious. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary. Here, strain is a potential source of physical damage. If we’re concerned about others, let’s name them.
The proposed rewording is an attempt at precision. If you don’t care to reword I would then argue that in that case the term “physical” should be eliminated. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: The adjective “physical” is clearly understood and its deletion does not improve the readability of the Code. The use of “physical damage” is in accordance with the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-77 Log #278 NEC-P18 **Final Action: Reject**
(410.30(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
“410.30(C)...the cord shall not be subject to strain ~~or physical damage~~ , blows, or abrasion...”.
Substantiation: Use of the word “physical” is superfluous– the purpose is obvious. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary. Here, strain is a potential source of physical damage. If we’re concerned about others, let’s name them.
The proposed rewording is an attempt at precision. If you don’t care to reword I would then argue that in that case the term “physical” should be eliminated. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: The adjective “physical” is clearly understood and its deletion does not improve the readability of the Code. The use of “physical damage” is in accordance with the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-78 Log #3176 NEC-P18 **Final Action: Accept**
(410.30(C)(1)(2)(c))

Submitter: Michael S. O’Boyle, Lightolier Division of Genlyte Thomas Group
Recommendation: Revise text to read:
c. Is terminated in a grounding-type attachment plug cap or busway plug, or is a part of a listed assembly incorporating a manufactured wiring system connector in accordance with 604.6(C), or has a luminaire (fixture) assembly with a strain relief and canopy ~~.~~ , or has a luminaire (fixture) assembly with strain relief and canopy having a maximum 152 mm (6 in.) long section of raceway for attachment to an outlet box above a suspended ceiling .
Substantiation: Suspension systems used to support electric-discharge luminaires are sometimes attached to grid members of suspended ceilings. Such installations are very popular in office environments where end-to-end mounted fluorescent systems are installed to provide indirect lighting of the space. To allow the canopy assembly to be positioned symmetrically in line with the suspension hardware, the canopy needs to be mounted directly below a grid member. This is a problem because the ceiling grid member blocks placement of an outlet box flush with the ceiling surface. Running flexible cord unprotected through a hole in a suspended ceiling is clearly precluded by 400.8. A short length of raceway attached between a luminaire canopy and outlet box would allow placement of the box on top of the ceiling grid. The raceway would protect the cord above the ceiling line. Repositioning a ceiling panel would allow access to the outlet box. 400.8 allows flexible cord to be run in a raceway when specifically permitted elsewhere in the Code.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-79 Log #937 NEC-P18 **Final Action: Accept in Part**
(410.33)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:
FEEDER AND BRANCH CIRCUIT CONDUCTORS . Feeder and branch circuit conductors with 75 mm (3 in.) of a ballast shall have an insulation temperature rating not lower than 90°C (194°F) unless ~~supplying a~~ the ballast or luminaire (fixture) is listed and marked as suitable for a ~~different~~ lower insulation temperature rating or does not require a higher insulation temperature rating.
Substantiation: Edit. 410.31 permits luminaires (fixtures) to be used as a raceway, not limited to branch circuit conductors. Present wording seems to infer the ballast is an integral part of the fixture. And literally permits a remote ballast to have lower than 90°C rated supply conductors if the separate and remote fixture is listed and marked for a lower temperature rating. If product standards that address insulation temperature ratings are, totally sufficient this section is superfluous.
Panel Meeting Action: Accept in Part
Revise to read as follows:
FEEDER and BRANCH CIRCUIT CONDUCTORS . Feeder and branch circuit conductors within 75 mm (3 in.) of a ballast shall have an insulation temperature rating not lower than 90°C (194°F) unless supplying a luminaire (fixture) listed and marked as suitable for a different insulation temperature.
Panel Statement: The panel accepts the addition of “feeder and” being added to the title and the beginning of the first sentence. The panel accepted the substantiation that luminaires permitted to be used as a raceway could contain feeders. The panel does not accept the additional changes proposed because the language does not add clarity or additional safety.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-79a Log #CP1802 NEC-P18 **Final Action: Accept**
(410.35)

Submitter: Code-Making Panel 18,
Recommendation: Revise the text of 410.35(A) to read as follows:
(A)Marking. All luminaires shall be marked with the maximum lamp wattage or electrical rating, manufacturer's name, trademark, or other suitable means of identification. A luminaire requiring supply wire rated higher than 60°C (140°F) shall be marked with the minimum supply wire temperature rating on the luminaire and shipping carton or equivalent.
Substantiation: The current wording of Section 410.35(A) includes a minimum letter height for the supply wire marking required on all luminaires requiring supply wire with an insulation temperature rating greater than 60°C. Clause 6.15.1.5 and Table 20.1.1, Item 1.1, in the safety Standard for Luminaires, ANSI/UL 1598 address the same issues. However, the minimum letter height for the supply wire marking differs between the two documents. Letter height is one factor to be considered when judging the legibility of a marking. The producers, installers, consumers and AHJ's involved in the ANSI approved consensus process used to develop ANSI/UL 1598 reached consensus agreement that specifying the letter font is equally important They also determined that markings in a specific font but smaller letters are equally readable and effective. For this reason, the trinational luminaire standard, ANSI/UL 1598, since its publication in 2000 specifies both minimum letter height and font for all required markings.
Compliance with marking letter height requirements are most effectively dealt with by the luminaire producer and safety certifier during the design and production of a luminaire, before it arrives at the installation site. They have the proper measuring tools and the resources required to resolve any compliance issues at hand.
Sections 90.7 and 110.3 (A)(1) of the 2005NEC authorize an AHJ to accept properly listed equipment without examining it in order to, "…avoid the necessity for repetition of examinations by different examiners, frequently with inadequate facilities for such work, and the confusion that would result from conflicting reports on the suitability of devices and materials examined for a given purpose." The Code recognizes the difficulties and problems associated with evaluating electrical equipment in the field. Removing the letter height specification in Section 410.35(A) supports these Code Sections and this basic NEC philosophy.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CARPENTER, F.: The substantiation for eliminating the minimum letter height of this marking because the visibility requirements are already addressed in the listing standard is only valid if all luminaires are required to be listed. Currently, the Code does not require listing of all luminaires. If Proposal 18-40a becomes accepted throughout the code revision process, then this proposal (18-79a) would be acceptable. However, since NEMA is voting against Proposal 18-40a, we must also vote against this proposal because it doesn't address unlisted luminaires.

18-80 Log #2295 NEC-P18 **Final Action: Reject**
(410.35(A))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Delete second sentence.
Substantiation: See statement for 410.36
All this second sentence does is to provide liability cover for the luminaire manufacturer. The average homeowner does not read or understand this information.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 18-82. Additionally, the panel does not agree with the claims that the second sentence provides liability coverage for the luminaire manufacturer and that the markings aren't understood.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-81 Log #277 NEC-P18 **Final Action: Reject**
(410.36)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
410.36 "... Wiring compartments, including their entrances, shall be such that conductors may be drawn in and withdrawn without ~~physical~~ damage."
Substantiation: Use of the word "physical" is superfluous – the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code. The use of "physical damage" is in accordance with the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-82 Log #2294 NEC-P18 **Final Action: Reject**
(410.36)

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Add: Luminaires shall be designed and assembled so as to limit the temperature at the branch-circuit conductors to not more than 60 degrees C (140 degrees F).
Substantiation: When I started as an Inspector with the Fire Underwriters in 1948 one of the field concerns I was warned about was the surface mounted enclosed incandescent drum-type fixture that were considered a fire hazard. We saw fixtures that got so hot that the glass shattered. We would only accept these fixtures if a spacer was installed to provide an air gap between the fixture and the ceiling. Soon fixtures were appearing with built-in spacers and then an additional pad of insulating material came with the fixture. The fixtures came with lamp stops which limited the wattage of the bulb as bulbs size varied with wattage. The stops proved ineffective as the bulb size became more uniform. The result is that these fixtures have been destroying branch circuit conductor insulation for half a century and the industry response has been to provide a warning label per 410.35(A) THESE FIXTURES ARE NOT INSTALLED IN THE EXPENSIVE HOMES THAT I SEE, THEY ARE BOUGHT AND INSTALLED IN POOR PEOPLE'S HOMES AND MAYBE BY PEOPLE THAT DON'T HAVE A GOOD UNDERSTANDING OF ENGLISH. WE CAN DO BETTER.
Panel Meeting Action: Reject
Panel Statement: Substantial changes have been made to the safety standards for luminaires over the past 60 years. The submitter has provided no data to substantiate his claim that the current practice has been destroying branch circuit insulation. Additionally, the supply wiring used in new construction is rated greater than 60 degrees C; therefore, limiting luminaires to 60 degrees C in all applications cannot be justified.
Luminaire labeling requirements have recently been revised to simplify and better convey the important wattage limitation information. These lamp wattage markings now employ an internationally agreed upon nomenclature that does not require an understanding of English.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-83 Log #2133 NEC-P18 **Final Action: Accept**
(410.45)

Submitter: Russell LeBlanc, Peterson School of Engineering
Recommendation: Change the word "grounds" to the words <u>ground faults as defined in 250.2.</u>
Substantiation: Removing required "grounds" would be dangerous if the intent of this requirement is misunderstood. This will make it very clear as to the intent of this requirement.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-84 Log #936 NEC-P18 **Final Action: Reject**
(410.46)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete present wording and substitute:
Conductor terminals for lampholders of a nonmetallic fixture designed for surface mounting on an outlet box shall be recessed and not less than 13 mm (1/2 in.) from the mounting plane of the fixture.
Substantiation: The designation "porcelain" infers this section is intended to apply to the ubiquitous lampholder part of a base, intended for surface mounting on an outlet box, which may be metal, which may have an integral switch or receptacle. These are not "luminaries" per definition since they have no provisions for positioning or protecting the lamp. They are also made of plastic, which is not addressed. They are designated "lampholders" by the manufacturers. 410.12 appears to recognize this type of lighting fixture. The title of this article includes lamphodlers, which includes this type sign

receptacles, and flood light type lampholders, none of which meet the definition of luminaire. Live parts (connection terminals) have to be located where wires can contact them. This section is a design specification and such requirements should be covered by other agencies (90.1(C)).
Panel Meeting Action: Reject
Panel Statement: Article 410, Part VII applies to luminaires not to lampholders which are covered in the Article 410, Part VIII. There are porcelain luminaires manufactured. This section does not apply to the ubiquitous lampholder.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-85 Log #1750 NEC-P18 **Final Action: Reject**
(410.47)

Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Revise text to read as follows:
410.47 Screw-Shell Type. Lampholders of the screw-shell type shall be installed for use as lampholders only. Where supplied by a circuit having a grounded conductor, the grounded conductor shall be connected to the screw shell. Listed 125V lampholder-to-receptacle outlet adapters shall be permitted for temporary, non-continuous use.
Substantiation: These lampholder-to-outlet adapters have had a long history of use without any evidence of field problems, yet their installation conflicts with 410.47 "lampholders of the screw-shell type shall be installed for use as lampholders only". The adapters are used to supply temporary power during maintenance operations, supplying power to tools, droplights, and the like. They are rated 125, 660W.
Their use dates back before the 410.47 requirements were added to the NEC in 1937. Prior to this date lampholder-to-outlet adapters were installed as a substitute for general use receptacles. The rationale for the 410.47 requirements from the 1937 NEC Handbook alludes to this:
"Where an outlet is intended for the connection of portable lighting equipment or appliances, it must not be fitted with a screw-shell type receptacle, as these devices are unsuitable for such use and when so used are hazardous."
Later NEC Handbooks clarifies the original rationale; per the 2005 NEC Handbook.
"Many years ago it was common practice to install screw-shell lampholders with screw shell adapters in baseboards and walls to connect cord-connecting appliances and lighting equipment. This now prohibited practice permitted exposing live parts to be contacted by persons when the adapters were removed. See 406.2(B) for permitted uses of receptacles."
As these adapters would currently be installed in a ceiling or wall mounted lampholder, high and out of the reach of small children, the risk of shock during insertion and removal is no greater than that of a lamp. While lampholder-to-outlet adapters should not be used as a substitute for general use receptacles, they do have a legitimate use as a temporary power tap for maintenance where other sources of power are not convenient or available.
Panel Meeting Action: Reject
Panel Statement: Providing temporary power via a lampholder is to provide it without an equipment grounding conductor. This is the obvious safety hazard that this proposal would permit.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
KEMPEL, K.: The panel action and substantiation does not adequately address the use with non-grounded products or double-insulated products. It also does not clarify the panel's position on the use of these devices.

18-86 Log #3218 NEC-P18 **Final Action: Reject**
(410.66(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Add text to read as follows:
"Ceiling penetrations by recessed lights shall be treated as outlet boxes for the purpose of applying 314.20 and 314.21."
Substantiation: Penetrations for these installations appear to compromise a fire barrier similarly. If the purpose of the Section 314 requirements is solely to contain sources of ignition within outlet boxes, this proposal is inappropriate. However, if they also have the purpose of maintaining the fire rating of a ceiling or wall, on the grounds that a cover plate is not sufficient to restore the barrier between the room and the inside of the wall or ceiling, then they should apply as well to rough-in kits, as there is no reason to presume that trim kits serve any better than cover plates to restore the barrier between the room and the inside of the ceiling.
Panel Meeting Action: Reject
Panel Statement: The purpose of the requirements of Article 314 is to contain sources of ignition within outlet boxes. Fire ratings are based on building construction assemblies that comply with the test criteria of ANSI/UL263 (ASTM E119 and NFPA 251). Published classifications of tested building constructions incorporate a detailed description of the assembly that complied with the test criteria. These descriptions may include generic types of luminaires that are allowed to be part of the fire rated construction. The luminaire standard contains mechanical requirements that allow any listed luminaire of the specified generic type to be used in the fire rated construction in accordance with the provisions included in the description. There are also luminaires and luminaire assemblies that have been subjected to testing and are classified for broad ranges of fire rated designs.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-87 Log #2132 NEC-P18 **Final Action: Accept**
(410.73(A))

Submitter: Russell LeBlanc, Peterson School of Engineering
Recommendation: Change the word "intended" to the word "identified."
Substantiation: The intent of wording is unclear. This will clarify what is required.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-88 Log #2320 NEC-P18 **Final Action: Reject**
(410.73(A))

Submitter: Jimmie Evanisko, National Cathode Corporation
Recommendation: Revise text to read:
(A) Open-circuit Voltage of 1000 Volts or Less. Equipment for use with high mA cathode electric discharge lighting systems and designed for an open-circuit voltage of 1000 volts or less shall be of a type intended for such service.
Substantiation: Over the past few years and the recent IEC proposal #60958-2-27 34/D 843/CD, the lighting consultants, architects, engineers and myself have seen an unbelievable amount of miniature fluorescent used in displays, computers, LCD backlights and neon power sources with very low mA current markings being marketed as cold cathode components which contradicts UL, CSA, NEC, 410.73 through 410.87 and does not fall into the scope of electric signs or outline lighting in Article 100 Definitions.
To substantiate please review the IESNA 8th edition pages 203, 205, 206, and 307, IESNA 9th edition pages 6-21, 6-26, 6-27, 6-29, 6-30, 6-41, and 6-42 which both describe in depth the definition of cold cathode as the IESNA has described in all of their previous editions since 1948.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Accepting this proposal would limit the entire Section of 410.73 to high mA cathode electric discharge lighting systems and eliminate coverage of any other electric discharge lighting systems of 1000 volts or less. The panel does not accept restricting electric discharge lighting of 1000 volts or less to a single product.
In addition, Part XIII of Article 410 is not intended to address the installation of electric discharge lighting in appliances. The rules in Part XIII provide guidance for safe installations of electric discharge lighting that qualifies based on the maximum limits specified. No safety reason is given for excluding electric discharge lighting systems that operate below the specified maximums.
The IEC proposal referenced in the substantiation is subject to change. Also, it does not contain a definition for high mA cathode / HMC.
How products are marketed is not valid substantiation to change a safety standard.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-89 Log #996 NEC-P18 **Final Action: Reject**
(410.73(F)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add "or masonry or tile construciton units".
Substantiation: This provision should also be suitable for fixtures installed in brick, block, or tile.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide technical substantiation to support the recommendation as is required by 4-3.3(d) of the NFPA Regulations Governing Committee Projects. See www.nfpa.org.
The substantiation failed to provide any reason why non-thermally protected luminaires should be permitted in masonry or tile construction units.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-90 Log #1081 NEC-P18 **Final Action: Reject**
(410.73(F)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
Add "masonry or tile units" between "installed" and "poured".
Substantiation: Edit. This provision should also apply to fixtures installed in concrete or tile block construction.

Panel Meeting Action: Reject
Panel Statement: The substantiation failed to provide any reason why non-thermally protected luminaires should be permitted in masonry or tile units.
The submitter did not provide technical substantiation to support the recommendation as is required by 4-3.3(d) of the NFPA Regulations Governing Committee Projects. See www.nfpa.org.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-90a Log #CP1801 NEC-P18 **Final Action: Accept**
(410.73(F)(5), FPN)

Submitter: Code-Making Panel 18,
Recommendation: Revise FPN to read as follows:
FPN: See ANSI Standard ~~C78.387~~ C78.389 , *American National Standard for Electric Lamps — ~~Metal Halide Lamps~~* , *High intensity Discharge* , Methods of Measuring Characteristics.
Substantiation: ANSI Standard C78.387 no longer exists. Standard C78.387 has been combined with standards C78.386 and C78.388 into new ANSI standard C78.389; therefore, the reference needs to be updated.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-90b Log #CP1803 NEC-P18 **Final Action: Accept**
(410.73(G))

Submitter: Code-Making Panel 18,
Recommendation: Modify Section 410.73(G) to read as follows:
(G) Disconnecting Means. In indoor locations, other than dwellings and assorted accessory structures, fluorescent luminaires that utilize double ended lamps and contain ballast that can be serviced in place, shall have a disconnecting means either internal or external to each luminaire. When connected to multiwire branch circuits, the disconnect shall simultaneously break all the supply conductors of the ballast, including the grounded conductor. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. Where the disconnecting means is external to the luminaire it shall be a single device, located in sight of the luminaire.
Existing five exceptions to remain as written in the 2005 NEC
Substantiation: The Panel has reviewed Proposals 18-91 through 18-96 and combined the acceptable concepts to create the text. These concepts include removal of the effective date, disconnecting the grounded conductor only on multiwire-branch circuits, location of external disconnect and clarification that the rule applies only to double-ended fluorescent luminaires.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
BER, M.: The final wording of this proposal was mistakenly changed to read: "(G) Disconnecting Means. In indoor locations, other than dwellings and *assorted* accessory structures...". When it should read: "(G) Disconnecting Means. In indoor locations, other than dwellings and *associated* accessory structures...". It was never the intent of the panel to change this word from that used in the 2005 NEC.
CARPENTER, F.: NEMA supports this proposal, but does not agree with the use of the word "assorted" in the first sentence. We believe that this was an inadvertent change by the panel, and recommend reverting to the word "associated" that was used in the 2005 NEC. Additionally, in the first sentence the words "double ended" should be changed to "double-ended", and the word "ballast" should be changed to "ballast(s)" to remain consistent with the previous code language and to clarify that a luminaire may contain more than one ballast.
COSTELLO, P.: The word "assorted" is a misprint in the panel proposal and should read with the current word "associated" accessory structure. Upon closer review of this section, CMP 18 needs to be reminded that 410.73(G) had the support of the electrical section and passed overwhelmingly on the floor of the 2005 NFPA Convention. While this committee proposal addresses some needed clarification, it is a mistake to remove multiwire branch circuits supplying luminaires that are not double ended. The same hazards exist on all multiwire branch circuits whether the luminaries are serviced in place or taken down for service. On multiwire branch circuits, there is a possibility that an open neutral condition could be introduced while servicing the luminaries, this causes a dangerous over voltage condition to the remaining circuit as well as a hazard to the qualified person servicing the luminary. This rule needs to apply to all luminaries on multiwire branch circuits.
KEMPEL, K.: My records indicate the word "assorted" in the first sentence is incorrect in panel proposal 18-90b; it should be "associated".
LARSON, S.: During deliberations to modify 410.73(G), the panel incorrectly inserted the word "assorted" in the first sentence. The word should have been "associated".
O'BOYLE, M.: Word "associated" in first sentence is not correct, it should be "associated".
OWENS, T.: There is a typographical error in the wording of CMP 18's recommendation. The word "assorted" should be "associated" in the first sentence. The first part of the sentence should read "In indoor locations, other than dwellings and associated accessary structures...".
SMITH, M.: Vote to accept this proposal with comment below:
An error was made in the text. My records indicate the word "assorted" is incorrect in the panel proposal and that it must be changed to "associated"...
(G) Disconnecting Means. In indoor locations, other than dwellings and ~~assorted~~ associated accessory structures, fluorescent luminaires that utilize double ended lamps and contain ballast that can be serviced in place, shall have a disconnecting means either internal or external to each luminaire.
WALL, C.: My records indicate the word "assorted" in the first line of panel proposal 18-90b is incorrect and that it needs to be changed to "associated". This line should read: "(G) Disconnecting Means. In indoor locations, other than dwellings and associated accessory structures...".
WRIGHT, R.: I agree with accepting the proposal and replacing the word ~~assorted~~ with associated .

18-91 Log #489 NEC-P18 **Final Action: Accept in Principle in Part**
(410.73(G))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(G) Disconnecting Means. In indoor locations, other than dwellings and associated accessory structures, fluorescent luminaires (fixtures) that utilize double-ended lamps and contain ballast(s) that can be serviced in place or ballasted luminaires that are supplied from multiwire branch circuits and contain ballast(s) that can be serviced in place shall have a disconnecting means either internal or external to each luminaire (fixture), to disconnect simultaneously from the source of supply all conductors of the ballast, including the grounded conductor if any. The line side terminals of ~~the~~ a disconnecting means internal to the luminaires (light fixtures) shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. Where the disconnecting means is external to the luminaire (light fixture) it shall be located immediately adjacent to and readily accessible from the luminaire (light fixture). ~~This requirement shall become effective January 1, 2008.~~
Substantiation: The new requirement accepted in the 2005 NEC falls short of providing specific direction about the location of the service disconnect when it is external to the luminaire (light fixture). Since it is important that this disconnect be located so ready operation can be accomplished without coming off a ladder to shut a circuit off, this proposed text will provide installers and enforcement with additional needed clarity that addresses the location of the external disconnect to effectively and consistently be able to apply it in the field. Disconnecting means located external to the luminaire (fixture) should not be required to have their terminals guarded because they are outside of the luminaire (light fixture) to be serviced.
Panel Meeting Action: Accept in Principle in Part
Panel Statement: The panel agreed in principle with the concept of the removal of the effective date and the need to clarify the location of an external disconnect.
The panel rejected the concept that an external disconnect did not require guarding and that the location of the external disconnect be immediately adjacent to and readily accessible from the luminaire.
See panel action and statement on Proposal 18-90b (Log # CP1803).
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-92 Log #2924 NEC-P18 **Final Action: Accept in Part**
(410.73(G))

Submitter: Frederick L. Carpenter, Lithonia Lighting
Recommendation: Revise 410.73(G) as shown below:
(G) Disconnecting Means. In indoor locations, other than dwellings and associated accessory structures, fluorescent luminaires (fixtures) that utilize double ended lamps and contain ballast(s) that can be serviced in place ~~or ballasted luminaires that are supplied from multiwire branch circuits and contain ballast(s) that can be serviced in place~~ and installed on branch circuits with voltages exceeding 150 volts-to-ground shall have a disconnecting means either internal or external to each luminaire (fixture), to disconnect simultaneously from the source of supply all conductors of the ballast, including the grounded conductor if any. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. ~~This requirement shall become effective January 1, 2008.~~
Substantiation: When 410.73(G) was added during the previous code cycle, no data was presented to show that 120 volt single phase circuits were a problem. Since then, field data regarding incidents has been presented to the Canadian Electrical Code Part 1 Committee which has led them to adopt a change only for systems over 150 volts-to-ground. Additionally, the need to disconnect the grounded conductor on a 120v single phase system cannot be substantiated. The last sentence, establishing an effective date, is no longer needed.

Panel Meeting Action: Accept in Part
The panel accepts the deletion of the effective date, and rejects the concept of excluding luminaires operating at less than 150 volts.
Panel Statement: The submitter offers no technical substantiation for proposed exclusion of luminaires operating at less that 150 volts.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CARPENTER, F.: NEMA supports the action taken by the panel on Proposal 18-90b to clarify the intent of section 410.73(G); however, we disagree with the conclusion that no technical substantiation was presented with this proposal to support the exclusion of luinaires operating at less than 150 volts. The introduction of this section of the code in the 2005 NEC was based on anecdotal reports of shock incidents and did not include any data that supported the adoption of the requirement for all supply voltages. The only incident data of which we are aware is the data that has been collected in recent years by the Electrical Safety Authority in Ontario, Canada. This data supports the exclusion of luminaires installed on circuits operating at less than 150 volts-to-ground.
Comment on Affirmative:
O'BOYLE, M.: As a function of magnitude, voltages below 150V present a lower level of risk than those exceeding 150V. The Canadian Electric Code action level of 150V is based on empirical data recorded in Canada. I agree that such data needs to be reviewed, and a technical substantiation be presented, before this change may be accepted.

18-93 Log #3177 NEC-P18 **Final Action: Accept**
(410.73(G))

Submitter: Michael S. O'Boyle, Lightolier Division of Genlyte Thomas Group
Recommendation: Revise text to read:
(G) Disconnecting Means. In indoor locations, other than dwellings and associated structures, fluorescent luminaires (fixtures) that utilize double-ended lamps and contain ballast(s) that can be serviced in place or ballasted luminaires that are supplied from multiwire branch circuits and contain ballast(s) that can be serviced in place shall have a disconnecting means either internal or external to each luminaire (fixture) . ~~, to disconnect simultaneously from the source of supply all conductors of the ballast, including the grounded conductor if any.~~ When connected to multiwire branch circuits, the disconnect shall simultaneously break all supply conductors of the ballast, including the grounded conductor. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. This requirement shall become effective January 1, 2008.
Substantiation: Since the grounded conductor of a 2-wire branch circuit does not pose a risk of electric shock, there is no reason to require it to be simultaneously disconnected.
Panel Meeting Action: Accept
Panel Statement: See panel action and statement on Proposal 18-90b (Log #CP1803).
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-94 Log #3178 NEC-P18 **Final Action: Reject**
(410.73(G))

Submitter: Michael S. O'Boyle, Lightolier Division of Genlyte Thomas Group
Recommendation: Revise text to read:
(G) Disconnecting Means. In indoor locations, other than dwellings and associated structures, fluorescent luminaires (fixtures) that utilize double-ended lamps and contain ballast(s) that can be serviced in place ~~or ballasted luminaires that are supplied from multiwire branch circuits and contain ballast(s) that can be serviced in place~~ and have input over 150V to ground shall have a disconnecting means either internal or external to each luminaire (fixture), to disconnect simultaneously from the source of supply all conductors of the ballast, including the grounded conductor if any. The line side terminals of the disconnecting means shall be guarded. The disconnecting means shall be located so as to be accessible to qualified persons before servicing or maintaining the ballast. This requirement shall become effective January 1, 2008.
Substantiation: The Canadian Electric Code is expected to adopt a similar requirement that establishes a 150V action level for disconnect protection based on empirical field data. No empirical data has been presented showing that 120V single phase circuits have been an issue.
Panel Meeting Action: Reject
Panel Statement: The panel rejects the concept of excluding luminaires operating at less than 150 volts since there was no technical substantiation submitted for the change.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CARPENTER, F.: See my Explanation of Negative Vote on Proposal 18-92.
Comment on Affirmative:
O'BOYLE, M.: As a function of magnitude, voltages below 150V present a lower level of risk than those exceeding 150V. The Canadian Electric Code action level of 150V is based on empirical data recorded in Canada. I agree that such data needs to be reviewed, and a technical substantiation be presented, before this change may be accepted.

18-95 Log #1740 NEC-P18 **Final Action: Reject**
(410.73(G) Exception No. 4)

Submitter: Jeffrey Roche, Kenall Manufacturing Co.
Recommendation: Revise text to read as follows:
410.73(G) Exception No. 4: A disconnecting means shall not be required ~~in industrial establishments with restricted public access~~ where the AHJ can verify that the conditions of maintenance and supervision ensure that only qualified persons service the installation by written procedures.
Substantiation: New Section 410.73(G) states in the first sentence that this section applies to indoor locations that are NOT dwellings or associated structures. The requirement can be met by either a luminaire construction that contains an internal disconnecting means or by a wiring method that allows a 2 pole switch to disconnect power to the luminaire. Dwellings are defined in Article 100, so by excluding dwellings, all other buildings are included. Exception No. 4 is directed only to "industrial establishments" but Article 100 does not have a definition for "industrial establishments." There are 2 ways to meet the requirement, and because this is an installation/maintenance requirement and not a luminaire construction requirement, luminaire manufacturers will not be required to incorporate a disconnect means into luninaires. Compliance will be determined by the AHJ and rather than having the AHJ define an "industrial establishment", and limiting the exception to "industrial establishments", I suggest removing that terminology. As reworded, the AHJ has the authority to use the exception in any non-dwelling application that has qualified maintenance personnel with written maintenance procedures.
Panel Meeting Action: Reject
Panel Statement: The panel rejects the submitter's opinion that the term "industrial establishments" is an undefined or unrecognized term. This term is used extensively (33 other times) throughout the NEC.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-96 Log #2928 NEC-P18 **Final Action: Accept in Principle**
(410.73(G) Exception No. 5)

Submitter: Frederick L. Carpenter, Lithonia Lighting
Recommendation: Add the sentence: "The locally accessible disconnects do not need to disconnect the grounded conductor." to the end of Exception No. 5 to 410.73(G). The exception would read as follows:
Where more than one luminaire is installed and supplied by other than a multiwire branch circuit, a disconnecting means shall not be required for every luminaire when the design of the installation includes locally accessible disconnects, such that the illuminated space cannot be left in total darkness. The locally accessible disconnects do not need to disconnect the grounded conductor."
Substantiation: The current wording is unclear. The exception could be incorrectly interpreted as implying that the locally accessible disconnects do not have to be on every luminaire, but do need to disconnect the grounded conductor. The intent should be clarified by incorporating this additional sentence.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 18-90b (Log #CP 1803).
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-97 Log #1737 NEC-P18 **Final Action: Reject**
(410.73(H))

Submitter: Michael Thornburg, Thornburg Electric
Recommendation: Install inline fuse protection for all ballast units from the factory.
Substantiation: Even though most florescent ballast have overload protection, they may be on the same circuit as other fixtures, making it hard to trace when one fails.
As Chief Engineer with the Owosso Township Fire Department for 31 years, I have been on many alarms where the building has been evacuated due to the smell of a burnt ballast, even though the bulbs were still lit.
I have had several municipal street light projects where power was ran several hundred feet and fused at 60 amps for a 2 amp ballast. We always wire in fuses at the base of the pole to prevent ballast from burning before it would/could trip an over current device.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide proposed text in the recommendation as is required by 4-3.3(c) of the NFPA Regulations Governing Committee Projects. See www.nfpa.org.

The submitter described incidents that do not appear to present hazards. Product safety standards require ballasts to have suitable enclosures to contain the arcing that might accompany ballast failure.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-98 Log #2319 NEC-P18 **Final Action: Reject**
(410, Part XIV)

Submitter: Jimmie Evanisko, National Cathode Corporation
Recommendation: Revise text to read:
XIV. Special provisions for <u>high mA cathode</u> electric-discharge lighting systems of more than 1000 volts.
Substantiation: Over the past few years and the recent IEC proposal #60958-2-27 34/D 843/CD, the lighting consultants, architects, engineers and myself have seen an unbelievable amount of miniature fluorescent used in displays, computers, LCD backlights and neon power sources with very low mA current markings being marketed as cold cathode components which contradicts UL, CSA, NEC, 410.73 through 410.87 and does not fall into the scope of electric signs or outline lighting in Article 100 Definitions.
To substantiate please review the IESNA 8th edition pages 203, 205, 206, and 307, IESNA 9th edition pages 6-21, 6-26, 6-27, 6-29, 6-30, 6-41, and 6-42 which both describe in depth the definition of cold cathode as the IESNA has described in all of their previous editions since 1948.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Accepting this proposal would limit Part XIV of Article 410 to high mA cathode electric discharge lighting systems and eliminate coverage of any other electric discharge lighting systems over 1000 volts. The panel does not accept restricting electric discharge lighting over 1000 volts to a single product.
In addition, Part XIV of Article 410 is not intended to address the installation of electric discharge lighting in appliances. The rules in Part XIV provide guidance for safe installations of electric discharge lighting that qualifies based on the limits specified. No safety reason is given for excluding electric discharge lighting systems that operate within the limitations.
The IEC proposal referenced in the substantiation is subject to change. Also, it does not contain a definition for high mA cathode / HMC.
How products are marketed is not valid substantiation to change a safety standard.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-99 Log #2321 NEC-P18 **Final Action: Reject**
(410.80(A))

Submitter: Jimmie Evanisko, National Cathode Corporation
Recommendation: Revise text to read:
(A) Listing. <u>High mA cathode</u> electric-discharge lighting systems with an open-circuit voltage exceeding 1000 volts shall be listed and installed in conformance with that listing.
Substantiation: Over the past few years and the recent IEC proposal #60958-2-27 34/D 843/CD, the lighting consultants, architects, engineers and myself have seen an unbelievable amount of miniature fluorescent used in displays, computers, lCD backlights and neon power sources with very low mA current markings being marketed as cold cathode components which contradicts UL, CSA, NEC, Article 410, 73 through 410.87 and does not fall into the scope of electric signs or outline lighting in Article 100 Definitions.
To substantiate please review the IESNA 8th edition pages 203, 205, 206, and 307, IESNA 9th edition pages 6-21, 6-26, 6-27, 6-29, 6-30, 6-41, and 6-42 which both describe in depth the definition of cold cathode as the IESNA has described in all of their previous editions since 1948.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Accepting this proposal would limit Section 410.80 to high mA cathode electric discharge lighting systems and eliminate the listing requirement of any other electric discharge lighting systems over 1000 volts. The panel does not accept restricting the listing requirement of electric discharge lighting over 1000 volts to a single product.
In addition, Part XIV of Article 410 is not intended to address the installation of electric discharge lighting in appliances. The rules in Part XIV provide guidance for safe installations of electric discharge lighting that qualifies based on the limits specified. No safety reason is given for excluding electric discharge lighting systems that operate within the limitations.
The IEC proposal referenced in the substantiation is subject to change. Also, it does not contain a definition for high mA cathode / HMC.
How products are marketed is not valid substantiation to change a safety standard.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-100 Log #486 NEC-P18 **Final Action: Accept**
(410.81(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(B) Within Sight or Locked Type. The switch or circuit breaker shall be located within sight from the luminaires (fixtures) or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position. <u>The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</u>
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-101 Log #2318 NEC-P18 **Final Action: Reject**
(410.83(C))

Submitter: Jimmie Evanisko, National Cathode Corporation
Recommendation: Revise text to read:
(C) Ratings. Transformers shall have a secondary short-circuit current rating of not more than ~~150 mA~~ (120 mA) if the open-circuit voltage is over 7500 volts, and not more than 300 mA if the open-circuit voltage rating is 7500 volts or less.
Substantiation: Over the past few years and the recent IEC proposal #60958-2-27 34/D 843/CD, the lighting consultants, architects, engineers and myself have seen an unbelievable amount of miniature fluorescent used in displays, computers, LCD backlights and neon power sources with very low mA current markings being marketed as cold cathode components which contradicts UL, CSA, NEC, 410.73 through 410.87 and does not fall into the scope of electric signs or outline lighting in Article 100 Definitions.
To substantiate please review the IESNA 8th edition pages 203, 205, 206, and 307, IESNA 9th edition pages 6-21, 6-26, 6-27, 6-29, 6-30, 6-41, and 6-42 which both describe in depth the definition of cold cathode as the IESNA has described in all of their previous editions since 1948.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Part XIV of Article 410 is not intended to address the installation of electric discharge lighting in appliances. The rules in Part XIV provide guidance for safe installations of electric discharge lighting that qualifies based on the limits specified. No safety reason is given for lowering the current rating.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-102 Log #276 NEC-P18 **Final Action: Reject**
(410.85)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
410.85 Exposure to Damage. Lamps shall not be located where normally exposed to ~~physical~~ damage."
Substantiation: Use of the word "physical" is superfluous.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code. The use of "physical damage" is in accordance with the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-103 Log #584 NEC-P18 **Final Action: Accept in Principle**
(410.101(B))

Submitter: Robert Pittman, Sacramento Engineering Consultants
Recommendation: Add new text to read:
(B) CONNECTED LOAD. The connected load on lighting track shall;
(1) Not exceed the rating of the track. Lighting track shall be supplied by a branch circuit having a rating not more than that of the track.
(2) The branch circuit load shall be calculated base on track fittings used. The track length does not enter into the branch-circuit calculation.
Substantiation: The deletion of the FPN from the 1996 NEC 410-102 has led to the limit of 24 ft of track per circuit based on 150 VA per 2 ft. It needs to be clear in the text of the code that 220.43(B) applies only to Feeder and Service Load Calculations and not to the branch circuit. FPN is not sufficient as this is not an enforceable part of the code. And the Handbook text is even less applicable because most do not see that.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 18-65.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-104 Log #275 NEC-P18 **Final Action: Reject**
(410.101(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) Where likely to be subjected to ~~physical damage~~ blows and abrasion ...
(8) Less than 1.5 m (5 ft) above the finished floor except where protected from ~~physical damage~~ blows and abrasion.
Substantiation: Use of the word "physical" generally is superfluous – the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Here, though, items (2) and (3), for example, refer to sources of physical damage. The proposed rewording is an attempt at precision. If you don't care to reword, I would argue that the term "physical" should be eliminated. Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the adjective of your choice.)
Panel Meeting Action: Reject
Panel Statement: The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code. The use of "physical damage" is in accordance with the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 411 — LIGHTING SYSTEMS OPERATING AT 30 VOLTS OR LESS

18-105 Log #2711 NEC-P18 **Final Action: Accept**
(411.2. Lighting Systems Operating at 30 Vols or Less)

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
411.2 Definitions.
~~Lighting Systems Operating at 30 Volts or Less. A lighting system consisting of an isolating power supply operating at 30 volts 942.4 volts peak) or less under any load condition, with one or more secondary circuits, each limited to 25-amperes maximum, and associated equipment each identified for the use.~~
Lighting Systems Operating at 30 Volts or Less. A lighting system consisting of an isolating power supply, the low voltage luminaires (lighting fixtures), and associated equipment, all identified for the use. The output circuits of the power supply shall each be rated for not more than 25 amperes and operate at 30 volts (42.4 volts peak) or less under all load conditions .
Substantiation: Problem Substantiation 1 - Define lighting system to include luminaires - In abbreviated form for ease of consideration, 411.2 defines a lighting system as, literally,
(a) an isolating power supply (that is) supplying (some) luminaires, and
(b) associated equipment.
The terms in parenthesis above are added to better illustrate that the resent definition does not literally state that the luminaires supplied by the power supply are part of the lighting system. That there are luminaires being supplied by the power supply is only a required condition for the power supply to be part of a lighting system. The revised definition in proposed 411.2 now literally states that the lighting system includes the luminaires. This distinction reinforces that, for example, a listed lighting system must include the luminaires and not just a power supply and associated equipment. Proposed 411.2 is also more clear because the many different items or points described in the long sentence of present 411.2 are regrouped into two sentences, the first identifying the lighting system parts and the second identifying the required characteristics of the power supply.
Problem/Substantiation 2 - "Limited to" versus "rated" 25 amperes - 411.2 states the output of the power supply is to be "limited to 25 amperes maximum". Manufactures, inspection authorities, and other persons referring to 411.2 often form different opinions of what it means to be "limited". Whether or not any circuit is "limited" to a maximum ampere value depends on how being "limited" is determined. No method for determining this is defined in the NEC.
Consider that a 25 ampere branch circuit will supply 26 amperes for several minutes and much more than 26 amperes for some nonzero amount of time. Regardless of how long the circuit supplies an amount of current exceeding 25 amperes, 25 amperes is generally considered both the rating and the limit for the circuit.
The standards for Low Voltage Landscape Lighting Systems, UL1838, and Low Voltage Lighting Systems, UL 2108, provide for the low voltage output circuit of the luminaire power supply to be rated up to and including 25 amperes. Note that the standards specify "rated" rather than "limited to". A hypothetical power supply that is somehow designed to deenergize the output circuit when the output current exceeds 25 amperes for any (hence arbitrarily small) amount of time would need an output circuit rated much lower than 25 amperes to prevent tripping of the overcurrent protection device when operated at full rated load until temperature stabilization.
To address the risks of fire resulting from excess output current, UL 1838 and UL 2108 require the power supply to deenergize the output circuit within one hour when the circuit is loaded at 135 percent of 25 amperes. This load and 1 hour period match the load and one hour period of one of the tests required for a 25 ampere circuit breaker in the standard for Molded Case Circuit breakers, UL 489. It is proposed that 411.2 be revised to require that output circuits be rated not more than 25 amperes (rather than an undefined "limited to"), with the awareness that requiring the low voltage luminaire power supply or the entire lighting system to be listed using the above specified standards inherently requires the power supply to limit the output current as defined in the standards.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-106 Log #2712 NEC-P18 **Final Action: Accept**
(411.3)

TCC Action: The Technical Correlating Committee directs that the Panel reconsider the proposal and add headings to (A) and (B). This action will be considered by the panel as a public comment.
Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
411.3 Listing Required. Lighting systems operating at 30 volts or less shall comply with (a) or (b) ~~: be Listed~~ .
(a) Be a listed lighting system
(b) Be a lighting system assembled from the following listed parts:
(1) Low voltage luminaires
(2) Low voltage luminaire power supply
(3) Class 2 power supply
(4) Low voltage luminaire fittings
(5) Cord (secondary circuit) that the luminaires and power supply are listed for use with
(6) Cable, conductors in conduit, or other fixed wiring method for the secondary circuit.
The luminaires, power supply, and luminaire fittings (including the exposed bare conductors) of an exposed bare conductor lighting system shall be listed for use as part of the same identified lighting system.
Substantiation: Problem/Substantiation - Field Assembled Systems - The wording of Section 411.3 regularly leaves the reader concluding that all parts of a lighting system operating must be part of one listed entire lighting system. Lighting systems operating at 30 volts or less have long been field assembled from individually listed low voltage luminaires, listed luminaire power units, listed cord, any any involved listed luminaire fittings.

Installers verify that individually listed lighting system parts (regularly from multiple manufacturers) are intended for the use and have the needed ratings, as indicated in items (a) through (d) below, to create and assemble a low voltage lighting system. This practice has been successful for many years and 411.3 should make clear that this practice is permitted.

a) The voltage rating of the luminaires and luminaire fittings is confirmed to match the output circuit voltage marked on the power unit.

b) The total load connected to each power unit output circuit, determined by adding the wattages of the individual luminaires, is confirmed to not exceed the maximum permitted total wattage marked on the power unit.

c) For landscape lighting systems, the low voltage circuit flexible cord is confirmed to be the type and size specified in the power supply installation instructions for the total connected luminaire load.

d) For other than landscape lighting systems, the low voltage circuit conductors are confirmed to have an ampacity suitable for the total connected load.

Proposed 411.3 provides for both (a) the situation where an entire listing system is packaged and listed as a complete lighting system and (b) the situation where individually listed lighting systems parts are field assembled into a lighting system.

The ability of assembled exposed bare conductor lighting system parts to comply with the performance and other requirements in the Standard for Low Voltage Lighting Systems, UL 2108, always depends on only parts of the same identified lighting system being used together. The last sentence of proposed 411.3 addresses this.

Panel Meeting Action: Accept

Panel Statement: The panel accepts the submitter's concerns and urges the standards and certification agencies to consider it important that the power supply installation instructions specify the type of conductor, size, and length.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-107 Log #2713 NEC-P18 **Final Action: Accept in Principle in Part (411.4)**

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for Comment.

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.

Recommendation: Revise as follows:

~~411.4 Locations Not Permitted. lighting systems operating at 30 volts or less shall not be installed in the locations described in 411.4(A) and 411.4(B).~~

~~(A) Where concealed or extended through a building wall unless permitted in (1) or (2);~~

~~(1) Installed using any of the wiring methods specified in Chapter 3.~~

~~(2) Installed using wiring supplied by a listed Class 2 power-source and installed in accordance with 725.52.~~

~~(B) Where installed within 3.0 m (10 ft) of pools, spas, fountains, or similar locations, unless permitted by Article 680.~~

411.4 Specific Location Requirements.

(A) Walls, Floors, and Ceilings. Conductors concealed or extended through a wall, floor, or ceiling shall be in accordance with (1) or (2):

(1) Installed using any of the wiring methods specified in Chapter 3.

(2) Installed using wiring supplied by a listed Class 2 power source and installed in accordance with 725.52.

(B) Pools, Spas, Fountains, and Similar Locations. The power supply shall be protected by a ground-fault circuit interrupter where it, a luminaire, system wiring, or any other system component is located less than 3.0 m (10 ft) horizontally from the inside walls of a pool, spa, fountain or similar location. All system components located less than 1.5 m (5 ft) horizontally from the inside walls shall be at a height of not less than 3.7 m (12 ft) above the maximum water level.

Substantiation: Problem/Substantiation 1 - Opportunity for confusion with "Shall not be...unless" language.

The first sentence of 411.4 and then 411.4(A) leads the reader through the thought process of "lighting systems shall not be X unless they meet Y". Further, the use of the reference to subsection 411.4(A) at the end of the first sentence of 411.4 causes the requirements to be more difficult to follow than necessary and, consequently, more opportunity for confusion. The submitter proposes changing the title and rewording 411.4 to state the requirements of the first sentence of 411.4 and subsection 411.4(A) in the form of "what must be done", rather than involving a "what must not be done" form of thought.

In conjunction with change to a "what must be done" format, the submitter proposes rewording 411.4(B) to fit this format as well.

The submitter also proposes adding titles to 411.4(A) and 411.4(B) to make the applicability of their requirements easier to identify.

Problem/Substantiation 2 - Concealed in Floor and Ceilings - 411.4(A) identifies the installation requirements when the lighting systems are concealed or extended through in a wall. The submitter proposes that reference also be made to the floor and ceiling of a building since the installation requirements that apply to walls must also apply to floors and ceilings. The lack of mention of a floor and ceiling in the requirement might lead some readers to conclude that the requirements of 411.4(A) do not apply to floors and ceilings. The proposal above includes the terms floor and ceiling.

Problem/Substantiation 3 - Conductors versus Luminaires/power Units Not Located in Wall - 411.4(A) addresses installations where "lighting systems" (the subject of the requirement as presented in the first sentence of 411.4) are "concealed or extended through a building wall". Where concealed or extended through a building wall, the installation is required to comply with one of the wiring methods specified in 411.4(A)(1) or 411.4(A)(2). Since the installation specified in 411.4(A)(1) or 411.4(A)(2) can only apply to conductors, and not to luminaires and power units, the submitter proposes specifying that the requirement of 411.4(A) applies to conductors. The submitter also proposes introducing the term "lighting system" to the requirement of 411.4(B) to make more apparent that 411.4(B) applies to the entire lighting system (all parts of it, not just the conductors). The submitter also proposes removing the term "building" since the requirement might be found to apply to walls, floors, or ceilings of another structure.

Problem/Substantiation 4 - Distance of Lighting Systems from Pools, Spas, Fountains, and Similar Locations - 411.4(B) requires low voltage lighting systems to be located not less than 3.0 m (10 ft) from pools, spas, fountains, and similar locations "unless permitted by Article 680." 680.22(B), 680.40, and 680.43(B) identify installation characteristics for luminaires near or above a permanent swimming pool, spa and hot tub. Parts I, III, and IV of Article 680 do not identify the minimum distance between a luminaire and a storable pool or fountain. This results in low voltage lighting systems being required to be installed not less than 3.0 m (10 ft) or more from a storable pool or fountain, as specified in 411.4(B).

People want low voltage landscape lighting systems located less than 3.0 m (10 ft) from a storable pool or fountain and there is no provision for locating the lighting system as near as 1.5 m (5 ft) of a storable pool or fountain like there is for permanent swimming pools and spas. Proposed 411.4(B) provides for this and the following benefits.

a) Conveniently specifies installation characteristics for all of pools, spas, fountains, and similar locations and does not require the reader to locate those requirements that are in Article 680.

b) Provides installation characteristics for system parts for storable pools and fountains and eliminates the need for the reader to attempt to locate in Article 680 the nonexistent requirements for installing nonimmersed luminaires near storable pools and fountains.

c) Clarifies that GFCI protection applies to the power supply of the lighting system and not the luminaries. This eliminates the possibility that a reader of present 411.4(B) will conclude that a GFCI is required in the low voltage isolated system circuit for the low voltage luminaires because Article 680 requires GFCI protection for luminaries.

d) Specifies installation distance, height, and GFCI protection that match or are more stringent than specified in Article 680 for 120 volt luminaires for permanent pools and spas.

Panel Meeting Action: Accept in Principle in Part

First, the panel accepts the changes shown in the proposal to the title of 411.4 and Section 411.4(A).

Secondly, the panel has modified 411.4(B) to read as follows:

(B) Pools, Spas, Fountains, and Similar Locations.

Lighting systems shall be installed a minimum of 3 m (10 ft) horizontally from the nearest edge of the water, unless permitted by Article 680.

Panel Statement: Proposed text of 411.4(B) was not accepted because the proposed requirements are in conflict with the requirements of 680.22(b). The panel does not agree that the proposed language is more strintgent, when in fact it is less.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

KEMPEL, K.: This proposal should be ACCEPTED IN PRINCIPLE. We agree with the Panel action except for the rejection of the proposed text of 411.4(B).

The panel concluded the proposed text of 411.4(B) was in conflict with, and less stringent than, the requirements of Section 680.22(B). Regrettably, the panel did not identify in the panel statement which of the multiple requirements that make up 680.22(B) of the 2005 NEC were more stringent than, or in conflict with, the requirements of proposed 411.4(B).

Proposed 411.4(B) required the following:

Power supply GFCI protected if less than 10 ft horizontal from pool

All system components less than 5 ft horizontal shall be minimum 12 ft above water

The following table compares 411.4(B) with each sub-section of 680.22(B):

Subsection and scope of requirement	Key required parameters
Proposed 411.4(B)	GFCI if < 10 ft horiz.
680.22(B)(1) New Outdoor Installation Clearances	12+ ft vert. if < 5 ft horiz.
680.22(B)(2) Indoor Clearances	Same as outdoor unless, for certain luminaires, GFCI and 7+ ft 6+ in vert.
680.22(B)(3) Existing Installations	5+ ft horiz. if GFCI, attached to structure, and 5+ ft vert
680.22(B)(4) GFCI Protection in Adjacent Areas	If 5+ ft to 10 ft horiz, GFCI or (5+ ft vert. and attached to structure)
680.22(B)(5) Cord-and-Plug-Connected Luminaires	If < 16 ft horiz, comply with 680.7 which requires (for cord-and-plug-connected equipment) <3 ft cord, 12+ AWG grounding conductor, and grounding-type attachment plug

The comparison of requirements in the above Table does not support the premise in the Panel Statement that proposed 411.4(B) is in conflict with or less stringent than required by 680.22(B). It does support that the proposed 411.4(B) does not conflict with 680.22(B) and is at least equally rigorous. Therefore it should be concluded that 411.4(B) be accepted and proposal 18-107 accepted in principle.

18-108 Log #871 NEC-P18 **Final Action: Reject**
(411.5(D) (New))

Submitter: Michael J. Timpanaro, Lake County Building Services
Recommendation: Add new text to read:
(D) Circuits for control of landscape lighting limited to not more than 30 volts shall comply with the minimum cover requirements of 300.5. (Table 300.5 Column 5).
Substantiation: It is necessary to provide uniformity between Article 411 and the minimum cover requirements for landscape lighting under 30 volts referenced in Table 300.5 Column 5.
Panel Meeting Action: Reject
Panel Statement: The arrangement of the Code specified in 90.3 makes this reference to 300.5 unnecessary. Section 4.1 of the 2003 Style Manual (available at www.nfpa.org) instructs the panel not to use a reference if 90.3 already covers this requirement.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-109 Log #2715 NEC-P18 **Final Action: Accept in Principle in Part**
(411.5(D) (New))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
411.5 Secondary Circuits.
(A) Grounding. Secondary circuits shall not be grounded.
(B) Isolation. The secondary circuit shall be insulted from the branch circuit by an isolating transformer.
(C) Bare Conductors. Exposed bare conductors and current-carrying parts shall be permitted for indoor installations only. Bare conductors shall not be installed less than 2.1 m (7 ft) above the finished floor, unless specifically listed for a lower installation height.
<u>(D) Insulated Conductors. Exposed insulated secondary circuit conductors shall be of the type and installed as, described in (1), (2), or (3).</u>
<u>(1) Class 2 cable supplied by a Class 2 power source and installed in accordance with Parts I and III of Article 725.</u>
<u>(2) Conductors, cord or cable of the listed system and installed not less than 2.1 m (7 ft) above the finished floor unless the system is specifically listed for a lower installation height.</u>
<u>(3) Conductors or cable of the type, and installed as, described in Chapter 3.</u>
Substantiation: Problem/Substantiation - Installation Requirements for Exposed Insulated Low Voltage Conductors. Article 411 does not identify the required characteristics of a low voltage lighting system and its installation where insulated conductors, cord, or cable are exposed. This has resulted in confusion on the required characteristics among system manufacturers, installers, and others.
The submitter believes such confusion is likely to continue unless better addressed in the NEC.
The low voltage circuit is permitted to have a voltage rating of up to 30 volts and a current rating of up to 25 amperes. These secondary circuit ratings present a risk of fire that needs to be addressed by characteristics of the lighting system and its installation. To address this risk, the Standard for Low Voltage Lighting Systems, UL2108, requires the exposed insulated low voltage conductors to comply with item (a), (b), or (c).
a) The conductors are supplied by a Class 2 power source.
b) The conductors are supplied by a power supply that includes integral protection against inadvertent shorting and overloading, like is required for the power supplies for exposed bare conductors.
c) The conductors comply with a 1 minute 500 volt dielectric voltage withstand test and are installed not less than 2.1 m (7 ft) above the floor.
In addition to the installation options described in the above three items, an insulated conductor or cable that is permitted to be exposed as described in Chapter 3 of the NEC could also be used for exposed insulated secondary circuit conductors.
To reduce confusion about required characteristics for installations that involve exposed insulated secondary circuit conductors, the submitter proposes adding a new 411.5(D) that identifies the permitted configurations. Items (b) and (c) of the preceding paragraph of this problem/substantiation description are both addressed by item (2) of proposed 411.5(D).
Panel Meeting Action: Accept in Principle in Part
First, The panel accepts (D)(1) and (2). Second, revise 411.5(D)(3) to read as follows:
(3) Wiring methods described in Chapter 3.
Panel Statement: This clarifies that any wiring methods in Chapter 3 can be used as long as it is listed for this type of condition.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-110 Log #3496 NEC-P18 **Final Action: Reject**
(414 (New))

Submitter: Alan Manche, Square D Co.
Recommendation: Add new <u>Article 414 Power-Limited Lighting Systems</u>
Article 414 Power-Limited Lighting Systems
I. General
414.1 Scope. This article covers lighting systems supplied by a power-limited source and the associated wiring and lighting components.
414.2 Definition.
Power-Limited Lighting System. A lighting system consisting of a power-limited supply with one or more secondary circuits supplying luminaires (lighting fixtures) and associated equipment identified for use with the system
Power-Limited Supply. An isolating power supply operating with power limitation characteristics that considers safety from a fire initiation standpoint. Additional safeguards are specified to provide protection from an electric shock hazard.
414.3 Other Articles. The construction and installation of the luminaire(s) shall comply with Article 410. Where the requirements of Article 410 and Article 414 differ, the requirements of Article 414 shall apply.
Lighting systems that operate at 30 volts or less shall be installed in accordance with the requirements of Article 411.
414.5 Secondary Circuits.
(A) Isolation. The secondary circuits shall be insulated from the branch circuit by an isolating power supply.
(B) Bare Conductors. Bare conductors shall not be permitted in the secondary circuits.
414.6 Listing. A power-limited lighting system shall be listed. The power-limited supply shall be identified for use on a power-limited lighting system.
II. Installation
414.20 Wiring Methods
(A) Supply. Conductors and equipment on the supply side of the power-limited supply shall be installed in accordance with Chapters 1 through 4. The power limited supply shall be protected by overcurrent protection not exceeding 20 amperes.
(B) Secondary. Conductors and equipment on the load side of the power-limited supply shall be installed in accordance with (1) or (2).
(1) A Class 1 wiring method meeting the requirements of 725.52(A).
(2) A Class 3 wiring method meeting the requirements of 725.52(B).
414.22 Equipment Location . The power limited supply shall be permitted to be part of the luminaire or separately mounted. Where the power limited supply is separately mounted and intended for direct connection to a wiring system, the power limited supply shall be required to be separately enclosed.
Substantiation: The objective of this proposal is to add a new Article 414 to the NEC to properly address the installation of a power limited lighting system. The concept of this system is not new, however the present NEC rules are not adequate to cover the unique aspects of the system and to fully allow the system to be utilized.
The need for this Article is not unlike the need shown for Article 411 that was introduced in the 1996 NEC.

The proposal combines aspects of Articles 410, 411 and 725 that are needed to address the unique requirements.

The most unique component for this system is the power-limited supply that converts 120 or 277V line power to a lower voltage, higher frequency output to supply fixtures specifically designed for the system. Typical wiring methods between the power supply and the luminaire utilize Class 1 or Class the wiring assemblies.

Information is included that describes the power supply as it exists today. It carries a Class 3 listing, however the energy levels of the Class 3 output are too limiting for the technology employed. Class 3 power supplies have a number of applications outside of lighting, but the power outputs for those systems were established in the early 1970s based on technology available at that time. The power supplies used in these systems can have higher power outputs and still be listed as safe from a fire initiation standpoint (Class 3 objective) because of specific characteristics integrated into the supply for the lighting system. The listing requirements of the power supply would detail the power output requirements based on the limitation of fire initiation.

Lighting systems exists that utilize power-limited supplies enabling the system to utilize a Class 3 wiring method. This article is necessary to provide guidance on which wiring means are permitted, and ensure the lighting system has appropriate construction and installation requirements for the fixtures.

Substantiation follows for the specific sections of the Article:

414.1 – The scope is modeled after the scope of 411 and modified to be specific to power limited systems.

414.2 – The definitions section establishes what a power limited lighting system is and also establishes the baseline requirement of the power limited supply making it clear that the supply must consider safety from a fire initiation standpoint.

414.3 – Applies the requirements of Article 410 to the construction and installation of the luminaire. The objective is to not create any new rules for where or how the luminaires can be installed.

A statement has also been added to make it clear that systems operating at 30V and less need to comply with Article 411.

414.5 – This section establishes the basic requirements for the secondary circuits. The power supply must be isolating and since the system may not inherently limit the electric shock aspect, no bare conductors are permitted.

414.6 – Requires that the system be listed and requires that the power limited supply be identified for use with the system.

414.20 – The branch circuit supply must comply with Chapters 1-4. Secondary wiring could be a Class 1 wiring method as allowed for Class 3 circuits today or, since the system is power limiting with respect to fire initiation, a Class 3 wiring method.

The reference to 725.52(A) for Class 1 is the appropriate reference since it references 725.25 which picks up the circuit separation requirements for Class 1 circuits in 725.26 and the Class 1 conductor and insulation requirements of 725.27.

The reference to 725.52(B) for Class 3 circuits will pick up the 725.82 requirements for listing of the Class 3 cable, the separation requirements for Class 3 circuits specified in 725.54 and the application limitations in 725.61.

414.22 – This section is a parallel to 410.77(B) and will make it clear that the power supply could be integral or remote from the luminaire. As with the ballast requirement in 410.77(B), the power supply would not have to be separately enclosed where it has provisions for direct connection to a branch circuit.

In summary, the new article is very much needed to clear up confusion associated with these systems that use new technology. Present code requirements are not adequate to address the unique requirements of these systems and, in some aspects, are too limiting to allow full application of the technology.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The submitter hasn't offered sufficient technical substantiation to justify exceeding existing wiring methods. The proposed 414.1 Scope does not provide or justify specific current, voltage and frequency limits similar to 411.1. The submitter hasn't provided justification for the necessity of a new article versus using existing code language. The panel would like to see data or fact-finding reports demonstrating the shock and fire ignition safety aspects within the context of the proposed application limits.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

ARTICLE 422 — APPLIANCES

17-1 Log #1528 NEC-P17 **Final Action: Accept in Principle**
(422, 426, 680, and 682)

Submitter: Technical Correlating Committee on National Electrical Code

Recommendation: Revise Articles 422, 426, 680, and 682 as described in the following, relative to the terms bonding and grounding.

422.15(C) Revise 422.15(C) to read as follows:

~~An equipment grounding conductor shall be used where the central vacuum outlet assembly has accessible non–current-carrying metal parts.~~ Accessible non–current-carrying metal parts of the central vacuum outlet assembly shall be connected to an equipment grounding conductor.

426.44 Revise 426.44 to read as follows:

The ferromagnetic envelope shall be ~~grounded~~ connected to an equipment grounding conductor at both ends; and, in addition, it shall be permitted to be ~~grounded~~ connected to an equipment grounding conductor at intermediate points as required by its design.

The provisions of 250.30 shall not apply to the installation of skin-effect heating systems.

FPN: For grounding methods, see Article 250 .

680.55(B) Revise 680.55(B) to read as follows:

(B) Supplied by a Flexible Cord. Electrical equipment that is supplied by a flexible cord shall have all exposed non–current-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of this cord. The equipment grounding conductor shall be connected to ~~a~~ an equipment grounding terminal in the supply junction box, transformer enclosure, or other enclosure.

680.62(D)(1) Revise 680.62(D)(1) to read as follows:

(D) Grounding.

(1) Fixed or Stationary Equipment. The equipment specified in (D)(1)(a) and (D)(1)(b) shall be ~~grounded~~ connected to the equipment grounding conductor .

680.62(D)(1)(a) Revise 680.62(D)(1)(a) to read as follows:

(a) Location. All electrical equipment located within 1.5 m (5 ft) of the inside wall of the tub shall be ~~grounded~~ connected to the equipment grounding conductor.

680.62(D)(1)(b) Revise 680.62(D)(1)(b) to read as follows:

(b) Circulation System. All electrical equipment associated with the circulating system of the tub shall be ~~grounded~~ connected to the equipment grounding conductor.

682.31(B) Revise 682.31(B) to read as follows:

Where a feeder supplies a remote panelboard, an insulated equipment ~~grounded~~ grounding conductor shall extend from a grounding terminal in the service to a grounding terminal and busbar in the remote panelboard.

Substantiation: 422.15(C): Clarified for the use of the wording "equipment grounding conductor" that accurately describes the intentional connection to ground.

426.44: Using the wording "connected to an equipment grounding conductor" accurately describes the intentional connection to ground.

680.55(B): The wording was changed to specifically describe the insulated grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

680.62(D)(1): The wording was changed to specifically describe the grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

680.62(D)(1)(a): The wording was changed to specifically describe the grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

680.62(D)(1)(b): The wording was changed to specifically describe the grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

682.31(B): The wording was changed to specifically describe the grounding connection. The use of equipment grounding conductor accurately describes the intentional connection to ground.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on CP-1700, CP-1701, CP-1702, and CP-1703.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-2 Log #1145 NEC-P17 **Final Action: Accept in Principle in Part**
(422.10(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise first sentence of third paragraph:

The branch-circuit rating for an appliance that is considered a continuous load ~~continuously loaded other than a motor-operated appliance~~ ...(remainder unchanged).

Substantiation: Edit. "Continuously loaded" is not defined whereas "continuous load" is. Present wording exempts the requirement if a motor is associated with a non-motor continuous load.

Panel Meeting Action: Accept in Principle in Part

Revise the first sentence of the third paragraph as follows:

The branch-circuit rating for an appliance that is a continuous load ~~continuously loaded~~ other than a motor-operated appliance...(remainder unchanged).

Panel Statement: The panel agreed with the submitter to comply with Article 100 but removed the word "considered" for clarity.

The panel retained the text "...other than a motor-operated appliance." Motor- operated appliances are not exempted per 422.3. See 430.52(C) for motor- operated appliances on a motor circuit. See 430.42 for motor-operated appliances on a general-purpose branch circuit.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-3 Log #1353 NEC-P17 **Final Action: Accept**

(422.10(A))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise as follows:

Branch circuits <u>and branch circuit conductors</u> for household <u>ranges and</u> cooking appliances shall be permitted to be in accordance with Table 220.55 <u>, and shall be sized in accordance with 210.19(A)(3)</u> .

Substantiation: The existing wording omits alerting the *Code* user to the important text of 210.19(A)(3), especially to that portion which states that "(for) ranges of 8 3/4 kW or more rating, the minimum branch-circuit rating shall be 40 amperes." This proposal remedies that omission.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-4 Log #3217 NEC-P17 **Final Action: Reject**

(422.10(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Add text to read as follows:

"Recessed Appliances shall be treated as outlet boxes for the purpose of applying 314.20 and 314.21."

Substantiation: Penetrations for these installations appear to compromise a fire barrier similarly. If the purpose of those requirements is solely to contain sources of ignition within outlet boxes, this proposal is inappropriate. However, if they also have the purpose of maintaining the fire rating of a ceiling or wall (or floor), on the grounds that a cover plate is not sufficient to restore the barrier between the room and the inside of the wall or ceiling space, then they should apply as well to bathroom exhaust fans, for example, even though their actual wiring compartments are within internal enclosures. There is no reason to presume that fans' grilles serve to restore the barrier between the room and the inside of the ceiling any better than receptacles' cover plates manage to restore wall integrity.

Panel Meeting Action: Reject

Panel Statement: The requirements for outlet boxes are to contain sources of ignition and enclose live parts. The panel agrees with the submitter that the proposal would then become inappropriate.

The integrity of the fire assembly is the requirement of the building code.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

YASENCHAK, R.: I do believe the submitter has a valid point. In accordance with Article 300 requiring electrical equipment installed in hollow spaces that could cause the spread of fire, or be a product to cause combustion, shall meet the requirements set forth in 300.22(C)(2). This panel should have accepted in principle and inserted language equal to the above stated article. Not all appliances are installed in residential settings, and Article 422 covers ALL occupancies.

17-5 Log #1643 NEC-P17 **Final Action: Reject**

(422.11(F)(1))

Submitter: Francois Tanguay, Pyradia, Inc

Recommendation: Add new text as follows:

<u>Branch circuits and branch circuit protection for all electrical circuits in the furnace heating system shall be provided in accordance with NFPA 70 or with NFPA 79. The requirements for resistance heaters larger than 48 amperes to be broken down into subdivided circuits not to exceed 48 amperes shall not apply to industrial ovens and furnaces.</u>

Substantiation: My problematic comes with the fact that CSA INTERNATIONAL which does our equipment certification for the US market are telling us that all our control panels for our ovens and furnaces shall have branch circuit for resistance heating elements divided in 48 A load, which is impossible to do on many ovens and furnaces. The company I work for, PYRADIA, manufactures industrial ovens and furnaces; some of which have heating power as high as 2.2 MW (2200 kW). It is impossible to design that kind of equipment with subdivided heating load of 48 A.

Certification agencies uses UL 499 Electrical Heating Appliances (at article 17.6) and UL 508A Industrial Control Panels (at 31.6), both of which have branch circuit requirements based on 422.11(F) and 424.22(B) of NFPA 70. In mind they both do not apply to industrial ovens and furnaces. Overcurrent protection for resistance heating elements as per 422.11(F) is for appliances.

NFPA 70 defines appliance as "Utilization equipment, generally other than industrial, that is normally built in standardized sizes or types and is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, and so forth". Which would exclude industrial ovens and furnaces.

Overcurrent protection for resistance heating elements as per article 424.22(B) is for fixed electric space-heating equipment. Which would exclude industrial ovens and furnaces.

670.4(C), which covers Industrial Machinery, does not specify limitation for overcurrent protection.

In NFPA 86 version 2003, Standard for Ovens and Furnaces;

It is written at the article 7-18.1.3 that:

"Branch circuits and branch circuit protection for all electrical circuits in the furnace heating system shall be provided in accordance with NFPA 70, National Electrical Code, and with NFPA 79, Electrical Standard for Industrial Machinery.

Exception: The requirements for resistance heaters larger than 48 amperes to be broken down into subdivided circuits not to exceed 48 amperes shall not apply to industrial ovens and furnaces."

Even though NFPA 86 at article 7.18.1.3 specify that the 48A breakdown is not required for industrial ovens and furnaces, the certification agencies (UL or CSA) do not base their certification of that NFPA code, which is a problem for us. And, it seems UL standards 499 and 508A can only be modified if NFPA 70 is modified to permit that exception.

Panel Meeting Action: Reject

Panel Statement: Increasing the size of the fuse or circuit breaker will result in greater energy let-through and therefore greater potential for damage. The amount of energy that may be generated in a short circuit can be calculated as I 2 t, where I is current and t is time. The proposed elimination of subdivision of heater circuits greatly increases the risk of fire.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

BLEWITT, T.: The Submitter sought relief from 48-ampere subdivision of circuits but failed to specify a limitation. Though the Panel Statement is supported where there is no limitation, 422.11(F)(2) and (3) already provide for 120 ampere subdivision under certain circumstances. Given the intended application and typical protection afforded to heating elements within ovens, dryers and furnaces, 120 A subdivision is appropriate. The Submitter's intent can be satisfied, in part, by a new 422.11(F)(4) as follows:

(4) Industrial Ovens, Dryers and Furnaces. Industrial ovens, dryers and furnaces using unexposed sheathed-type heating elements shall be permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes where one of the following is met:

(1) Elements are integral with and enclosed within a heating surface.

(2) Elements are completely contained within an enclosure identified as suitable for this use.

(3) Elements are contained within an ASME-rated and stamped vessel.

17-6 Log #2954 NEC-P17 **Final Action: Reject**

(422.12)

Submitter: James J. Rogers, Bay State Inspectional Agency

Recommendation: Rewrite the two exceptions and add the following additional language as follows:

It shall be permissible to connect the following additional loads to the central heating circuit:

1. Auxiliary equipment, such as a pump, valve, humidifier, or electrostatic air cleaner directly associated with the heating equipment.
2. Permanently connected air-conditioning equipment.
3. A single lighting outlet at the heating equipment.
4. Not more than one duplex receptacle for service purposes at the heating equipment.

Substantiation: There are many times where central heating equipment is installed in remote locations. There appears to be no solid technical reason for not allowing a lighting outlet and a service receptacle on this circuit.

Panel Meeting Action: Reject

Panel Statement: The submitter is referred to 210.63 and 217.70(C).

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-7 Log #1491 NEC-P17 **Final Action: Reject**

(422.12 Exception No. 1)

Submitter: Thomas E. Purpura, City of Quincy Wire Department

Recommendation: 422.12 Exception No. 1: after the word humidifier, add <u>carbon monoxide detector</u> .

Substantiation: Carbon monoxide detectors are now required in Massachusetts to be installed in the area of a central heating system when some types of heating systems are installed. There have been deaths due to Carbon Monoxide poisoning from central heating systems. When a replacement

heating system is installed, many times it is not practical to connect to other or a dedicated circuit for this detector. Adding this device to a heating circuit would have minimal effect on the circuit and would encourage the use of these detectors for all heating systems thus saving many lives over time.
Panel Meeting Action: Reject
Panel Statement: A carbon monoxide detector is not considered auxilliary equipment to the heating system.
Although the electric power to the furnace is turned off, the risk is still present due to other sources of carbon monoxide.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-8 Log #2431 NEC-P17 **Final Action: Reject**
(422.12 Exception No. 1)

Submitter: Robert P. McGann, City of Cambridge
Recommendation: Revise text to read as follows:
Exception No. 1: Auxilary equipment, such as a carbon monoxide detector , a pump, valve, humidifier.
Substantiation: NFPA 720 requires this to be installed on the same circuit.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 17-7.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-9 Log #1017 NEC-P17 **Final Action: Reject**
(422.12 Exception No. 2)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Except in dwelling units , ~~permanently connected~~ air-conditioning equipment and central heating equipment shall be permitted to be connected to the same branch circuit where means are provided to prevent simultaneous operation .
Substantiation: Even if the parameters for circuit conductors overcurrent protection, etc. could be met, safety and reliability should not permit nonrelated equipment on the same circuit with gas and oil furnaces, especially where older or infirm persons may suffer serious consequences during winter if reliability is compromised by other load, and no requirements to prevent simultaneous operation. If this is to be permitted, there is no reason to exclude cord-connected air conditioners.
Panel Meeting Action: Reject
Panel Statement: Defining a requirement that pertains specifically to dwelling units is beyond the scope of Article 422.1, as this scope pertains to any occupancy.
If an appliance is not permanently connected, there is no means to prevent simultaneous operation.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-10 Log #884 NEC-P17 **Final Action: Reject**
(422.12 Exception No. 2, FPN (New))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Add FPN following Exception No. 2 as follows:
FPN: For permissible loads on branch circuits see 210.23.
Substantiation: Exception No. 2 in the 2005 NEC was based partly on the heating and AC loads being non-coincident. But non-coincident load rules (220.60) apply to feeders only. Therefore, Exception No. 2 applies only where the BC rating is at least equal to all the load (210.23). The exception and 2005 panel statements imply otherwise.
Panel Meeting Action: Reject
Panel Statement: The submitter did not address what can and what cannot be installed on the branch circuit.
The addition of the FPN would mislead the user to believe that additional undefined loads could be added to the circuit dedicated to central heating equipment.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-11 Log #2567 NEC-P17 **Final Action: Reject**
(422.12 Exception No. 3 (New))

Submitter: Joel Ebersole, Coffman Electric Inc.
Recommendation: Add new text as follows:
Exception No. 3: The equipment outlet may be installed on the circuit when labeled for service technician use only not for any other purpose.
Substantiation: When installing/replacing a furnace in an existing home, the panel may be full and there is no room for a new circuit or access to an existing circuit. When the furnace is being serviced it is not in operation at that time.
Panel Meeting Action: Reject
Panel Statement: See panel action statement on Proposal 17-6.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-12 Log #885 NEC-P17 **Final Action: Reject**
(422.13)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise as follows:
"A fixed storage-type water heater that has a capacity of 450L (120 gal) or less shall be considered a continuous load for the purposes of sizing branch circuits ."
Substantiation: This requires the water heater to be considered a continuous load at all stages, including on feeders and services. This change was not substantiated in the 2005 code cycle. This is inconsistent with 220.53, and 424.3 (424.3 applies only to branch circuits and is therefore consistent with 220.51.)
Panel Meeting Action: Reject
Panel Statement: The sizing of branch circuits is already covered by the Code.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-12a Log #CP1700 NEC-P17 **Final Action: Accept**
(422.15(C))

Submitter: Code-Making Panel 17,
Recommendation: Revise 422.15(C) to read as follows:
~~An equipment grounding conductor shall be used where the central vacuum outlet assembly has accessible non–current-carrying metal parts.~~
Accessible non–current-carrying metal parts of the central vacuum outlet assembly shall be connected to an equipment grounding conductor.
Substantiation: As Proposal 17-1 pertained to several articles (Articles 422, 426, 680 and 682), the panel chose to separate these into four (4) separate committee proposals to minimize confusion and act on them separately.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-13 Log #3563 NEC-P17 **Final Action: Reject**
(422.16(B)(5))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
Submitter: Edward A. Schiff, Technology Research Corp.
Recommendation: Add new text to read:
422.16(B)(5) Room Air Heaters. Single-phase cord-and-plug-connected room air heaters shall be provided with factory-installed LCDI or AFCI protection. The LCDI or AFCI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.
Substantiation: Portable electric space heaters have accounted for the highest civilian fire death toll of all home heating devices in 10 of the 14 years studied (1985-1998) according to the U.S. Home Heating Fire Patterns and Trends published in June, 2001 by the NFPA. The risk of fire death for these appliances relative to the number of households using the devices was much higher in 1997 than in 1987. Portable electric space heaters caused an average of 2,800 fires per year from 1994 to 1998 resulting in 95 deaths, 242 injuries and $52.1 million in property damage per year.
Short circuit or ground faults account for 20.7% of the fires and electrical failure other than short circuit account for 10.1% of the fires. Damaged power supply cords account for the majority of these fires.
The space heater's power supply cord can be damaged in a number of ways.
1. Pinched or crimped by furniture or doors
2. Overheated by covering or coiling of the cord
3. Crushed by pedestrian traffic or furniture
4. Improper handling in storage
5. Splicing of the cord
6. Pets or children chewing on the cord
7. Normal aging of the cord

The damage in many of the instances is internal and may not be detectable by inspection. Space heaters, by the nature of the product and application, present a high risk of fire. They are a high current appliance, used around elderly and children (the likely victims of fires), unattended operation, used while people are sleeping, portable, and frequently handled. All of these factors increase the risk of a serious fire.
There are two primary types of cord faults. Series faults (the fault is in series with the load) are partially or completely severed conductors within the cord set. A parallel fault, either line to neutral or a ground fault, is typically caused by degraded insulation. Both of these faults will lead to tracking within the cord set, leakage current, arcing and then combustion.

AFCI protected cord sets sense an arcing fault, at a predetermined level an disconnect power. This technology is being employed in circuit breakers for residential load centers.

LCDI protected cord sets sense leakage current flowing from or between conductors. Leakage current is the precursor to an arcing fault. This technology employs a ground fault sensing circuit as the disconnecting means so it also will prevent ground fault fires within the appliance (beyond the power supply cord) and provide shock protection for the appliance. There are 100,000's of LCDI protected cord sets on heaters. In addition, LCDI protected cords have been employed on extension cords, power strips, and other appliance cords for the past six years.

Adopting this proposal will have a positive economic impact on society. The CDI cord set will add approximately $5.00 to the retail cost of the electric space heater. There are 5 million heaters manufactured each year for a total cost to the consumer of $25 million.

The 2,800 attended portable electric heater fires are responsible for $52.1 million in property damage per year. These fires resulted in 242 serious injuries. The costs associated with the medical treatments, lost work expense, quality of life and pain and suffering, and product liability from these injuries will likely exceed the property damage. The reduction in fire fighting expenses associated with the 2,800 fires per year will also be in the millions. The estimated economic impact of all electric heater fires is well over $100,000,00.00 in annual costs. The cord set is involved in as many as 30% of these fires. Reduction in the cord fires should be able to offset the added cost of the heater.

It is difficult to put a price tag on the loss of life. The fact that most of the victims are children, makes this cost to society even greater. Approximately 10 people each year die from heater cord fires. The ground fault protection provided for the complete appliance will prevent additional fires,electrocutions, and the related costs of property damage and injuries.

Precedent exists for the incorporation of this requirement into the NEC. 440.65 of the 2002 NEC requires AFCI or LCDI protection for room air conditioner power supply cords. Immersion protection for hair dryers, GFCI protection for cord sets of pools, spas and pressure washers have been code requirements for some years.

Power supply cords for space heaters continue to cause residential fires. A proven economical solution exists and should be adopted.

Panel Meeting Action: Accept in Principle

Add new text in Part IV to read as follows:

422.53 Cord-and-Plug-Connected Room Heaters. Single-phase cord-and-plug-connected room heaters shall be provided with factory-installed LCDI, AFCI or other listed protection equal to or exceeding that of an LCDI or AFCI. The protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.

Panel Statement: Today's developing technologies of protection mitigate against fires and may go beyond only LCDI and AFCI.

This would permit the implementation and development of other technologies in addition to LCDI or AFCI.

The panel has relocated the submitter's proposed text as modified to Part IV.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 6 Negative: 8

Explanation of Negative:

BLEWITT, T.: The Panel attempted to avoid a prescriptive requirement that would preclude alternative approaches. This is supported. However, the text "…or other listed protection equal to or exceeding that of an LCDI or AFCI" is subjective and will open the door to confusion. As proposed, 422.53 does not require the heater, the LCDI or the AFCI to be listed. As written only the alternative protection needs to be listed. Who makes the determination that the alternative protection is equivalent to these other protective devices if the entire assembly is not listed? The listed protective device could be a listed glass fuse. Does that meet the requirement of 422.53? The AHJ is not in any position to evaluate the performance of the protective device as being equivalent to an AFCI or LCDI, nor is he in any position to determine the suitability of the entire assembly. There are no established criteria for "equal to or exceeding" which therefore can result in differing interpretations by the listing organizations. It is better to require that heaters be listed and be provided with features to mitigate the hazards associated with damaged power supply cords and connections.

A UL Standards Technical Panel (STP) Task Group has reviewed available data, current requirements for heaters, flexible cords, wiring devices, and the AFCI / LCDI protective devices. The recommendation of the Task Group to the STP (consensus standards body) is to address cord fires via new performance testing of cords, additional requirements for electrical connections and changes in markings / instructions that would be supported by an educational campaign(s). The intention is to prevent the hazard from occurring as opposed to mitigating it once it has occurred. AFCI and LCDI protective devices would be an acceptable alternative when accompanied by additional requirements that mitigate non-arc fault cord fire risks. Adoption of such requirements in the product standards would facilitate consistency by the listing organizations while retaining the opportunity for technological innovation.

Lastly, the Submitter did not substantiate the need for the devices in heaters intended for commercial applications. The Panel Action would apply to all cord-and-plug-connected room heaters.

CRIPPS, R.: I oppose the panel action on this proposal on the following grounds:

1) The language of the proposal as amended by the panel is inappropriate, and will lead to controversy and confusion when attempts are made to interpret it for practical purposes. LCDI and AFCI devices are not equivalent to each other. They operate on different principles and respond to different fault conditions. It is inappropriate to cite technology not in existence as being "equal to or exceeding..." as that is a judgment to be made by testing and certification. Therefore, the phrase "...protection equal to or exceeding that of an LCDI or AFCI" would be difficult, if not impossible, for code authorities, authorities having jurisdiction or certification organizations to interpret.

2) Code Making Panel 17 has been made aware of the activities of a UL joint task group which is actively developing proposals to improve the protection of power supply cords for electric fans and heaters. Those proposals will address the issues from a fundamental design standpoint, and will aim to prevent from developing the types of fault which AFCI/LCDI devices are intended to detect. The requirement of cord and plug mounted LCDI/AFCI devices should not be imposed on manufacturers until the proposals of the UL standards task group have been incorporated into product standards and their results evaluated through experience. Allowing the UL standards development process to address this issue is a more expeditious and substantive solution.

3) There remain serious technical issues with the overall reliability of LCDI/AFCI devices and their ability to respond dependably to the fault conditions against which they are claimed to protect.

4) The proponents of AFCI/LCDI devices continue to use unsubstantiated and outdated data as justification for their proposals. In particular, they do not take into account a substantial and sustained reduction in overall cord-and-plug initiated fires which have already occurred over the past ten years and has been reported in NFPA statistics. In addition, the proponents ignore other large causes of cord and plug related incidents that should be addressed before those of fans and heaters.

CRIVELL, P.: 1. LCDI/AFCI device would tend to lead to the use of plug strips because the device, would most likely be an integral part of the attachment plug, which could not share a duplex receptacle with another cord-and-plug device which has a transformer or an LCDI/AFCI device.

2. LCDI/AFCI device would have a reliability less than that of a simple attachment plug and if it fails would likely lead to consumer modification of cord (e.g., cutting off LCDI/AFCI device and installation of an after market attachment plug with or without adequate termination, and with or without a ground prong.)

3. Potential for mechanical damage to LCDI/AFCI device if stepped on when plugged into a plug strip on the floor.

EILS, L.: It was stated during the meeting that the power cords attached to room heaters are subject to testing by UL concerning abuse these cords may be subjected to in the normal course of the appliance use. If there are series faults in the cord design, they should be corrected by the manufacturer based on these UL tests or reports in the field of failure. The best place to make a change is by revising the UL standard to require better power cords and/or internal components related to the cord set to prevent a cord from failing because of abuse. This is a more economical and faster approach to resolve a safety issue such as this one.

There was much discussion by the members about the efficacy and use of LCDIs and AFCIs on power cords for this type of appliance. No one could answer the question if one was better than the other since they operate somewhat differently. It appears more work needs to be done on the application of these devices to appliances.

I do not believe the language proposed "equal to or greater than" is appropriate when the devices referred to do not function the same. How will a testing organization decide which device should be held as the standard for a particular test?

I propose this proposal be deleted.

HIRSCH, B.: It is the Edison Electric Institute's position that the requirements for end-use electrical devices that are not installed as part of the permanent premises wiring system are best covered by appropriate product standards. It is not the National Electrical Code's intent or scope to set requirements for end-use electrical devices that would typically be purchased by the after market consumer.

Work done by the Panel 17 Task group on Protective Devices Integral with Electric Appliance Power Supply Cords revealed that there is no one solution that will provide complete protection in all cases. Thus, for the NEC to attempt to legislate a particular protection scheme makes no sense. EEI recognizes that a Joint Task Group on Power Supply Cord Safety, set up by UL and others, is currently in operation. A preliminary report was issued by the task Group in January, 2006 which calls for performance based requirements for electric fans and electric room heaters. This approach allows manufacturers an option of meeting safety criteria in a number of ways. The EEI supports this approach.

The Edison Electric Institute supports the entire electrical safety system that integrates product standards, installation standards, product testing and evaluation, electrical inspection, manufacturer's products, qualified electrical installation and maintenance, electric supply system characteristics, and the owner's use and operation. Covering product standards in the National Electrical Code installation standard could negate the responsibility of the appropriate product standard and adversely impact the entire process.

The integrity of the electrical safety system is anchored in the systematic integration of the National Electrical Code, installation inspection, product safety standards and product testing. If non-premises end-use product safety issues are unsurpassed by the National Electrical Code, the product safety standard process will be weakened resulting in the entire process being weakened. In addition, since non-premises end-use products are not normally in place during the inspection process, enforcement of such a requirement under the NEC would be impossible.

KOESSEL, W.: New Text: Single phase cord and plug connected heaters. Reason being AFCIs and LCDIs do not act in the same way. The question arises as to the validity of these devices. There are concerns with manufacturers and testing laboratories as if this is the way to proceed. Even with the additional wording added by CMP 17 could be confusing to NRTL agencies as what is "equal to or exceeding...".

I feel there are alternate methods that may be more useful.

SARDINA, A.: ARI and AHAM are supportive of the development of new technology to increase safety and particularly of AFCIs as they technology progresses. However, Proposals 17- 13 and 17- 29 fall short of the mark on several accounts. While we believe there are several arguments against this approach, we would like to raise a few at this time.

1. AFCIs and LCDIs are not equal in all aspects. One looks at one aspect of the power cord and another looks at the hazards and functions differently. We find it inappropriate to cite in the NEC technologies which address different aspects of safety.

2. Underwriters Laboratories Standards Development Panels for Standards 507 and 1042/1278 have met concerning this issue and formed a joint task group which has met over the last 14 months to review this situation. This Joint Task Group was composed of manufacturers of LCDIs and AFC's, manufacturers of fans and heaters, UL staff and CPSC staff. The final report of this Task Group has been presented and calls for significant changes to the UL standards for fans and heaters to address the concerns that have been raised. While the recommendations of the Task Group do not prevent the use of AFCIs or LCDIs, they suggest that there are other ways to achieve the increase to safety without relying on AFCIs or LCDIs. ARI and AHAM members support these recommendations and will work to implement these changes to the standards through the appropriate standards development process. I believe ITS has representatives on these ST's and we hope your company will likewise support the adoption of these changes.

3. At the meeting, AHAM raised some serious questions as to the validity of these devices. AHAM prepared a report on the efficacy of LCDI's in 2003 and many of our concerns have still not been addressed. At the January 2006 CMP 17 meeting, AHAM raised still other questions about whether AFCIs will perform adequately when compared to a solution in the UL Joint Task Group report, a simple over-current device. It would appear that it is possible that AFCI's may not function soon enough in a "cut-cord" situation to prevent ignition of the cord set, and may give a false sense of protection.

4. We still have questions whether the NEC is the place to write specific product-related safety requirements. In the case of electrical appliances, we continue to believe that the ANSI/UL standards are a more appropriate venue.

5. The slight wording changes made by the CMP 17, do nothing to improve the situation, and could lead to more confusion, inconsistency and debate.

The Code Making Panel made some slight changes to the wording of the proposals.

"Proposal 17-13, Log 3563, Section 422.15(B)(5) New Text: Single phase cord and plug connected heaters shall be provided with factory installed LCDI, AFCI <u>or other listed protection equal to or exceeding that of an LCDI or AFCI. The protection</u> shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm of the attachment plug."

"Proposal 17-29, Log 3301, Section 422.52. New Text: Single phase cord and plug connected fans shall be provided with factory installed LCDI, AFCI <u>or other listed protection equal to or exceeding that of an LCDI or AFCI. The protection</u> shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm of the attachment plug."

(Underlined section of the proposal is what the Code Panel changed to at the CMP meeting.) We believe such an addition would only cause continuous debate by NRTL agencies as to whether a particular method is "equal to or exceeding…".

SWEIGART, R.: Log 3563, Section 422.16(B)(5) New Text: Single phase cord and plug connected room heaters shall be provided with factory installed LCDI, AFCI, or other listed protection equal to or exceeding that of an LCDI or AFCI. The protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.

As an example, the NEC's requirement for GFCIs on hair dryers was an attempt to solve a known safety problem where existing homes didn't have GFCIs installed, and were unlikely to retrofit. The NEC was not intended to be a product code. The NEC's intent is to cover the safe installation of fixed wiring and appliance wiring in residences and businesses (commercial and residential).

It should be noted that manufacturers are not prevented from installing AFCIs, LCDIs, or GFCIs on any product. I also believe that the phrase "equal to or exceeding" is ambiguous, and subject to AHJ interpretation.

ANSI/UL product standards are a more appropriate channel to address any fire hazard risks or product safety issues.

17-14 Log #3157 NEC-P17 **Final Action: Reject**
(422.16(A), FPN (New))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Add FPN as follows in underlined type:
<u>See 210.50(C) for location of Appliance Receptacle Outlets.</u>
Substantiation: This proposed change would help assure that too long of an appliance cord was not used, and would help in assuring that cords supplied with specific appliances are not altered to a longer length than was intended by the manufacturers. This proposed change would also "light the light" to Code users to double check the material referenced in 210.50(C).
Panel Meeting Action: Reject
Panel Statement: The cord lengths in Article 422 are presently established. Acceptance of the proposal would encourage cord length to be increased.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-15 Log #256 NEC-P17 **Final Action: Reject**
(422.16(B)(1)(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(3) Receptacles shall be located to avoid ~~physical~~ damage to the flexible cord.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.

Submitting proposals removing the adjective "physical" may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-16 Log #255 NEC-P17 **Final Action: Reject**
(422.16(B)(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(3) Receptacles shall be located to avoid ~~physical~~ damage to the flexible cord.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.,

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-17 Log #1118 NEC-P17 **Final Action: Reject**
(422.16(B)(4)(5))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete (5) The receptacle shall be supplied by an individual branch circuit.
Substantiation: Range hoods "permanently connected" (hard wired) do not require an individual circuit. There was no substantiation in Proposal 17-21 in the 2004 ROP for an individual circuit. The definition of Branch Circuit, Appliance permits more than one appliance.
Panel Meeting Action: Reject
Panel Statement: The panel intends to retain this requirement. The requirement is for possible replacement by a microwave oven. The requirement is for a cord-and-plug-connected appliance, and not a hard-wired appliance.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-18 Log #1001 NEC-P17 **Final Action: Reject**
(422.16(B)(5))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete (5) The receptacle shall be supplied by an individual branch circuit.
Substantiation: Individual branch circuit was seemingly intended to provide for future possible load which 90.1(A) indicates is not a Code function. Permanently connected (hardwired) range hoods do not require an individual circuit.
Panel Meeting Action: Reject
Panel Statement: See panel action statement on Proposal 17-17.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-19 Log #2729 NEC-P17 **Final Action: Reject**
(422.16(B)(5))

Submitter: Doug Boggus, City of Grand Prairie
Recommendation: Revise text to read:
422.16(B) Specific Appliances
(5) Water Heaters. Water heaters shall be permitted to be cord-and-plug connected with a flexible cord identified as suitable for use on water heaters in the installation instructions of the appliance manufacturer, where all of the following conditions are met:
(1) The flexible cord is terminated with a grounding-type attachment plug.
(2) The length of the cord is not less than 610 mm (2 ft) and not more than 1.8 m (6 ft).
(3) The receptacle is accessible.
(4) The flexible cord is not subject to physical damage.
(5) The flexible cord has a temperature rating not less than that marked on the appliance nameplate or in the appliance's connection wiring compartment.
(6) The water heater is identified for cord-and-plug connection.
Substantiation: Throughout the US, jurisdictions are constantly approached to allow water heaters to be connected to 120-volt and 240-volt power supply through plug-and-cord connection in violation of 422.16(A) as such appliances are generally not identified for flexible cord connection. The most commonly proposed type cord is "dryer cords" rated at 30-amperes for connections to 30-50 gallon storage type units. This is because of local demand for a quick and safe way to facilitate removal and replacement of such appliances. The proposed wording is intended to set necessary requirements for installations where cord-and-plug connection of a water heater is chosen as the connection wiring method. Such specific requirements will allow cord manufacturers to address this issue with properly rated cord insulation and connections while also allowing manufacturers of water heater appliances to be able to allow a connection method that is favored by both electricians and plumbers making new installations and by plumbers and homeowners replacing such appliances.
Panel Meeting Action: Reject
Panel Statement: The submitter has not substantiated a need for an exception to 400.8(1): "…cords shall not be used…as a substitute for fixed wiring of a structure." The panel notes that water heaters are often installed near other heating equipment or in areas used for storage of tools and other implements that can damage cords. They are infrequently replaced, have no vibration concerns, and can be serviced in place. Cellar installation of water heaters may also necessitate that the cord be plugged into a ceiling receptacle, requiring a cord longer than proposed and increasing the risk of cord damage.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

17-20 Log #3564 NEC-P17 **Final Action: Reject**
(422.16(B)(6)(a) & (b) (New))

Submitter: Edward A. Schiff, Technology Research Corp.
Recommendation: Add new text to read:
422.16(B)(6) Extension Cords for use with Appliances.
(a) Definition: Leakage Current Detection and Interruption (LCDI) Protection. A device provided in a power supply cord or cord set that senses leakage current flowing between or from the cord conductors and interrupts the circuit at a predetermined level of leakage current.
(b) Leakage Current Detection and Interruption (LCDI). Extension Cords for use with appliances shall be provided with factory-installed LCDI protection. The LCDI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.
Substantiation: Extension Cord Fire Problem
Faulty or damaged cords or plugs caused an estimated 6,900 attended fires, 91 civilian deaths, 421 civilian injuries, and $115.9 million in direct property damage per year in US homes between 1994 and 1998 according to The US Home Product Report , published January, 2002 by the NFPA. The leading cause of cord and plug fires was short circuits and ground faults (52.3% of fires and 39.2% of deaths). Other electrical failure and overloads account for the majority of the balance.
Electrical cord fires are a leading cause of residential fires in the United States. During the five year period from 1994 to 1998, there were 27,400 cord fires attended by the fire service according to the 1998 Residential Fire Loss Estimates published by the U.S. Consumer Product Safety Commission (CPSC) in 2002. These fires resulted in 350 deaths and 1,680 injuries. Extension cords were responsible for over half of these incidents.
The extension cord fire problem is getting worse. 2002 has been another terrible year for extension cord fires. In January alone, there were seven different fatal extension cord fires in US residences. Additionally, two catastrophic fires have occurred that summer.
1. On August 3, 2002 an overloaded extension cord caused the fire that killed six children (ages 10, 4, 3, 2 and eight month old twins) in Baton Route, LA.
2. On June 11, 2002, an overloaded extension cord melted and set the couch on fire in Silver City, NC killing six family members. The 33 year old mother, daughter 6, two stepsons age 10 and 13, 48 year-old brother, and the children's 41 year-old aunt died of smoke inhalation. The father and their 2 year-old daughter escaped by braking out a rear window.
These two fires accounted for 12 deaths, nine of which were children. The table entitled, "Fire Event Summary Report", highlights the severity of the problem.
Causes of Extension Cord Fires.
Extension cord fires have been and continue to be a major problem. There are many causes of cord fires including overload, overheating, pinching, crimping, crushing, customer misuse, fraying, and aging of the cord. These problems can cause combustion on their own or in conjunction with one another.
Extension cords are easily overloaded by exceeding the typical 13 Amp rating of the cord with multiple loads. Circuit breakers are designed to protect the fixed wiring in a dwelling. Their continuous current rating is typically 15A or 20A. A breaker allows an overload to exist for a period of time depending on its inverse-time trip curve; therefore, they do not provide overload protection for cords. Overloading damages the insulation from the inside (next to the conductor) to the outside of the cord.
Extension cords are frequently overheated. Consumers often run them under carpet or leave them coiled for ascetic reasons. Combustibles such as clothes or newspapers are put onto the cords. These scenarios prevent proper cooling and will overheat the cord. As with the overload condition, the insulation is damaged from the inside out. This damage is irreversible and may not be visible to inspection.
Extension cords can be mechanically damaged. They are frequently pinched or cramped by furniture and doorways. This will result in broken conductors within the cord and can cut or scrape the insulation. Cords may also be crushed by pedestrian traffic or by heavy items (furniture being placed on top of the cord). This damage is also irreversible and not visible to inspection.
Customer misuse comes in a variety of fashions including leaving the cord in pedestrian traffic, stapling of the cord to baseboards, using the cord as a permanent extension of premises wiring, and using the cord around pets or infants who chew cords. This misuse can result in fires caused by broken conductors and degraded insulation.
Finally, extension cords wear out in time resulting in cracked insulation and fraying of the conductors. Unlike the proposed LCDI cords, they will continue to pass current even though they present a major fire, injury and loss of life risk.
This damage described above results in insulation degradation and breaking of the current carrying conductors. The damage is irreversible and may not be visible to inspection. Circuit breakers and fuses are not sensitive enough to detect this damage before combustion can occur. Even the arc fault breakers (AFCIs) require a significant arc over a period of time which may be a fire in progress before detection. AFCIs are only being required on certain branch circuits in new homes, when the majority of electrical fires occur in older homes that do not have this limited protection.

Extension cords are used in high risk applications. Some of the common characteristics of these applications include unattended operation, high current loads, operation while people are sleeping and used around children and elderly people.

There are two primary types of cord faults. Series faults (the fault is in series with the load) are partially or completely severed conductors within the cord set. A parallel fault, either line to neutral or a ground fault is typically caused by degraded insulation. Both of these faults will lead to tracking within the cord set, leakage current, arcing and then combustion.

Over the past two decades, efforts have been made to reduce the number of extension cord fires including increased conductor size, improved labeling, improved materials and education. These efforts have reduced the annual number of extension cord fires by 35 percent since 1980. However, data for the most current years (1996 to 1998) demonstrates a plateau in number of extension cord fires (the same is true for other electrical cords). The fires cited in the table indicate the actual number of fatalities for 2002 will show a significant increase. LCDI protected cords provide the ability to eliminate extension cord fires.

LCDI protected cord sets sense leakage current flowing from or between conductors. Leakage current is the precursor to an arcing fault. This technology employs a ground fault sensing circuit as the disconnecting means so it also will prevent ground fault fires beyond the power supply cord and provide shock protection for the cord. Over the past six years, millions of LCDI protected cords have been field proven on extension cords, power strips, space heaters, and other appliance cords.

An additional benefit to this technology is preventing electrocutions and serious injury from electrical shock. According to the 1998 Electrocutions Associated with Consumer Products , published by the U.S. Consumer Product Safety Commission in July, 2001 there were 12 electrocutions caused by extension cords in 1998. Since the LCDI utilizes a ground fault sensing circuit as the disconnect means, these deaths would also be prevented.

Economic Impact

This improvement in safety will have a positive economic impact on society. The current retail price of an eight foot 120V/13A two wire LCDI protected extension cord is under $9.00. TRC anticipates the retail price will be under $5.00 for this product in large scale production. Unprotected indoor extension cords currently sell for between $1.00 and $7.00 dependent on length, gauge, number of conductors and receptacle type. The added cost borne by the consumer will be minimal.

In 1998, the property damage from the 2,800 attended extension cord fires was $57.5 million. These fires resulted in 170 serious injuries. The costs associated with the medical treatments, lost work expense, quality of life and pain and suffering, and product liability from these injuries will likely exceed the property damage. The reduction in fire fighting expenses associated with the 2,800 fires per year will also be in the millions. The rough estimate of well over $100,00,000.00 in annual costs caused by these fires will offset the majority of the added cost of the cords.

It is difficult to put a price tag on the loss of life. The fact that the most of the victims are children, makes this cost to society even greater. 40 people each year die from extension cord fires. An additional 12 lives are lost from electrocution. The ground fault protection provided down stream of the extension cord will prevent additional fires electrocutions, and the related costs of property damage and injuries.

Incorporation into the NEC

There are many precedents for incorporation of this requirement in the code. 440.63 requires either AFCI or LCDI protected cord sets for room air conditioners. Ground fault protection on the cord sets for pressure washers and portable hot tubs are long standing NEC requirements. Immersion protection for hair dryers has been part of the code for years.

The NEC code panels provides the only complete representation of the electrical community. This includes standards organizations, industry trade associations, insurance industry, electrical inspectors, contractors, and electricians. Safety is the primary reason for the code and clearly this is a critical safety issue.

Conclusion

Today's indoor extension cords are cheap. The U.S. Consumer Product Safety Commission (CPSC) recalls hundreds of thousands of extension cords every year. Undersized conductors and fake UL markings are common reasons. Raising the bar on performance to an LCDI protected cord set should reduce the likelihood of recalls.

A serious safety problem continues to exist. A proven, cost effective solution exists. There are many precedents for incorporation of this safety improvement into the NEC including the new requirement for AFCI or LCDI protected cord fires, injuries and reduce property damage and have a positive economic impact on society. Most importantly, adoption of this proposal will save lives!

This proposal was referred by Panel 6 to Article 240 and Article 210 during the last code cycle. None of the panels felt it was in their domain (the opinion of those panels was this is not an overcurrent device nor part of the branch circuit). From the work on the task force, Panel 17 is uniquely aware of the problem and the solution. The submitter respectfully requests that the panel take action on this proposal.

Panel Meeting Action: Reject

Panel Statement: The submitter's language is unenforceable, in that it cannot be determined that the extension cord will specifically be used for an appliance.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

Comment on Affirmative:

BLEWITT, T.: Extension cords are Listed as "cord sets." The UL Guide covering cord sets (ELBZ) indicates that cord sets are designated as one of the following types and are so identified by the Listing Mark:

- Cord Set
- Outdoor Use Cord Set
- Adapter Cord Set
- Cord Set for Recreational Vehicles
- Shore Power Cable Set

None are identified or Listed as "Extension Cords for use with Appliances." There currently is no means in the safety standards or Code to differentiate between "extension cords for use with appliances" and any other general use cord set.

YASENCHAK, R.: I agree that this type of protective device should be installed, but the submitter did not specify on what and where these cords would be used.

17-21 Log #2732 NEC-P17 **Final Action: Reject**
(422.19)

Submitter: Doug Boggus, City of Grand Prairie

Recommendation: Revise text to read:

422.19 Boxes and Wiring Compartments for Appliances. Boxes or wiring compartments used for a point of junction to an electrical power source, whether separate or furnished as a part of the appliance, shall comply with (1) through (5) where applicable:

(1) Where wire leads are provided by an appliance manufacturer for connection to an electrical power source, at least 150 mm (6 in.) of free conductor, measured from the wall of the box or wiring compartment opposite where the conductors emerge for termination to an electrical power source, shall be provided for splices to either a permanent wiring method or a cord connection.

(2) For either permanent wiring methods or cord connections used to supply the appliance, at least 150 mm (6 in.) of free conductor, measured from the point in the box or wiring compartment where the conductors emerges from its raceway or cable sheath shall be left for splices or for connection to terminals provided as a part of the appliance.

(3) Where the provided opeining in a box or wiring compartment is less than 200 mm (8 in.) in any dimension and where wire leads are provided by the appliance manufacturer for connection to an electrical power source, each conductor shall be long enough to extend at least 75 mm (3 in.) outside the opening.

(4) Boxes and wiring compartments shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box or wiring compartment be less than the fill calcuation as calculated in Table 422.19(A). Volumes of standard boxes that are not marked with their volume shall be as given in Table 314.16(A). Other boxes shall be durably and legibly marked with their volume by the box manufacturer, and appliance wiring compartments shall be durably and legibly marked with their volume by the appliance manufacturer.

(5) Conductors shall not be deflected within a box or wiring compartment unless a minimum wire-bending space per Table 422.19(B) is provided.

Table 422.19(A) Volume Allowance Required per Conductor

Size of Conductor (AWG)	mm^2	Free Space Within Box for Each Conductor cm^3	$in.^3$
14 or smaller	2.1	32.8	2.00
12	3.3	36.9	2.25
10	5.3	41.0	2.50
8	8.4	49.2	3.00
6	13.3	81.9	5.00

Table 422.19(B) Minimum Wire-Bending Space within Box or Wiring Compartment

Size of Conductor (AWG)	Wire Bending Space mm	in.
14-10	Not Specified	
8-6	38.1	$1^1/_2$
4-3	50.8	2
2	63.5	$2^1/_2$
1	76.2	3

Substantiation: 314.16 requires boxes and conduit bodies to be of sufficient size to provide free space for all enclosed conductors but is silent on appliance wiring compartments where a general use junction or splice box is not utilized. 300.14 requires at least 6-inches of free conductor, 3-inches past the box opening for boxes less than 8-inches in any dimension, for outlet, junction, and switch points, yet this rule does not seem to be applied to appliances with wire leads and in some cases terminals used for the power connection to the appliances by appliance manufacturers. Also, the physical cubic inches allowed in appliance wiring compartments for both factory lead conductors and field installed connection conductors will in most cases not allow 6-inches of free conductor as required for a non-appliance termination box or wiring compartment. This is especially noticeable in the provided appliance wiring compartments of water heaters and in many dishwashers, trash compactors, and hood vents. The 6-inches of free conductor requirement dates back to the 1937 NEC where in section 3011 it stated that "at least six inches of free conductor shall be left at each outlet and switch point for the making up of joints or the connection of fixtures and devices." 300.14 was revised in the 1999 NEC to clarify how 6-inches of free conductor is measured and to add the requirement that 3-inches past the box opening for boxes less than 8-inches in any dimension with the focus of this clarification and additional language addressing the need to assure adequate connectability, and safe workability on the conductors once the conductors are installed. There should be no differentiation between conductor requirements involving a junction or splice box regardless of its intended purpose. The acceptance of this proposal will assure that boxes and wiring compartments of appliances used to connect supply conductors can be accomplished in a safe manner with the installer being able to make connections without being subjected to the sharp edges of inadequately sized appliance wiring compartments. Companion proposals have also been submitted to Code-Making Panel 9 for 314.16 for the addition of a FPN No. 2 that will state, "For volume requirements for appliance terminal connections, see 422.19." and to 314.28 for the addition of an Exception No. 2 that will state, "Boxes and wiring compartments utilized for the connection of appliances to supply conductors shall comply with 422.19."

Panel Meeting Action: Reject

Panel Statement: The submitter combined requirements in Article 422 that would belong in Articles 300 and 314.

The requirements for boxes and wiring compartments for appliances are adequately addressed by product-specific standards.

The submitter's proposal is new text rather than revised text.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-22 Log #128 NEC-P17 **Final Action: Reject**

(422.31(A) and (B))

Submitter: Yakov Fonarev, Allston, MA

Recommendation: Revise as follows:

(A) Rated at Not Over 300 (Should be 100 instead of 300) Volt-Amperes or 1/8 Horsepower. For permanently connected appliance rated at not over 300 (Should be 100 instead of 300) volt-ameperes or 1/8 hp.

(B) Appliances Rated Over 300 (Should be 100 instead of 300) Volt-Amperes or 1/8 Horsepower. For permanently connected appliance rated over 300 (Should be 100 instead of 300) volt-amperes or 1/8 hp.

Substantiation: The problem is 1 hp=800 volt-amperes, so 300 volt-ameperes = 0.375 hp.

Then 1/8 hp = 100 Va.

NEC 1999 and NEC 2002 and Electrician's Exam Preparation Guide Revised by Dale C. Brickner (John E. Traisten) have the same statement.

I would like to have got an answer from you and NEC 2002 for more investigation.

Panel Meeting Action: Reject

Panel Statement: The section is intended for non-motor-rated and motor-rated appliances. The 300 volt-amperes applies to non-motor-rated appliances. 1/8 Horsepower is calculated to be approximately 400 VA full load.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-23 Log #1501 NEC-P17 **Final Action: Accept in Part**

(422.33(A) and (B))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise last sentence of (A):

Where the separable connector or plug and receptacle are not <u>readily</u> accessible...(remainder unchanged).

In (B), delete "household" or delete (B).

Substantiation: Edit. Cord connectors, receptacles, and plugs cannot be "not accessible" (closed in by the building finish) through they may be not "readily" accessible. There is no apparent reason (B) should be limited to household ranges; subsection (A) appears to be inclusive of commercial ranges.

Panel Meeting Action: Accept in Part

Revise the last sentence of 422.33(A) as follows:

Where the separable connector or plug and receptacle are not <u>readily</u> accessible...(remainder unchanged).

Panel Statement: The panel accepts the first part of the submitter's recommendation.

The panel rejects the change or deletion of 422.33(B) because there are significant differences between household and commercial ranges.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-24 Log #2549 NEC-P17 **Final Action: Reject**

(422.34(E))

Submitter: Gary W. Williamson, State of Oklahoma

Recommendation: Add new text as follows:

<u>(E) Commercial Kitchens. All appliances in commercial kitchens shall have an integral disconnecting means that disconnects all ungrounded conductors.</u>

Substantiation: On October 25th, 2005, an electrical journeyman was killed in a new school cafeteria. A disconnecting means was in sight but it's not possible to tell if the circuit breaker was in the off or on position. The journeyman removed the cover of the control panel for a dishwasher and came into contact with a live circuit while installing control wiring. Commercial kitchens are hazardous areas to work. Floors are generally wet and conductive. Stainless Steel tables are wet and block access to disconnecting means mounted on walls. Disconnects are commonly found beneath tables and presents extra hazards when operating. A disconnecting means integral with the equipment served provides a high level of safety for persons who service and maintain electrical equipment.

Panel Meeting Action: Reject

Panel Statement: The requirements of 422.34(D) and 422.35 for the marking of the disconnect are clear.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-25 Log #1253 NEC-P17 **Final Action: Reject**

(422.45)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete.

Substantiation: This is impractical and impossible to enforce. These appliances may not be present at time of inspection. Some smoothing appliances are designed to press clothing, curtains, drapes suspended from hangers. After many years in the trade, I have never seen or heard of this being enforced.

Panel Meeting Action: Reject

Panel Statement: This is an important safeguard to guard against fires.

The submitter has not provided adequate substantiation to delete the text.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

HIRSCH, B.: The submitter makes the point that this is impossible to enforce. The EEI agrees with this comment. The EEI also believes this is an appliance requirement and as such does not belong in the code. See my comment for Proposal 17-13.

17-26 Log #478 NEC-P17 **Final Action: Reject**

(422.51)

Submitter: Joseph Rossi, Township of Clinton

Recommendation: Revise the last sentence to read:

Cord-in-Plug-connected vending machines not incorporating integral GFCI protection shall be connected to a GFCI protected outlet.

Substantiation: During a 2005 update class some discussion came up on this article. I asked the question "If in an existing hotel where vending machines are installed, and the hotel moves the vending machine from the 7th floor to the 8th floor, does this now require a GFCI protected outlet?" We spent some time on this and of course we all had different views. Therefore, we either need a fine print note or have this article reworded for better clarification.

Panel Meeting Action: Reject

Panel Statement: The Code requires GFCI protection for such cord-and-plug-connected vending machines.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

EILS, L.: On behalf of the food and beverage industry, NAMA has not seen any compelling evidence the vending machines now in operation need GFCI protection. When NAMA received information from the Consumer Product Safety Commission on electrocutions caused by machines that had their power cords abused, NAMA alerted its members to inspect all their machines to assure all power cords were intact. To the best of our knowledge, there have been no new incidents of electrocutions from vending machines.

You also need to know that vending operators do not have control of the receptacles where machines are placed. Operators are invited to provide a service for the employees of our client. A simple installation now becomes a complicated situation that will cause unnecessary expense when the safety of the operator's clients has already been ensured.

We recommend the sentence "Cord-and-plug connected vending machines not incorporating integral GFCI protection shall be connected to a GFCI protected outlet" be deleted from 422.51.

17-27 Log #1739 NEC-P17 **Final Action: Accept in Part**

(422.51)

Submitter: Daniel Cuddy, Inspectional Service, Town of Methuen, MA

Recommendation: Revise the section and add a definition for the term "vending machine" as follows:

422.51 Cord- and Plug-Connected Vending Machines. <u>A</u> cord- and plug-connected vending machine <u>served by a 15- or 20-ampere, 120-volt branch circuit and</u> manufactured on or after January 1, 2005 shall include...

<u>For the purposes of this section, the term vending machine is defined as a coin-operated machine for dispensing merchandise.</u>

Substantiation: The Ampere/Voltage rating needs to be addressed as there are coin-operated 30 A, 250V electric clothes dryers that, possibly were not intended to be included. The definition is needed to distinguish that you put a coin into the slot and you receive merchandise or a product. Many cord-connected coin-operated machines do not vend merchandise or a product, instead they offer a service such as clothes washers, clothes dryers, ATM machines, ice machines (no coin needed), slot machines (some are cord-and plug-connected; of course, you get nothing back). The intent of this proposal is to give the Code-Making Panel some thoughts toward clarifying this section for 2008.

Panel Meeting Action: Accept in Part

Revise 422.51 to read as follows:

Cord-and-plug-connected vending machines, manufactured or re-manufactured on or after January 1, 2005, shall include a ground-fault-circuit-interrupter as an integral part of the attachment plug or located within 300 mm (12 in) of the attachment plug. Older vending machines manufactured or remanufactured prior to January 1, 2005, shall be connected to a GFCI-protected outlet. For the purpose of this section, the term "vending machine" means any self-service device that dispenses products or merchandise without the necessity of replenishing the device between each vending operation and designed to require insertion of a coin, paper currency, token, card, key, or receipt of payment by other means.

Add FPN to read as follows:

FPN: For further information, see ANSI/UL 541-2005, Standard for Refrigerated Vending Machines, or ANSI/UL 751-2005, Standard for Vending Machines.

Panel Statement: The panel rejects the deletion of re-manufactured vending machines as well as the branch circuit limitations. There is no substantiation for not providing the same level of safety for vending machines that are on branch circuits of greater than 20 amperes or 120 v.

The panel accepts the submitter's statement defining vending machines as modified.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

17-28 Log #506 NEC-P17 **Final Action: Reject**

(422.52)

Submitter: Jessica King, Oswego County Boces

Recommendation: Water fountains should be GFCI protected by code.

Substantiation: This is to ensure the safety of individuals who drink or even touch the water/drinking fountains. If the fountain is metal, an individual will get shocked when they come in contact with the button, if they don't get shocked by the side for a certain reason and there is a bad connection, they will get shocked from the electricity flowing through the water.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).

The submitter is encouraged to review and resubmit for the ROC with specific proposed text.

A definition for a "water fountain" would be in order.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

Comment on Affirmative:

YASENCHAK, R.: We agree with the submitter and believe their intent could be met with the following text:

"Drinking fountains should be GFCI protected by code."

17-29 Log #3301 NEC-P17 **Final Action: Reject**

(422.52)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Aaron B. Chase, Leviton Mfg. Co. Inc.

Recommendation: Add text to read as follows:

422.52 Cord-and-Plug-Connected Electric Fans. All single-phase cord-and plug-connected electric fans shall be provided with factory-installed LCDI or AFCI protection. The LCDI or AFCI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.

Substantiation: Electric fans were responsible for 2,600 fires attended by the Fire Services in 1998 according to the 1998 Residential Fire Loss Estimates published by the U.S. Consumer Product Safety Commission (CPSC) in 2002. These fires resulted in 10 deaths, 120 civilian injuries and $35.9 million in property damage. This is the highest number of electric fan fires over the past five years. The CPSC conducted 243 in-depth incident investigations from 1990 to 2001. Sixty-three of these fires (26 percent) involved cord failures.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Add new text in Part IV to read as follows:

422.52 Cord-and-Plug-Connected Electric Fans. Single-phase cord-and plug-connected electric fans shall be provided with factory-installed LCDI, AFCI, or other listed protection equal to or exceeding that of an LCDI or AFCI. The protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.

Panel Statement: Today's developing technologies of protection mitigate against fires and may go beyond only LCDI and AFCI. This would permit the implementation and development of other technologies in addition to LCDI or AFCI.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 6 Negative: 8

Explanation of Negative:

BLEWITT, T.: The Panel attempted to avoid a prescriptive requirement that would preclude alternative approaches. This is supported. However, the text "…or other listed protection equal to or exceeding that of an LCDI or AFCI" is subjective and will open the door to confusion. As proposed, 422.52 does not require the fan, the LCDI or the AFCI to be listed. As written only the alternative protection needs to be listed. Who makes the determination that the alternative protection is equivalent to these other protective devices if the entire assembly is not listed? The listed protective device could be a listed glass fuse. Does that meet the requirement of 422.52? The AHJ is not in any position to evaluate the performance of the protective device as being equivalent to an AFCI or LCDI, nor is he in any position to determine the suitability of the entire assembly. There are no established criteria for "equal to or exceeding" which therefore can result in differing interpretations by the listing organizations. It is better to require that fans be listed and be provided with features to mitigate the hazards associated with damaged power supply cords and connections.

A UL Standards Technical Panel (STP) Task Group has reviewed available data, current requirements for fans, flexible cords, wiring devices, and the AFCI / LCDI protective devices. The recommendation of the Task Group to the STP (consensus standards body) is to address cord fires via new performance testing of cords, required overcurrent protection at or near the attachment plug, and changes in markings / instructions that would be supported by an educational campaign(s). The intention is to prevent the hazard from occurring as opposed to mitigating it once it has occurred. AFCI and LCDI protective devices would be an acceptable alternative when accompanied by additional requirements that mitigate non-arc fault cord fire risks. Adoption of such requirements in the product standard would facilitate consistency by the listing organizations while retaining the opportunity for technological innovation. Lastly, the Submitter did not substantiate a need for such devices in commercial or rangehood applications, both of which are Listed as "fans." The Panel Action would apply to all cord-and-plug-connected fans.

CRIPPS, R.: See my comment on Proposal 17-13.

CRIVELL, P.: 1. LCDI/AFCI device would tend to lead to the use of plug strips because the device, would most likely be an integral part of the attachment plug, which could not share a duplex receptacle with another cord-and-plug device which has a transformer or an LCDI/AFCI device.

2. LCDI/AFCI device would have a reliability less than that of a simple attachment plug and if it fails would likely lead to consumer modification of cord (e.g., cutting off LCDI/AFCI device and installation of an after market attachment plug with or without adequate termination, and with or without a ground prong.)

3. Potential for mechanical damage to LCDI/AFCI device if stepped on when plugged into a plug strip on the floor.

EILS, L.: It was stated during the meeting that the power cords attached to cord-and-plug-connected electric fans are subject to testing by UL concerning abuse these cords may be subjected to in the normal course of the appliance use. If there are series faults in the cord design, they should be corrected by the manufacturer based on these UL tests or reports in the field of failure. The best place to make a change is by revising the UL standard to require better power cords and/or internal components related to the cord set to prevent a cord from failing because of abuse. This is a more economical and faster approach to resolve a safety issue such as this one.

There was much discussion by the members about the efficacy and use of LCDIs and AFCIs on power cords for this type of appliance. No one could answer the question if one was better than the other since they operate somewhat differently. It appears more work needs to be done on the application of these devices to appliances.

I do not believe the language proposed "equal to or greater than" is appropriate when the devices referred to do not function the same. How will a testing organization decide which device should be held as the standard for a particular test?

I propose this proposal be deleted.

HIRSCH, B.: See my explanation of negative vote on Proposal 17-13.

KOESSEL, W.: Reason being AFCIs and LCDIs do not act in the same way. The question arises as to the validity of these devices. There are concerns with manufacturers and testing laboratories as if this is the way to proceed. Even with the additional wording added by CMP 17, could be confusing to NRTL agencies as what is "equal to or exceeding...".
Especially when you get into fractional horsepower fans such as range hoods with fans. I feel there are alternate methods that may be more useful.

SARDINA, A.: ARI and AHAM are supportive of the development of new technology to increase safety and particularly of AFCIs as they technology progresses. However, Proposals 17- 13 and 17- 29 fall short of the mark on several accounts. While we believe there are several arguments against this approach, we would like to raise a few at this time.

1. AFCIs and LCDIs are not equal in all aspects. One looks at one aspect of the power cord and another looks at the hazards and functions differently. We find it inappropriate to cite in the NEC technologies which address different aspects of safety.

2. Underwriters Laboratories Standards Development Panels for Standards 507 and 1042/1278 have met concerning this issue and formed a joint task group which has met over the last 14 months to review this situation. This Joint Task Group was composed of manufacturers of LCDIs and AFC's, manufacturers of fans and heaters, UL staff and CPSC staff. The final report of this Task Group has been presented and calls for significant changes to the UL standards for fans and heaters to address the concerns that have been raised. While the recommendations of the Task Group do not prevent the use of AFCIs or LCDIs, they suggest that there are other ways to achieve the increase to safety without relying on AFCIs or LCDIs. ARI and AHAM members support these recommendations and will work to implement these changes to the standards through the appropriate standards development process. I believe ITS has representatives on these ST's and we hope your company will likewise support the adoption of these changes.

3. At the meeting, AHAM raised some serious questions as to the validity of these devices. AHAM prepared a report on the efficacy of LCDI's in 2003 and many of our concerns have still not been addressed. At the January 2006 CMP 17 meeting, AHAM raised still other questions about whether AFCIs will perform adequately when compared to a solution in the UL Joint Task Group report, a simple over-current device. It would appear that it is possible that AFCI's may not function soon enough in a "cut-cord" situation to prevent ignition of the cord set, and may give a false sense of protection.

4. We still have questions whether the NEC is the place to write specific product-related safety requirements. In the case of electrical appliances, we continue to believe that the ANSI/UL standards are a more appropriate venue.

5. The slight wording changes made by the CMP 17, do nothing to improve the situation, and could lead to more confusion, inconsistency and debate.

The Code Making Panel made some slight changes to the wording of the proposals.

"Proposal 17-13, Log 3563, Section 422.15(B)(5) New Text: Single phase cord and plug connected heaters shall be provided with factory installed LCDI, AFCI <u>or other listed protection equal to or exceeding that of an LCDI or AFCI. The protection</u> shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm of the attachment plug."

"Proposal 17-29, Log 3301, Section 422.52. New Text: Single phase cord and plug connected fans shall be provided with factory installed LCDI, AFCI <u>or other listed protection equal to or exceeding that of an LCDI or AFCI. The protection</u> shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm of the attachment plug."

(Underlined section of the proposal is what the Code Panel changed to at the CMP meeting.) We believe such an addition would only cause continuous debate by NRTL agencies as to whether a particular method is "equal to or exceeding…".

SWEIGART, R.: Log 3301, Section 422.52 New Text: Single phase cord and plug connected electric fans shall be provided with factory installed LCDI or AFCI protection. The LCDI or AFCI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in.) of the attachment plug.

As an example, the NEC's requirement for GFCIs on hair dryers was an attempt to solve a known safety problem where existing homes didn't have GFCIs installed, and were unlikely to retrofit. The NEC was not intended to be a product code. The NEC's intent is to cover the safe installation of fixed wiring and appliance wiring in residences and businesses (commercial and residential).

It should be noted that manufacturers are not prevented from installing AFCIs, LCDIs, or GFCIs on any product. I also believe that the phrase "equal to or exceeding" is ambiguous, and subject to AHJ interpretation.

ANSI/UL product standards are a more appropriate channel to address any fire hazard risks or product safety issues.

ARTICLE 424 — FIXED ELECTRIC SPACE-HEATING EQUIPMENT

17-30 Log #258 NEC-P17 **Final Action: Reject**
(424.12(A))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

Where subject to ~~physical~~ damage, fixed electric space-heating equipment shall be protected in an approved manner.

Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.,

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-31 Log #388 NEC-P17 **Final Action: Accept in Principle**
(424.19)

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Add to the end of 424.19 Disconnecting Means: <u>The disconnecting means specified in 424.19(A) and 424.19(B) shall have an ampere rating not less than 115 percent of the total load of the motors and the heaters.</u>
Substantiation: There is no specification in Article 424 on the rating of the disconnecting means for fixed electric space-heating equipment. This change would be consistent with disconnect ratings in other similar articles such as motors and air conditioning and refrigeration equipment.
Panel Meeting Action: Accept in Principle
Add to the end of 424.19 as follows:

<u>The disconnecting means specified in 424.19(A) and 424.19(B) shall have an ampere rating not less than 125 percent of the total load of the motors and the heaters.</u>

Panel Statement: The disconnect must be rated at least equal to the rating of the branch circuit overcurrent device.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-32 Log #958 NEC-P17 **Final Action: Reject**
(424.19)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:

~~Means~~ <u>A switch or circuit breaker that simultaneously disconnects all ungrounded conductors of the circuit</u> shall be provided to disconnect the heater(s), motor(s), controller(s), and supplementary overcurrent device(s) ~~from all ungrounded conductors~~ . In (A)(1) and (2) delete the second word "above."

Substantiation: Edit. No specific type of disconnect is indicated. Lugs, terminals, wire connectors, etc. are means of disconnecting. The word "above" can be perceived as referring to the immediate preceding paragraph or all preceding paragraphs.
Panel Meeting Action: Reject
Panel Statement: The disconnecting means can be other than a switch or circuit breaker. Specific means via reference to other articles and their respective permitted disconnect types are indicated in the remainder of 424.19.

Article 424, in general, and 424.19(A)(2) specifically, indicate disconnects for motor controllers from Article 430. These are not limited to switches and circuit breakers.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-33 Log #2036 NEC-P17 **Final Action: Accept**
(424.19)

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:

424.19 Disconnecting Means

Means shall be provided to disconnect the heater, motor controller(s), and supplementary overcurrent protective device(s) of all fixed electric space-heating equipment from all ungrounded conductors. Where heating equipment is supplied by more than one source, the disconnecting means shall be grouped and marked. <u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.</u>

Substantiation: The problem with the present wording of this section is that the disconnect in many Fixed Electric Space-Heating Equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where Fixed Electric Space-Heating Equipment is involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for Fixed Electric Space-Heating Equipment.

Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-34 Log #2056 NEC-P17 **Final Action: Reject**
(424.44)

Submitter: William Carter, Easy Heat, Inc.
Recommendation: Revise text to read as follows:

424.44 Installation of Cables in Concrete or Poured Masonry Floors

~~(G) Ground Fault Circuit Interrupter Protection~~

~~Ground fault circuit interrupter protection for personnel shall be provided for cables installed in electrically heated floors of bathrooms and in hydromassage bathtub locations.~~

(G) Ground Fault Equipment Protection Circuit Interruption. Ground fault equipment protection circuit interrupter shall be provided for cables in all electrically heated floors.

Substantiation: 1. The existing requirement for ground fault circuit protection (GFCI) for personnel should be changed to ground fault equipment protection circuit interruption for the following reasons:

a. Heating cables protected by GFCIs have resulted in field complaints of nuisance tripping - i.e. where no fault exists but the GFCI trips due to natural leakage current of the cables and noise on the power lines. This nuisance tripping often result in users bypassing the GFCI protection, usually leaving them with no protection whatsoever.

Heating cables typically have much higher normal leakage than other heating appliances due to the length of cable involved in applications. Often, 400 ft of cable or more can be required for even bathroom areas, and, when the cable is operating at normal temperature, this results in leakage current of several milliamps, often very close to the trip threshold of a GFCI. Minor disturbances on the power line, such as another household appliance starting up, can then momentarily cause the leakage current to appear to increase above the GFCI trip level, thereby de-energizing the floor heating cables when no fault exists.

b. Heating cables are buried in concrete and are not in direct contact with persons. Even the potential for water coming in contact with the cables is a remote possibility, and, in the event of a breach in the cable insulation AND a breach in the grounding path, is certain to trip a ground fault equipment protection circuit interrupter.

c. Heating cables for snow melting applications require only GFEPCI protection. This protection ensures that faults in these cables are detected and the cables de-energized. Heating cables in snow melting applications expose persons to the virtual same risk as floor heating cables, and arguably, likely even more due to the routine presence of moisture on these cables.

Panel Meeting Action: Reject
Panel Statement: This proposal attempts to substitute GFPE for equipment vs. GFCI for personnel.

The panel rejects the substantiation for the submitter's items b. and c.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-35 Log #2058 NEC-P17 **Final Action: Reject**
(424.44)

Submitter: William Carter, Easy Heat, Inc.
Recommendation: Add text to read as follows:

424.44 Installation of Cables in Concrete or Poured Masonry Floors

(C) Secured in Place. Cables shall be secured in place by nonmetallic frames or spreaders or other approved means while the concrete or other finish is applied. Frames or spreaders may be metallic if the heating cable is protected by either ground fault equipment protection circuit interrupter (GFEPCI) or ground fault circuit interrupter (GFCI) or approved equivalent.

Cables shall not be installed where they bridge expansion joints unless protected from expansion and contraction.

(D) Spacings Between Heating Cable and Metal Embedded in the Floor. Spacings shall be maintained between the heating cable and metal embedded in the floor, unless the cable is a Listed grounded metal-clad or is protected by either ground fault equipment protection circuit interrupter (GFEPCI) or ground fault circuit interrupter (GFCI) or approved equivalent.

Substantiation: I. The requirement for nonmetallic frames or spreaders is not necessary if ground fault protection is provided for the cable as proposed for 424.44(G). Any fault that develops in the cable will be sensed by the GFEPCI or GFCI and it will de-engerize the circuit.

II. There has been some confusion regarding the term "metal-clad" cable; by adding the "Listed" requirement, this ensures it qualifies with the agency requirements for metal-clad cable.

III. The requirement for spacings between heating cable and metal embedded in the floor is not necessary if ground fault protection is provided for the cable as proposed for 424.44(G). Any fault that develops in the cable will be sensed by the GFEPCI or GFCI and it will de-energize the circuit.

Panel Meeting Action: Reject
Panel Statement: This proposal attempts to substitute GFPE for equipment vs. GFCI for personnel.

The panel rejects the substantiation for item III.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-36 Log #2112 NEC-P17 **Final Action: Reject**
(424.44)

Submitter: William Carter, Easy Heat, Inc.
Recommendation: Add the following text as a preamble:

The provisions of 424.44(A) through (G) shall apply to Listed cables embedded in concrete or poured masonry floors; additionally, tile or wood floor finishing may be set on top of these. Cables may be laid directly on wood sub-floors but must be covered with concrete or mortar or other approved material and must be at least 1/4 in. below the finished surface of the concrete, tile, wood or poured masonry floor. Other flooring materials may be placed on top of these floors, but these are not considered herein.

Substantiation: I. The term Listed ensures that heating cables have the appropriate agency approval.

II. Tile and wood are common flooring materials that floor heating cables are now being installed under, so it is reasonable to expand the scope of this section to include requirements for these materials.

III. Wood subfloors are commonly used as the base for heating cables, with the cables covered with mortar and then ceramic tile or wood type floor covering laid on top. Addressing this directly in the code provides a "vehicle" for ensuring that such installations are safely constructed.

IV. The requirement for a minimum coverage of mortar, tile, etc. ensures that cables are adequately protected from mechanical abuse that would result if they are flush with the floor surface.

V. The reference to "other flooring materials" reinforces that the "floor" is to be considered as the concrete, tile, wood or poured masonry ONLY and that other flooring materials laid on top of this floor, while permissible, are not considered in this section.

Panel Meeting Action: Reject
Panel Statement: This Code is not intended as a design specification or an instruction manual for untrained persons. The panel refers the submitter to 90.1(C).

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-37 Log #2020 NEC-P17 **Final Action: Reject**
(424.44(G))

Submitter: Russell Childs, Heatizen System
Recommendation: First Example:

424.44(G) Ground-Fault Circuit-Interrupter Protection

Ground-fault circuit-interrupter protection for personnel shall be provided for cables installed in electrically heated floors of bathrooms and in hydromassage bathtub locations.

Exception: Ground-Fault Circuit-Interrupter Protection. Ground-fault circuit-interrupter protection is not required for cable installed in electrically heated floor for bathroom and in hydromassage bathtub location where the cables are part of a Listed system which includes powering the cables from the secondary of an isolation transformer where the transformer is provided with a grounded metal barrier between the primary and secondary.

Example 2:

424.44(G) Ground-Fault Circuit-Interrupter Protection.

Ground-fault circuit- interrupter protection for personnel shall be provided for cables <u>supplied directly by a branch circuit</u> and installed in electrically heated floors of bathrooms and in hydromassage bathtub locations.

Example 3:

424.44(G) Ground-fault circuit- interrupter protection for personnel shall be provided for cables installed as part of electrically heated floors of bathrooms and in hydormassage bathtub locations. <u>Listed Equipment provided with an isolation transformer including a grounded shield between primary and secondary windings does not need to be additionally protected by Ground-fault Circuit interrupter protection.</u>

Substantiation: The need to provide GFCI protection on the secondary of an isolation transformer does not serve the purpose intended. First, when a GFCI is placed on the secondary of an isolation transformer there is no reference to ground and a ground fault would not trip a GFCI as there is no current to ground. Secondly, the systems in question are heater systems rated 120V for connection to a normal branch circuit, but the heater cables are connected to the secondary of an isolation transformer that includes a grounded shield between primary and secondary. These products are Listed by a NRTL as a complete product in compliance with UL standard. Having a GFCI inserted into the circuitry between the secondary of the transformer and the heater leads is modifying a listed product which should not be done in the field.

The transformer in use in these products have an isolated ungrounded secondary winding that has a grounded metal barrier between the primary and secondary and are the same construction as permitted for the lighting for swimming pools and spas in Section 680.25 of the 2005 NEC.

Panel Meeting Action: Reject
Panel Statement: The submitter did not provide a specific recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).
The submitter is encouraged to review and resubmit for the ROC with specific proposed text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-38 Log #1252 NEC-P17 **Final Action: Accept**
(424.85)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete: "...in accordance with Article 250".
Substantiation: To conform to the Style Manual. Article 250 already applies per 90.3.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

17-39 Log #2057 NEC-P17 **Final Action: Reject**
(424.90)

Submitter: William Carter, Easy Heat, Inc.
Recommendation: Add text to read as follows:
424.90 Scope. The provisions of Part IX of this article shall apply to radiant heating panels and heating panel sets. This section shall not apply to cables, or cables provided in a fixed form, embedded in mortar/concrete and installed in floors according to 424.44.
Substantiation: There has been confusion in the field between sections V Electric Space Heating Cables 424.44 (Installation of Cables in Concrete or Poured Masonry Floors) and IX Electric Radiant Heating Panels and Heating Panel Sets 424.90. By adding the sentence excluding cables installed according to 424.44, confusion will be alleviated.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree with the submitter's recommendation for "cables provided in fixed form". Cables provided in fixed form are covered by 424.90.
The proposal would change the scope of the article.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
BLEWITT, T.: The Submitter is correct that there has been confusion in the field regarding heating panel sets incorporating heating cable. Although the Panel Action and Statement are affirmed, the confusion in the field is not resolved. A modification of the definitions in 424.91 as indicated clarifies the intent that heating cables, factory pre-assembled in a standardized size (Submitter's "fixed form"), are covered by 424.90 unless identified otherwise.
424.91 Definitions.
Heating Panel . A complete factory fabricated unit ~~assembly~~ provided with a junction box or a length of flexible conduit for connection to a branch circuit.
Heating Panel Set. A field assembled system ~~rigid or nonrigid assembly~~ provided with nonheating leads or a terminal junction assembly identified as being suitable for connection to a wiring method specified in Chapter 3 ~~system~~ . Heated portions are normally factory pre-assembled in standardized widths. Heating cables pre-assembled in standardized widths are heating panel sets unless identified as electric space-heating cables.

17-40 Log #248 NEC-P17 **Final Action: Reject**
(424.93(A)(2)(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) In or behind surfaces where subject to ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13 \

17-41 Log #257 NEC-P17 **Final Action: Reject**
(424.93(B)(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(1) In or behind surfaces where subject to ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.,
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 426 — FIXED OUTDOOR ELECTRIC DEICING AND SNOW-MELTING EQUIPMENT

17-42 Log #247 NEC-P17 **Final Action: Reject**
(426.11)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
426.11 Use. Electrical heating equipment shall be installed in such a manner as to be afforded protection from ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "protection" means "physical protection."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-43 Log #246 NEC-P17 **Final Action: Reject**
(426.12)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
External surfaces of outdoor electric deicing and snow-melting equipment that operate at temperatures exceeding 60°C (140°F) shall be ~~physically~~ guarded, isolated, or thermally insulated to protect against contact by personnel in the area.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "protection" means "physical protection."

Panel Meeting Action: Reject

Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

17-44 Log #245 NEC-P17 **Final Action: Reject**
(426.22(A))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

426.22(A) Grounding Sheath or Braid. Nonheating leads having a grounding sheath or braid shall be permitted to be embedded in the masonry or asphalt in the same manner as the heating cable without additional ~~physical~~ protection.

Substantiation: Use of the word "physical" is superfluous - the purpose is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering this completely unnecessary. If a lead is nonheating, the protection clearly isn't going to be overload or ocercurrent.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "protection" means "physical protection."

Panel Meeting Action: Reject

Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

17-45 Log #2900 NEC-P17 **Final Action: Reject**
(426.28)

Submitter: Eugene Lucas, American Electronic Components

Recommendation: None.

Substantiation: I believe that in this article that GFCI should be used for dwelling units that are snow and ice melting devices. If the dwelling unit has a metal roof.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the requirements of the Regulations Governing Committee Projects, Section 4-3.3(c).

The submitter is encouraged to review and resubmit for the ROC with specific proposed text.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

17-46 Log #1744 NEC-P17 **Final Action: Reject**
(426.32 Exception (New))

Submitter: Neal Fenster, Thermo Systems Technology, Inc.

Recommendation: Revise paragraph 426.32 for the 2008 National Electrical Code. In the 2005 NEC currently the paragraph reads as follows:

"Unless protected by a ground-fault circuit-interrupter protection for personnel, the secondary winding of the isolation transformer connected to the impedance heating elements shall not have an output voltage greater than 30 volts ac.

Where ground-fault circuit-interrupter protection for personnel is provided, the voltage shall be permitted to be greater than 30 but not more than 80 volts.

We propose adding an exception to read:

<u>"Exception: Where conditions of maintenance and supervision ensure that only qualified personnel will service and maintain the heating elements and system, the voltage shall be permitted to be not more than 80 volts where ground-fault protection is provided with a trip setting not to exceed 30 Ma above the inherent leakage characteristic of the heating system."</u>

Substantiation: 1) These systems are normally located inside large fenced industrial facilities.

2) The piping systems involved are insulated and jacketed which will prevent contact with the internal metallic piping system.

3) Impedance systems, because of their higher current levels, are not compatible with a 5 Ma trip ground-fault circuit interrupter.

4) In a system designed to maintain desired operating temperatures, the inherent capacitive leakage current could be several amperes.

5) The leakage current at any point along the pipeline will typically be below 5 Ma, while the protective device with ground fault protection will monitor the total leakage.

Panel Meeting Action: Reject

Panel Statement: This proposal attempts to substitute GFPE for equipment vs. GFCI for personnel.

The panel rejects the substantiation because it does not pertain to the submitter's proposed text. The requirements for pipe tracing are not in this article.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

17-46a Log #CP1701 NEC-P17 **Final Action: Accept**
(426.44)

Submitter: Code-Making Panel 17,

Recommendation: Revise 426.44 to read as follows:

The ferromagnetic envelope shall be ~~grounded~~ <u>connected to an equipment grounding conductor</u> at both ends; and, in addition, it shall be permitted to be ~~grounded~~ <u>connected to an equipment grounding conductor</u> at intermediate points as required by its design.

The provisions of 250.30 shall not apply to the installation of skin-effect heating systems.

FPN: For grounding methods, see Article 250.

Substantiation: As Proposal 17-1 pertained to several articles (Articles 422, 426, 680 and 682), the panel chose to separate these into four (4) separate committee proposals to minimize confusion and act on them separately.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

17-47 Log #957 NEC-P17 **Final Action: Reject**
(426.50(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

All fixed outdoor deicing and snow-melting equpment shall be provided with ~~a means for disconnection from~~ <u>a switch or circuit breaker that simultaneously disconnects</u> all ungrounded conductors <u>of the circuit</u> . Where readily accessible to the user of the equipment, the branch circuit switch of circuit breaker shall be permitted to serve as the disconnecting means. Switches <u>or circuit breakers</u> used as the disconnecting means shall be of the indicating type <u>and provided with a positive lockout means in the "off" position.</u>

Substantiation: Edit. No specific type of disconnect is indicated; many types of devices will disconnect conductors. Disconnection should be simultaneous for all ungrounded conductors. The temperature controller of 426.51(A) is required to open all ungrounded conductors and have a positive lockout means. The disconnecting means of 427.55(A) and 427.56(A) require positive lockout provisions and the same should be required for these disconnecting means which may be remote from the equipment.

Panel Meeting Action: Reject

Panel Statement: The disconnecting means can be other than a switch or circuit breaker.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

17-48 Log #3408 NEC-P17 **Final Action: Accept**
(426.50(A))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Delete the phrase "provided with a positive lockout in the 'off' position" and replace it with "capable of being locked in the open position."

Substantiation: The term "positive lockout" is undefined in the NEC and not clear as to meaning. Disconnects that are to be capable of being locked open are familiar to all code users and the terminology is widely used throughout the NEC.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

17-48a Log #CP1704 NEC-P17 **Final Action: Accept**
(426.51 and 427.56)

Submitter: Code-Making Panel 17,
Recommendation: Change 426.51(A) to read as follows:
(A) Temperature Controller with ``Off'' Position Temperature controlled switching devices that indicate an ``off'' position and that interrupt line current shall open all ungrounded conductors when the control device is in the ``off'' position. These devices shall not be permitted to serve as the disconnecting means unless capable of being locked in the open position.
Change 426.51(D)(3) to read as follows:
(3) Be capable of being locked in the open position
Change 427.56(A) to read as follows:
A) Temperature Control with ``Off'' Position Temperature controlled switching devices that indicate an ``off'' position and that interrupt line current shall open all ungrounded conductors when the control device is in this ``off'' position. These devices shall not be permitted to serve as the disconnecting means unless capable of being locked in the open position.
Change 427.56(D)(3) to read as follows:
(3) Be capable of being locked in the open position
Substantiation: The panel changed 426.51 and 427.56 t o establish consistency with Proposal 17-48.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-49 Log #1251 NEC-P17 **Final Action: Accept**
(426.52)

TCC Action: It is the action of the Technical Correlating Committee that the panel reconsider the proposal and clarify that branch circuit sizing does not provide overcurrent protection. This action will be considered by the panel as a public comment.
Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text: Fixed outdoor electric de-icing and snow melting equipment shall be ~~permitted to be~~ protected against overcurrent by a branch circuit ~~as specified in 426.4~~ rated not less than 125 percent of the load.
Substantiation: 426.4 does not specify a branch circuit. The intent appears to require a branch circuit rated for continuous load. This should be a requirement, not "permitted".
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 427 — FIXED ELECTRIC HEATING EQUIPMENT

17-50 Log #2268 NEC-P17 **Final Action: Accept in Principle in Part**
(427.5)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
427.xx Fixed electric heating equipment for pipelines and vessels shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 202-2001, Recommended Practice for Installing and Maintaining Industrial Heat Tracing Systems, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 427. However, safety would be improved by offering more detailed installation guidance for fixed electric heating equipment for pipelines and vessels.
Panel Meeting Action: Accept in Principle in Part
Revise FPN following 427.1 to read as follows:
FPN: For further information, see ANSI/IEEE Std. 515-2002, Standard for the Testing, Design, Installation and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications; ANSI/IEEE Std. 844-2000, Recommended Practice for Electrical Impedance, Induction, and Skin Effect Heating of Pipelines and Vessels; and ANSI/NECA 202-2001, Recommended Practice for Installing and Maintaining Industrial Heat Tracing Systems.
Panel Statement: The panel did not include the submitter's sentence that included "in a neat and workmanlike manner" in order to comply with the NEC Style Manual, 3.2.1.
The panel incorporated the proposed FPN in the existing FPN of 427.1.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
ROCK, B.: NEMA opposes the portion of the Panel Action and Panel Statement to revise 427.1 FPN. This reference should not be included in the NEC since the NEC is not a design, installation or maintenance manual. NEC 90.1(C) specifically states: "This Code is not intended as a design specification or an instruction manual for untrained persons." NEMA does concur with the portion of the panel statement rejecting the addition of the sentence that included "in a neat and workmanlike manner," as this sentence would be redundant to the main requirement of 110.12.

17-51 Log #244 NEC-P17 **Final Action: Reject**
(427.11)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Electrical heating equipment shall be installed in such a manner as to be afforded protection from ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-52 Log #243 NEC-P17 **Final Action: Reject**
(427.12)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
External surfaces of pipeline and vessel heating equipment that operate at temperatures exceeding 60°C (140°F) shall be ~~physically~~ guarded, isolated, or thermally insulated to protect against contact by personnel in the area.
Substantiation: Use of the word "physical" generally is superfluous - the intent is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "protection" means "physical protection."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-52a Log #CP1705 NEC-P17 **Final Action: Accept**
(427.13)

Submitter: Code-Making Panel 17,
Recommendation: Change 427.13 to read as follows:
Identification
The presence of electrically heated pipelines, vessels, or both, shall be evident by the posting of appropriate caution signs or markings at intervals not exceeding 6 m (20 ft) along the pipeline or vessel and on or adjacent to equipment in the piping system that requires periodic servicing.
Substantiation: The panel agreed with the substantiation of Proposal 17-53 to remove the word "frequent" and specified a linear dimension. The panel specified 6 m (20 ft) to correlate with IEEE 515-2002.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-53 Log #2145 NEC-P17 **Final Action: Accept in Principle**
(427.13)

Submitter: Kurt Hamilton, Omaha Joint Electrical Apprenticeship and Training Committee
Recommendation: Revise text to read:
427.13 Identification. The presence of electrically heated pipelines, vessels, or both, shall be evident by the posting of appropriate caution signs or markings at ~~frequent~~ intervals not exceeding 3 m (10 ft) along the pipeline or vessel.
Substantiation: The current text of this article contains the term frequent, which is very vague and unenforceable. This section does not comply with the following section of the 2003 National Electrical Code Style Manual:
3.2.1 Unenforceable Terms. The NEC shall not contain references or requirements that are unenforceable or vague. The terms contained in Table 3.2.1 shall be reviewed in context, and, if the resulting requirement is unenforceable or vague, the term shall not be used.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-52a (Log #CP-1705).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-54 Log #242 NEC-P17 **Final Action: Reject**
(427.25)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
All accessible external surfaces of the pipeline or vessel, or both, being heated shall be ~~physically~~ guarded, isolated, or thermally insulated (with a weatherproof jacket for outside installations) to protect against contact by personnel in the area.
Substantiation: Use of the word "physical" is superfluous - the intent is obvious. In some instances, one could argue for the use of "mechanical" to differentiate that from e.g., "thermal" damage, but context makes the intended sense quite clear, rendering anything like this completely unnecessary.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "protection" means "physical protecton."
Panel Meeting Action: Reject
Panel Statement: The panel refers the submitter to the NEC Style Manual, 3.2.5.5.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-55 Log #1745 NEC-P17 **Final Action: Reject**
(427.27 Exception (New))

Submitter: Neal Fenster, Thermo Systems Technology, Inc.
Recommendation: Revise paragraph 427.27 and the 2008 National Electrical Code. In the 2005 NEC currently the paragraph reads as follows:
"Unless protected by a ground-fault circuit-interrupter protection for personnel, the secondary winding of the isolation transformer connected to the impedance heating elements shall not have an output voltage greater than 30 volts ac.
Where ground-fault circuit-interrupter protection for personnel is provided, the voltage shall be permitted to be greater than 30 but not more than 80 volts.
We propose add an exception to read:
" Exception: Where conditions of maintenance and supervision ensure that only qualified personnel will service and maintain the heating elements and system, the voltage shall be permitted to be not more than 80 volts where ground-fault protection is provided with a trip setting not to exceed 30 Ma above the inherent leakage characteristic of the heating system."
Substantiation: 1) These systems are normally located inside large fenced industrial facilities.
2) The piping systems involved are insulated and jacketed which will prevent contact with the internal metallic piping system.
3) Impedance systems, because of their higher current levels, are not compatible with a 5 Ma trip ground-fault circuit interrupter.
4) In a system designed to maintain desired operating temperatures, the inherent capacitive leakage current could be several amperes.
5) The leakage current at any point along the pipeline will typically be below 5 Ma, while the protective device with ground fault protection will monitor the total leakage.
6) This exception would be for systems not enclosed in a grounded metal enclosure, but would allow practical safe systems above 30 volts.
Panel Meeting Action: Reject
Panel Statement: This proposal attempts to substitute GFPE for equipment vs. GFCI for personnel, which would reduce safety for personnel.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-56 Log #1148 NEC-P17 **Final Action: Reject**
(427.55)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
~~Means~~ A switch or circuit breaker that simultaneously disconnects all ungrounded conductors of the circuit shall be provided to disconnect all fixed electric pipeline or heating vessel equipment ~~from all ungrounded conductors.~~
Substantiation: Edit. No specific type disconnect is indicated. Lugs, terminals, wire connectors, etc. are means of disconnection per definition. Simultaneous disconnection should be specified.
Panel Meeting Action: Reject
Panel Statement: The disconnecting means can be other than a switch or circuit breaker.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

17-57 Log #1027 NEC-P17 **Final Action: Reject**
(427.55(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence:
A ~~means~~ switch or circuit breaker shall be provided to simultaneously disconnect all ungrounded conductors of the circuit supplying fixed electric pipeline or vessel heating equpment ~~from all ungrounded conductors~~ .
Substantiation: Edit. No specific type of disconnect is indicated. Plug/receptacle, lugs, terminals, wire connectors are means of disconnection. E.g., removable links are permitted in 669.8(B).
Panel Meeting Action: Reject
Panel Statement: The disconnecting means can be other than a switch or circuit breaker.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 430 — MOTORS, MOTOR CIRCUITS, AND CONTROLLERS

11-16 Log #1690 NEC-P11 **Final Action: Reject**
(Figure 430.1)

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: Add text to read as follows:
Figure 430.1 Valve Actuator Motors Part XI
Substantiation: This is a companion proposal for a new addition for valve actuator motors. Companion proposal section numbers are: 430.2, 430.6(D) and 430 Part XI.
The NEC doesn't presently address valve actuator motors. Users in the industrial/petrochemical have tried for years to apply Article 430 to valve actuator motors without success. These motors do not fit into many of the present rules that are in Article 430. I believe they need their own section and special rules.
Panel Meeting Action: Reject
Panel Statement: Refer to the panel action and statement on Proposal 11-81.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
GOETZ, C.: It is understood that the proposed revision is not necessary as the companion proposal 11-81 to create a new part in Article 430 was not accepted.

11-16a Log #CP1101 NEC-P11 **Final Action: Accept**
(430.2)

TCC Action: The Technical Correlating Committee Rejects the panel action to add a new definition for "Engineering Supervision" to Article 430. The term is used throughout the NEC and if a definition is needed it should be under the purview of Code-Making Panel 1. The Technical Correlating Committee directs that this proposal be sent to Code-Making Panel 1 for consideration of action in Article 100 during the comment phase. This action will be considered by Code-Making Panel 1 as a Public Comment.

The Technical Correlating Committee directs that this proposal be forwarded to Panels 1, 2, 3, 6, 10, and 14 for public comment to Code-Making Panel 1.

Submitter: Code-Making Panel 11,

Recommendation: Add a new definition in 430.2 to read as follows:

Engineering Supervision. Direct supervision by an electrical engineer engaged primarily in the design or maintenance of electrical installations and who has skills and knowledge related to the construction and operation of the electrical equipment and installation.

Substantiation: The panel has provided a definition to correlate with the action on Proposal 11-34 and Proposal 11-45 where the term is used. The definition is needed to provide a clear indication of the level of qualification required to apply these calculations.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 12 Negative: 3

Explanation of Negative:

GLOVER, W.: The action on this proposal should have been Reject. Refer to my comments on proposals 11-34 and 11-45.

HAMER, P.: The term "Engineering Supervision" is used in many Articles of the NEC and as such, if the term is to be defined at all, it should be the responsibility of CMP-1 and not of CMP-11. The definition as recommended in this proposal does not provide a clear and objective set of criteria to determine qualifications. The AHJ would need to check the skills and knowledge of each engineer based on his or her own standards. This level of scrutiny should not be required for checks that could simply be made by references to tables or graphs (Proposals 11-34 and 11-45).

WRIGHT, J.: See NEMA negative comment on Proposals 11-34 and 11-45. NEMA does not support the Panel Meeting action. The proposed changes to the tap rules, even under engineering supervision, could reduce electrical safety. The proposed tap rules require an in-depth knowledge of the overcurrent device characteristics. In particular, this information is required not only during initial system installation but throughout the maintenance life of the system to ensure replacement by an identical device.

11-17 Log #1691 NEC-P11 **Final Action: Reject**
(430.2)

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.

Recommendation: Revise text to read as follows:

<u>430.2 Valve Actuator Motor Assemblies. A manufactured assembly consisting of a valve, valve actuator motor, and other components such as controllers, torque switches, limit switches, and overload protection. Valve actuator motor assemblies are also referred to as "motor-operated valves" or "MOVs".</u>

<u>FPN: Valve actuator motors have a unique design that can result in significantly different operating characteristics than NEMA Design B motors. Continuous duty motors, such as NEMA Design B motors, are rated in horsepower, which implies a constant torque. Valve actuator motors are neither continuous duty nor constant torque at rated speed. They can be characterized as short duty time, high starting torque motors.</u>

Substantiation: This is a companion proposal for a new addition for valve actuator motors. Companion proposal section numbers are: Figure 430.1, 430.6(D) and 430 Part XI.

The NEC doesn't presently address valve actuator motors. Users in the industrial/petrochemical have tried for years to apply Article 430 to valve actuator motors without success. These motors do not fit into many of the present rules that are in Article 430. I believe they need their own section and special rules.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Refer to the panel action and statement on Proposal 11-81.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

GOETZ, C.: It is understood that the proposed new definition is not necessary as the companion proposal 11-81 to create a new part in Article 430 was not accepted. Additionally, the defined term "Valve actuator motor assemblies" is not used anywhere in the current text of Article 430.

11-18 Log #2689 NEC-P11 **Final Action: Reject**
(430.6(A)(1) and (2))

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Recommendation: Delete all of the present text in 430.6(A)(1) and (2) and replace with text as follows:

(1) Nameplate Values. Motor nameplate current ratings shall be used to determine the ampacity of conductors used or ampere ratings of switches, branch-circuit short-circuit and ground-fault protection.

Exception No. 1: The values given in Table 430.247, Table 430.248, Table 249, and Table 250 in Annex F shall be permitted to be used in lieu of the motor nameplate current rating.

(2) Separate motor overload protection shall be based on the motor nameplate current rating.

Substantiation: This proposal is contingent on acceptance of the proposal to relocate Table 430.247, Table 430.248, Table 249 and Table 250 to a new Annex F or wherever the panel should decide.

Apparently the existence of 430.6(A)(1) is to provide oversize conductors that would be available if and when the motors are replaced because there is no assurance that these future replacement motors will be as efficient as the motors being replaced This puts the National Electrical Code in the position of designing electrical installations for future use. Using motor nameplate current ratings to determine ampacity of conductors used, ampere ratings of switches, branch-circuit short-circuit and ground-fault protection and separate motor overload protection is a prescribed manner of electrical design and provides the proper degree of safety desired. If and when it becomes necessary to replace a motor, the qualified electrical installer will be competent enough to size conductors and equipment properly without pre-installed oversized conductors installed "just in case".

It is not the purpose of the National Electrical Code to mandate electrical design beyond that which is considered necessary for safety. If nameplate current ratings are safe enough for all the sizes and types of motors not included in the Tables 430.247, -48, -49 and 50 in addition to all the motors excepted from the tables then the nameplate ratings should be acceptable for all motors.

Panel Meeting Action: Reject

Panel Statement: The submitter has to consider that many times motors are changed under emergency conditions that even under the normal design process do not always lend themselves to any consideration other than the horsepower and voltage ratings of the motor. The tables provided in the NEC provide a consistent source that guarantees safety over a wide range of motor applications.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-19 Log #1692 NEC-P11 **Final Action: Reject**
(430.6(D))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.

Recommendation: Add text to read as follows:

<u>430.6(D) Valve Actuator Motors. Valve actuator motor conductor ampacity, the ampere ratings of switches and branch-circuit short-circuit and ground fault protection will vary based on the type of valve actuator motor. The valve actuator motor shall be installed in accordance with manufacturer's instructions and all calculations shall be made under engineering supervision.</u>

Substantiation: This is a companion proposal for a new addition for valve actuator motors. Companion proposal section numbers are: Figure 430.1, 430.2 and 430 Part XI.

The NEC doesn't presently address valve actuator motors. Users in the industrial/petrochemical have tried for years to apply Article 430 to valve actuator motors without success. These motors do not fit into many of the present rules that are in Article 430. I believe they need their own section and special rules.

Panel Meeting Action: Reject

Panel Statement: Refer to the panel action and statement on Proposal 11-81.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

GOETZ, C.: The first sentence of the recommended text is not a requirement and refers to the ratings of switches and branch circuit short circuit and ground fault protection that are not covered under Section 430.6 for determining the size of conductors. IEEE Standard 1296 suggests that most valve-actuated motors draw less than 15A where 14AWG conductors would normally be installed. The submitter has not provided substantiation as to why the valve actuator motor current ratings cannot be established so that installers may select suitable conductors.

11-20 Log #3158 NEC-P11 **Final Action: Accept**
(Table 430.7(B))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Insert lines into table as shown below:

Table 430.7(B) Locked-Rotor Indicating Code Letters

Code Letter	Kilovolt-Amperes per Horsepower with Locked Rotor
A	0–3.14
B	3.15–3.54
C	3.55–3.99
D	4.0–4.49
E	4.5–4.99
F	5.0–5.59
G	5.6–6.29
H	6.3–7.09
J	1–7.99
K	8.0–8.99
L	9.0–9.99
M	10.0–11.19
N	11.2–12.49
P	12.5–13.99
R	14.0–15.99
S	16.0–17.99
T	18.0–19.99
U	20.0–22.39
V	22.4 and up

Substantiation: Inserting these lines will make the Table easier to use, more "user friendly", and perhaps reduce the possibility of user error.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-21 Log #2346 NEC-P11 **Final Action: Reject**
(430.9(C))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Delete torque requirements (C).
Substantiation: The 2002 cycle rejected the inclusion of torque requirements as this places the responsibility of torque verification on the electrical inspector. This is the responsibility of the installer.
Panel Meeting Action: Reject
Panel Statement: Proper torque is essential for safe and reliable connections and consistent with
Section 110.14(B). Deletion of these requirements could result in unreliable connections. If the terminal strip or other small equipment does not have information on what the torque value is, then this Code section gives the installer a minimum value to use for that equipment.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-22 Log #1502 NEC-P11 **Final Action: Accept in Part**
(430.11)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "injurious" to "damaging".
Substantiation: Edit. Materials and equipment are not sensate, they may be damaged but not injured.
Panel Meeting Action: Accept in Part
The panel accept the deletion of the word "injurious". The panel does not accept insertion of the word "damaging".
Panel Statement: The current adjective "injurious" and as recommended replacement, "damaging", describing the nature of a liquid is not useful or enforceable in terms of this requirement. Motor enclosures and guards are intended to provide protection from spraying or dripping liquids.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-23 Log #3001 NEC-P11 **Final Action: Reject**
(Table 430.12(B))

Submitter: Jerry D. Cain, Charolais Coal No. 1 LLC
Recommendation: Revise text as follows:

Motors Over 275 mm (11 in.) in Diameter – Alternating-Current Motors

Maximum Full Load Current for 3-Phase Motors with Maximum of 12 Leads (Amperes)	Terminal Box Cover Opening Minimum Dimension mm	in.	Usable Volume Minimum cm³	in.³	Typical Maximum Horsepower 3-Phase 230 Volt	460 Volt
45	~~65~~	~~2.5~~	~~595~~	~~36.4~~	~~15~~	30
70	~~84~~	~~3.3~~	~~1,265~~	~~77~~	~~25~~	50
110	~~100~~	~~4.0~~	~~2,295~~	~~140~~	~~40~~	75
160	~~125~~	~~5.0~~	~~4,135~~	~~252~~	~~60~~	125
250	~~150~~	~~6.0~~	~~7,380~~	~~450~~	~~100~~	200
400	~~175~~	~~7.0~~	~~13,775~~	~~840~~	~~150~~	300
600	~~200~~	~~8.0~~	~~25,225~~	~~1540~~	~~250~~	500
45	100	4.0	2,295	140	15	30
70	150	6.0	7,380	450	25	50
110	200	8.0	8,960	560	40	75
160	250	10.0	13,775	840	60	125
250	300	12.0	25,255	1540	100	200
400	325	14.0	35,840	2240	150	300
600	400	16.0	46,080	2880	250	500

Substantiation: It is common practice in industry to connect motors via conduit and a short section of flex to allow for motor alignment and adjustment. The leads from the motor are several sizes smaller than the NEC requires to operate the motor. Most terminal boxes supplied with large frame motors do not provide ample room to make connections and insulate such connections, especially if wire is oversized for voltage drop or temperature correction factors.
One could extend the motor leads to a junction box and connect to the larger wire, however this would add significant cost. I have seen motors where the terminal box has been replaced with a NEMA 4X Enclosure to obtain additional wiring space. Article 314 addresses space requirements for junction boxes, Article 430 should at a minimum apply the same requirements. Note, if don't understand what I am trying to convey, just imagine crimping a terminal on 350 MCM then connect it to the motor lead and insulate it in a box the size of letter size paper, then do it two more times and try to stuff it all in the box and close the lid. I can generally hook up a motor on a new installation without a lot of trouble, however, when you have to change one that has operated for years and the wires have become stiff is a different matter. Please address this problem and give everyone that has to deal with these situations a little relief.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided sufficient technical substantiation for increasing the sizes of these enclosures. In 430.12(D) the Code specifies minimum sizes and allows larger sizes to be installed.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-24 Log #652 NEC-P11 **Final Action: Reject**
(430.14(A))

Submitter: Darrell Morrow, Morrow Electric Company
Recommendation: Add new text as follows:
Attic ventilation should be installed where they can be serviced without having to construct a way to get to them.
Substantiation: Most attic ventilators are installed at the highest point of the roof. To replace a ventilator you either have to install plywood on the rafter and set a ladder on it or let a latter straddle the rafter. Either way is very dangerous.
Panel Meeting Action: Reject
Panel Statement: The Code does not require motors to be readily accessible. Location of ventilation equipment is a design consideration and the responsibility of the mechanical code.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-25 Log #2269 NEC-P11 **Final Action: Reject**
(430.19 (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
430.xx Motors and motor controllers shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 230-2003, Standard for Selecting, Installing, and Maintaining Electric Motors and Motor Controllers, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 430. However, safety would be improved by offering more detailed installation guidance for motors and motor controllers.
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are presently covered in 110.12.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-26 Log #1158 NEC-P11 **Final Action: Reject**
(430.22(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
For a wye-start delta-run connected motor the ~~selection~~ ampacity of the branch circuit conductors on the line side of the controller shall be ~~based on~~ not less than 25 percent of the motor full-load current. The ~~selection~~ ampacity of conductors between the controller and the motor shall be ~~based on~~ not less than ~~58~~ 72 percent of the motor full-load current.
Substantiation: Edit. Proposal is a positive statement consistent with similar code wording. Ampacity is what is addressed, "selection" may infer other criteria. The proposal is specific and not prone to misinterpretation.
Panel Meeting Action: Reject
Panel Statement: The current text in 430.22(C) properly and clearly provide the requirements. The panel advises that the general requirements of 430.22(A) are applicable to 430.22(C). The term "selection" is consistently used in 430.22(B), (C), and (D) and refers back to the ampacity requirements in (A). The submitter's proposal does not improve clarity.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-27 Log #3154 NEC-P11 **Final Action: Accept**
(Table 430.22(E))

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Insert lines into table as shown:

Table 430.22(E) Duty-Cycle Service

	Nameplate Current Rating Percentages			
Classification of Service	**5-Minute Rated Motor**	**15-Minute Rated Motor**	**30- & 60-Minute Rated Motor**	**Contin-uous Rated Motor**
Short-time duty operating valves, raising or lowering rolls, etc.	110	120	150	—
Intermittent duty freight and passenger elevators, tool heads, pumps, drawbridges, turntables, etc. (for arc welders, see 630.11)	85	85	90	140
Periodic duty rolls, ore- and coal-handling machines, etc.	85	90	95	140
Varying duty	110	120	150	200

Substantiation: Inserting these lines will make the Table easier to use, more "user friendly", and perhaps reduce the possibility of user error.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-28 Log #2834 NEC-P11 **Final Action: Reject**
(430.24 Exception (New))

Submitter: Russell A. Tiffany, York International Corp.
Recommendation: Where one or more of the motors of the group are powered from an equipment mounted variable frequency drive, the ampere rating of the drive and/or drives shall be permitted in the summation of the full-load current ratings of the group.
Substantiation: UL allows the equipment wiring lugs to be sized per the nameplate ampacity on equipment based on the ampacity of the drive/drives, but 430.24 only considers the motors, but does not consider the drives. By allowing the smaller conductors, you allow the designer to increase the impedance of the circuit, now reducing the available fault current and helping reduce the risk of injury if a fault occurs.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided sufficient substantiation for the change. In addition the panel does not agree with the second sentence of the submitter's substantiation. Furthermore, it is unclear as to exactly what the submitter intends.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
BUNCH, R.: The panel action was appropriate as we had several questions related to what the submitter was asking for and what we thought he might be asking. Since the ROP, I spoke with Mr. Tiffany and he, in fact, was asking for the exception only for equipment with the drive mounted as part of the original equipment. The panel may not change its basic position, but does need to reevaluate the proposal under the clarified intent of the submitter.

11-29 Log #2705 NEC-P11 **Final Action: Reject**
(430.26)

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise as follows:
430.26 Feeder Demand Factor.
(A) For the purposes of this article, Supervised Industrial Installations shall be defined as installations meeting the following conditions:
(1) Conditions of maintenance and engineering supervision ensure that only qualified persons design, control, monitor and service the system.
(2) The premises has at least one service or feeder that is more than 150 volts to ground and more than 300 volts phase to phase.
This definition excludes installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant substation, or control center.
(B) Supervised Industrial Installations. For Supervised Industrial Installations, allowable ampacity of feeder conductors supplying several motors, or a motor(s) and other load(s) shall be permitted to be the product of the ampacity calculated in 430.24 and a demand factor. The demand factor shall be calculated and applied under engineering supervision and meet the following requirements:
(1) The application of a determined demand factor must yield sufficient ampacity capable of serving the actual operating load in accordance with the size and number of motors supplied and the character of their loads and duties.
(2) The minimum allowable demand factor applied shall not be less than 50%.
(C) All Other Installations. Where reduced heating of the conductors results from motors operating on duty-cycle, intermittently, or from not all motors operating at the same time, the authority having jurisdiction may grant permission for feeder conductors to have an ampacity less than specified in 430.24, provided the conductors have sufficient ampacity for the maximum load determined in accordance with the size and number of motors supplied and the character of their loads and duties.
FPN: Demand factors determined in the design of new facilities can often be validated against actual historical experience from similar installations. Refer to ANSI/IEEE Std. 141, Recommended Practice for Electric Power Distribution for Industrial Plants and ANSI/IEEE Std. 241, Recommended Practice for Electric Power Systems in Commercial Buildings, for information on the calculation of loads and demand factor.
Substantiation: The National Electrical Code does not specifically recognize the use of demand factors in the determination of loads in Supervised Industrial Installations. As a result, the NEC determined loads are overly conservative and require distribution systems with higher than needed ratings at a significant cost to owners. 430.26 recognizes ampacities calculated per 430.24 may be overly conservative for motor installations where not all motors operate at the same time and/or motors are oversized with respect to the actual mechanical load served. However, it does not offer a practical guideline for determination of a safe operating ampacity in these circumstances. This proposal offers such a guideline for Supervised Industrial Installations in which condition of maintenance and engineering supervision ensure that only qualified persons design, monitor and service the system. This proposal makes use of concepts

the NEC already recognizes such as demand factor, Supervised Industrial Installations, and engineering supervision. For Supervised Industrial Installations, it appropriately puts the responsibility for the proper determination of demand factor on engineering supervision.
Panel Meeting Action: Reject
Panel Statement: The new sub-item (A) of the recommended text is a modified version of the definition of supervised industrial installation in the current Section 240.2. No substantiation is provided as to why the existing definition is not suitable for Article 430.26(A). No technical substantiation is given as the basis or conditions when conductor ampacity may be 50 percent of the ampacity required by Section 430.24.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
GLOVER, W.: The action on this proposal should have been Accept in Principle in Part.
Paragraph (A) of the proposal should have been rejected since there is an existing definition of supervised industrial installations in 240.2.
The submitter requests a means to assure acceptance during final construction, of a properly determined demand factor that was applied during the initial design and estimating phase of an industrial project. The need to apply this demand factor may occur a few years before the AHJ acts on its acceptability per 430.26. The risk of not having any prior assurance of acceptance prevents engineers from taking proper advantage of a demand factor that would reduce the cost of their facilities.
The basis for a minimum demand factor of 50 percent is for those applications where all motors have a standby (non-running) spare.

11-30 Log #207 NEC-P11 **Final Action: Accept**
(430.28)

TCC Action: The Technical Correlating Committee understands that the panel action on this proposal results in no change to the existing text.

NOTE: The following proposal consists of Comment 11-18 on Proposal 11-26 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 11-26 was: Revise text as follows:
Feeder tap conductors shall have an ampacity not less than that required by Part II, shall terminate ~~in a branch circuit~~ <u>an</u> overcurrent protective device and in addition, shall meet at least one of the following conditions:
(1) no change;
(2) no change;
(3) have ~~the same~~ <u>an</u> ampacity <u>not less than</u> ~~as~~ the feeder conductors.
Make present exception Exception No. 1.
Add <u>Exception No. 2: Feeder taps in accordance with 240.21(B)(5) shall be permitted.</u>
The Technical Correlating Committee directs that this comment be reported as "hold" and returned to the Panel for futher processing during the next code cycle.
The Technical Correlating Committee does not agree with the panel statement that 240.21(B) can be applied to motor branch circuits. If this were the case, 430.28 and 240.21(B) would be in conflict in a number of instances. Specifically, in the application of the 10 ft. and 25 ft. tap rules. The panel is directed to reconsider the issue during the next code cycle and ensure that, if the panel desires, 430.28 includes language to allow the use of other taps for motor circuits.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the reference being in conflict with the NEC Style Manual. This action will be considered by the Panel as a Public Comment
Substantiation: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
Panel Meeting Action: Accept
Panel Statement: Accept TCC direction to review this proposal from the 2005 Code cycle but continue to reject the proposal, as the substantiation does not provide sufficient examples of field problems that would be rectified by this new text.
Further, the panel does not accept the addition of the proposed Exception No. 2 to Section 430.28. Section 430.28 only deals with the conductor size of feeder taps. In the proposed reference to Section 240.21(B)(5), only subpart (2) deals with the conductor size and is no different from the current Section 430.28(3). The proposed Exception No. 2 adds no new information with regard to the conductor size used for feeder taps and would create confusion that the balance of the requirements of Section 240.21(B)(5) referring to the location and accessibility of overcurrent protection and disconnecting means could be employed in motor feeder circuits.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
CACCAMESE, J.: In order to be clear, the proposal should be and was reviewed. However, the panel action should be to "reject" the proposal. It is my concern that with the panel action indicating an "accept" there will be a misunderstanding that the proposal was accepted when the panel statement indicates that it should be rejected.
Comment on Affirmative:
GOETZ, C.: It is understood that by accepting the TCC proposal 11-30, no text in Section 430.28 is revised.
SAPORITA, V.: It is imperative that the tap terminates in a branch-circuit protective device. All overcurrent devices are not branch-circuit overcurrent devices. Only a branch-circuit overcurrent device with full range (overload and short-circuit) capability shall be permitted at the tap's termination. Tap conductors are not fully protected at their point of connection and, therefore, must be protected with a branch-circuit overcurrent device at their termination for safety reasons. See CMP 10 actions on 10-1a.

11-31 Log #208 NEC-P11 **Final Action: Accept**
(430.28)

TCC Action: The Technical Correlating Committee understands that the panel action on this proposal results in no change to the existing text.

NOTE: The following proposal consists of Comment 11-20 on Proposal 11-26 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 11-26 was: Revise text as follows:
Feeder tap conductors shall have an ampacity not less than that required by Part II, shall terminate in ~~a branch circuit~~ <u>an</u> overcurrent protective device and in addition, shall meet at least one of the following conditions:
(1) no change;
(2) no change;
(3) have ~~the same~~ <u>an</u> ampacity <u>not less than</u> ~~as~~ the feeder conductors.
Make present exception Exception No. 1.
Add <u>Exception No. 2: Feeder taps in accordance with 240.21(B)(5) shall be permitted.</u>
The Technical Correlating Committee directs that this comment be reported as "Hold and returned to the committee for futher processing during the next cycle. See Technical Correlating Committee Note on Comment 11-18.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Accept the proposed Exception No. 2 in the original proposal.
Substantiation: The proposed exception is in full agreement with the Style Manual. There is no hazard in running a tap conductor of indefinite length from outside the building, as the experience with this provision in 240.21(B) has demonstrated over the years.
Panel Meeting Action: Accept
Panel Statement: Refer to the panel action and statement on Proposal 11-30.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
GOETZ, C.: It is understood that by accepting the TCC proposal 11-31, no text in Section 430.28 is revised.

11-32 Log #241 NEC-P11 **Final Action: Reject**
(430.28(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Have an ampacity of at least one-third that of the feeder conductors, be suitably protected from ~~physical~~ damage or enclosed in a raceway, and be not more than 7.5 m (25 ft) in length.
Substantiation: Use of the word "physical" is superfluous - the intent is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-33.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-33 Log #240 NEC-P11 **Final Action: Reject**
(430.28(3) Exception (c))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
The tap conductors are suitably protected from ~~physical~~ damage and are installed in raceways.
Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The term "physical" is used in many sections of the Code. This term needs to remain in this section to provide descriptive information to the installer on what type of damage the Code section is concerned with. The adjective "physical" is necessary to differentiate from other types of damage such as cosmetic damage. The intent of the Code is clear as written.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-34 Log #2880 NEC-P11 **Final Action: Reject**
(430.28(4) (new) and Table 430.28(4) (new))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
The reader is directed to the panel statement on Proposal 11-45 for reference. The panel statement shown in Proposal 11-34 does not correlate with the action taken by the panel.
Submitter: Robert Padgham, Jacksonville, FL
Recommendation: Add the following new text as 430.28(4) and the following new table as Table 430.28(4).
430.28(4) Be suitably protected from physical damage or enclosed in a raceway, and protected in accordance with Table 430.28(4).
Table 430.28(4) Conductor Short-Circuit Current Ratings. Conductors are considered to be protected under short-circuit conditons when their short-circuit temperature limit is not exceeded. Conductor heating under short-circuit conditions is determined by (1) or (2):
(1) Short-Circuit Formula for Copper Conductors
$(I^2/A^2)\,t = 0.0297 \log_{10} ((T_2 + 234)/(T_1 + 234))$
(2) Short-Circuit Formula for Aluminum Conductors
$(I^2/A^2)\,t = 0.0125 \log_{10} ((T_2 + 228)/(T_1 + 228))$
where
I = short-circuit current in amperes
A = conductor area in circular mils
t = time of short-circuit in seconds (for times less than or equal to 10 seconds)
T_1 = initial conductor temperature in degrees Celsius.
T_2 = final conductor temperature in degrees Celsius.
Copper conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Copper conductor with thermoplastic insulation $T_2 = 150$
Copper conductor wiht crosslinked polyethylene insulation $T_2 = 250$
Copper conductor with ethylene propylene rubber insulation $T_2 = 250$
Aluminum conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Aluminum conductor with thermoplastic insulation $T_2 = 150$
Aluminum conductor with crosslinked polyethylene insulation $T_2 = 250$
Aluminum conductor with ethylene propylene rubber insulation $T_2 = 250$
Substantiation: North American industry is in a daily struggle to compete with global competitors. As such, we need every possible chance to reduce costs, but with safety as the number one directive. That is the intent of this proposal.
The existing NEC requirements for motor circuit feeder taps dictate that the ampacity of the tap conductors be at least 1/10 of the feeder overcurrent device (ten foot tap) or 1/3 of the feeder conductor ampacity (twenty-five foot tap). At first, this sizing seems reasonable when considering that the feeder circuit device is being asked to provide short-circuit protection for the smaller tap conductors. But, this is often extremely conservative and frequently results in a conductor sized much larger than is actually required according to the laws of physics. By using formulas that have been widely utilized by IEEE, the Canadian Electrical Code, and the IEC, much smaller conductors can be installed. This will provide significant cost savings for industrial distribution systems, allowing North American manufacturers to be more competitive in the global marketplace.
An example would be helpful. Assume a feeder conductor is a 3/0 with an ampacity of 200 amperes. According to the 2005 NEC, the smallest 25 foot tap conductor would be a 4 AWG with an ampacity of 85 amperes, even if it were only supplying a 5 hp motor at 7.6 amperes. (Three times the ampacity of a 6 AWG, with an ampacity of 65 only gives 195 amperes, which doesn't meet the 200 ampere requirement.) According to the physics formula, and UL standards, a 200 ampere Class J fuse will protect a 10 AWG conductor for faults up to 200,000 amperes. (Maximum I^2t let-through of a 200 ampere Class J fuse at 600 volts with 200,000 amperes available is 300×10^3 ampere squared seconds, while the short-circuit withstand of a 10 AWG copper conductor is 303×10^3 ampere squared seconds.) As we can imagine the cost savings here will be substantial, and within the safety umbrella of internationally accepted standard physics formulas.
The physics formulas submitted with this proposal are the accepted basis for conductor short-circuit temperatures throughout the world. They are found in the ANSI/IEEE Red, Gray, Buff, and Blue Books and in the Canadian Electrical Code. Similar versions of these formulas are found in IEC 60204-1 (IEC Machinery Standard), SAE HS-1738 (Automotive Industry Machinery Standard), and IEC 60364-4-43 (IEC Installation Standard).
Let's give North American industry every possible (safe) option to be competitive in the global market by accepting this proposal.
Panel Meeting Action: Accept in Principle
Add new 430.28(4) to read as follows:
(4) Be suitably protected from physical damage or enclosed in a raceway and determined under engineering supervision to be protected under short-circuit conditions. Conductors are considered to be protected under short-circuit conditions when their short-circuit temperature limit is not exceeded as calculated by the following general formulas:
(1) Short-Circuit Formula for Copper Conductors
$(I^2/A^2)t = 0.0297 \log_{10} ((T_2 + 234)/(T_1 + 234))$
(2) Short-Circuit Formula for Aluminum Conductors
$(I^2/A^2)t = 0.0125 \log_{10} ((T_2 + 228)/(T_1 + 228))$
where
I = short-circuit current in amperes
A = conductor area in circular mils
t = time of short-circuit in seconds (for times less than or equal to 10 seconds)
T_1 = initial conductor temperature in degrees Celsius
T_2 = final conductor temperature in degrees Celsius
Copper conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Copper conductor with thermoplastic insulation $T_2 = 150$
Copper conductor with crosslinked polyethylene insulation $T_2 = 250$
Copper conductor with ethylene propylene rubber insulation $T_2 = 250$
Aluminum conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Aluminum conductor with thermoplastic insulation $T_2 = 150$
Aluminum conductor with crosslinked polyethylene insulation $T_2 = 250$
Aluminum conductor with ethylene propylene rubber insulation $T_2 = 250$
Panel Statement: The proposal includes calculations that would be difficult for the installer to use. The smaller wire sizes proposed would not enhance the safety of the electrical system. Unless performed under engineering supervision, the enforcement would be difficult to ensure the calculations are accurate.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 9 Negative: 6
Explanation of Negative:
BRINKMEYER, W.: The primary reason given in the submitter's substantiation is that cost savings could be realized by reducing the size of these tap conductors through the proposed use of very complex formulas and difficult calculations. The stated purpose of the NEC is the practical safeguarding of persons and property arising from the use of electricity. This proposal is not practical and does nothing to enhance safety. Cost savings should not be the primary reason to make this change. The panel statement itself concludes that the calculations would be difficult for the installer to use and the smaller wire sizes would not enhance safety of the electrical system. Further, enforcement would be difficult to ensure the accuracy of the calculations.
FAHEY, R.: The panel action should have been to reject this proposal to add new Section 430.28(4) and Table. The proposal as submitted does not enhance a safer installation. I do not agree tap conductors should be permitted in unlimited lengths, thereby increasing resistance in the conductor and limiting proper opening of the overcurrent device under fault conditions.
The substantiation that this proposed change will assist in competitiveness should not be considered as justification to reduce safety.
As accepted, there would be no limitations on the type of occupancy for which this installation would be permitted. This new calculation should only be permitted where installed and serviced by qualified personnel.
The substantiation for the proposal references the Canadian Electrical Code (CEC). CEC Section 28 covers motors, this Section does not have a similar formula to calculate conductor sizes for motor taps as is proposed for the

National Electrical Code (NEC). Section 28 of the CEC has rules similar to the existing NEC rules for tap conductors.

If accepted, this will reduce the safety of the installations of tap conductors and increase the possibility of injury to people who service these installations.

I would be in favor of acceptance if only permitted under engineering supervision by special permission in industrial locations where qualified personnel service the equipment. This should help satisfy the submitter's concerns and at the same time guarantee a safer installation that is enforceable by the authority having jurisdiction.

GLOVER, W.: The action on this proposal should have been Accept.

The calculations may be difficult for some persons to perform, but I do not agree they are of such a difficulty to require by code an engineer. We should insist on qualified persons making the calculations (on this and any other calculation in the code) rather than insisting on engineers. There are other personnel with skills and knowledge related to the design, construction and operation of electrical equipment and installations that are fully qualified to perform these calculations.

GOETZ, C.: The proposed requirement as modified by the panel does not adequately consider overload protection of the tap conductors. The overcurrent protection at the end of a motor feeder tap is permitted to be sized greater than the ampacity of the conductors, such as when the feeder tap is to supply another feeder, or combination loads. The proposed equation should be rearranged so that it is clear that the conductor area, A, is the number to be found from the equation based upon entering appropriate data under engineering supervision. While the submitter used the maximum allowable I squared t for a specific size and type of fuse, this data is not required or referenced by the proposed new text. Presumably, the lowest published numbers available will be sought so that conductors even smaller than those determined by the example in the substantiation would meet this requirement. Not all overcurrent protective devices have such standardized characteristics whereby replacement overcurrent protective devices characteristics may vary from those used for the original calculations. Replacement branch circuit short circuit and ground fault protection having let-through characteristics greater than those used originally to justify the reduced conductor size could lead to dangerous overheating and damage to the tap conductor insulation. Therefore, it is strongly suggested that a warning marking be placed by the branch circuit protective device so that when a replacement branch-circuit short -circuit and ground-fault protective device is subsequently installed, that the calculations be re-performed under engineering supervision to ensure that the new overcurrent protective device provides protection under short circuit conditions that are suitable for the conductors that are already installed.

TODD, L.: After review and consideration of the comments on negative votes, I now believe that this change in wire size is more complicated than the proposal makes it seem. Also, once installed as changes are made in the future is there going to be consideration of the smaller size wire already installed? Also, there is considerable uncertainity on the qualification of those who should make these calculations. The main substantiation was the cost of current methods. I think that testing showing that these smaller sizes of wire are acceptable should be provided.

WRIGHT, J.: NEMA does not support the Panel Meeting action. The proposed changes to the tap rules, even under engineering supervision, could reduce electrical safety. The proposed tap rules require an in-depth knowledge of the overcurrent device characteristics. In particular, this information is required not only during initial system installation, but throughout the maintenance life of the system to ensure replacement by an identical device.

11-35 Log #841 NEC-P11 **Final Action: Accept**
(430.31)

Submitter: Stephen W. Drayton, Eastern Idaho Electrical JATC
Recommendation: Revise text to read as follows:

~~Overload in electrical apparatus is an operating overcurrent that, when it persists for a sufficient length of time, would cause damage or dangerous overheating of the apparatus. It does not include short circuits or ground faults.~~ FPN: See definition of overload in Article 100.
Substantiation: We believe that definitions should not have to repeated throughout the NEC. This will also help in reducing the size of the NEC. i.e., see also 210.21(B)(1), FPN.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-36 Log #156 NEC-P11 **Final Action: Accept in Principle**
(430.32(C))

Submitter: Steven Duritt, Empire Abrasive Equipment Co.
Recommendation: Revise as follows:

(C) Selection of Overload Relay. Where the sensing element or setting of ~~the~~ an overload relay selected in accordance with 430.32(A)(1) and 430.32(B)(1) is not sufficient to start the motor or to carry the load, higher size sensing elements or incremental settings shall be permitted to be used, provided the trip current of the overload relay does not exceed the following percentage of motor nameplate full-load current rating:
Substantiation: 430.32(A)(1) and 430.32(B)(1) refer to overload devices. An overload relay is one type of overload device. Using "the" implies an overload relay is the only type of overload device which may be selected. Using "an" correctly states that an overload relay is only one type of overload device which may be selected.
Panel Meeting Action: Accept in Principle

See Panel Action Proposal 11-37.
Panel Statement: Changing "the" to "an" is not needed because the panel action on Proposal 11-37 achieves the same goal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-37 Log #157 NEC-P11 **Final Action: Accept**
(430.32(C))

Submitter: Steven Duritt, Empire Abrasive Equipment Co.
Recommendation: Revise as follows:

(C) Selection of Overload ~~Relay~~ Device. Where the sensing element or setting or sizing of the overload ~~relay~~ device selected in accordance with 430.32(A)(1) and 430.32(B)(1) is not sufficient to start the motor or to carry the load, higher size sensing elements or incremental settings or sizing shall be permitted to be used, provided the trip current of the overload ~~relay~~ device does not exceed the following percentage of motor nameplate full-load current rating:
Substantiation: 430.32(A)(1) and 430.32(B)(1) refer to overload devices. 430.32(C) should, therefore, refer to all types of overload devices, not exclusively overload relays. The inserted wording "or sizing" is applicable when properly selected fuses are ued for motor overload protection.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-38 Log #1597 NEC-P11 **Final Action: Accept**
(Table 430.37)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 430.37 Table 430.37, line 3:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

3-wire, 1-phase ac or dc, grounded neutral conductor
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-39 Log #409 NEC-P11 **Final Action: Accept**
(430.51)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:

IV. Motor Branch-Circuit Short-Circuit and Ground-Fault Protection.

430.51 General

Part IV specifies devices intended to protect the motor branch-circuit conductors, the motor control apparatus, and the motors against overcurrent due to short circuits or ground faults ~~grounds~~. These rules add to or amend the provisions of Article 240. The devices specified in Part IV do not include the types of devices required by 210.8, 230.95, and 590.6.
Substantiation: This proposal is an effort to promote consistency with the use of terms related to grounding and bonding. Ground fault is defined in Section 250.2 and is more appropriate to be used here because this is the type of event

that the protection required in this part of Article 430 is intended to provide. This change brings the proposed text in this section consistent with the title of this section which is "Motor Branch-Circuit Short-Circuit and Ground-Fault Protection."

Note: There are also proposals to revise the current definition of the word "ground" in Article 100 which could impact how it is currently used in this section.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-40 Log #79 NEC-P11 **Final Action: Reject**
(Table 430.52)

Submitter: Joe Riley, City of Arlington
Recommendation: Revise as follows:

Table 430.52 Standard Rating of Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices.

Substantiation: The heading over this table is deceiving using the word "Maximum". This table is really a starting point for sizing the branch-circuit short-circuit ground-fault device and would be better described as "Standard" rating since Exception No. 1 allows a higher rating and Exception No. 2 allows the maximum rating.
Panel Meeting Action: Reject
Panel Statement: The present title of the table is correct. The panel disagrees that the table is really a starting point. The table provides the maximum values intended by 430.52(C)(1).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-41 Log #3155 NEC-P11 **Final Action: Accept**
(Table 430.52)

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Reformat Table as present below:
Substantiation: As an inspector and instructor in the electrical trades for a number of years, I have found that this Table is more often than not the most confusing to class participants and clients than any other Table in the Code. The present format in use leaves too much room for error and confusion. The format as proposed will clarify the Table and make using it much simpler.
Panel Meeting Action: Accept
Panel Statement: The panel advises that the only change intended by this proposal is to add separator lines to allow easier reading of the table.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-42 Log #2177 NEC-P11 **Final Action: Accept**
(430.52(C) Exception No. 2)

Submitter: Dann Strube, Strube Consulting
Recommendation: Revise text to read as follows:

"Exception No. 2: Where the rating specified in Table 430.52 or the rating modified by Exception No. 1...".

Substantiation: Given a 3 phase 460V 10 HP motor protected by a circuit breaker.

Table FLA = 14A
Table 430.52 = 250 percent
14A X 2.5 = 35A

35 amps is a standard size so Exception No. 1 cannot be used. With the current rule, Exception 2 cannot be used if this motor will not start.

This problem does not occur in NFPA 79 because the wording is not the same there.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

Table 430.52 Maximum Rating or Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices

	Percentage of Full-Load Current			
Type of Motor	**Nontime Delay Fuse[1]**	**Dual Element (Time-Delay) Fuse[1]**	**Instantaneous Trip Breaker**	**Inverse Time Breaker[2]**
Single-phase Motors	300	175	800	250
AC polyphase motors other than wound-rotor Squirrel cage — other than Design B energy efficient	300	175	800	250
Design B energy efficient	300	175	1100	250
Synchronous3	300	175	800	250
Wound rotor	150	150	800	150
Direct current (constant voltage)	150	150	250	150

11-43 Log #3070 NEC-P11 **Final Action: Reject**
(430.52(C)(8))

Submitter: Travis Foster, Lyondell Chemical Company
Recommendation: Add text to read as follows:
(8) Series Ratings for Combination Motor Controllers. The components of a combination motor controller shall be permitted to use a series short circuit current rating if the components are listed for the purpose.
Substantiation: This addition will clarify some general confusion among the end users of combination motor controllers with regards to series ratings. Many end users do not presently understand that a typical combination motor controller utilizes a series rating and the components when replaced, must be properly matched.
Panel Meeting Action: Reject
Panel Statement: Individual components are not listed with a series short-circuit current rating. For a listed combination motor controller, any series connection rating must include the disconnecting means, branch circuit protection, motor controller, and overload relay.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-44 Log #3514 NEC-P11 **Final Action: Reject**
(430.53(C)(3) (New))

Submitter: Todd Lottmann, Cooper Bussmann
Recommendation: Add new text to read:
(3) Each circuit breaker is one of the inverse time type and listed for group installation.
Substantiation: Circuit Breakers need to be listed for group installation in order for a safe installation for the following reasons:
1) Group motor applications in and of themselves are provided with a lower level of short circuit and ground fault protection compared to that of single motor circuits. This is due to the fact that the short circuit and ground fault protective device, in group motor applications, is allowed to be sized much larger than allowed for single motor circuits. This increase in sizing decreases the level of short circuit and ground fault protection that is provided for the components and equipment used in the group motor application. There are specific conditions, which must be met, to qualify for the use of group motor installations, as shown in 430.53. However, that does not preclude the fact of assuring that the components and equipment, which is used in the group installation, must be able to handle the increased level of ground faults and short circuit currents which will be available due to the increased size of the ground fault and short circuit protective device.
2) Circuit breakers do not have short circuit let through limits to which they must adhere. Rather, evaluation of conductors and the circuit breaker itself are used to determine whether or not a circuit breaker provides suitable short circuit protection. Therefore, one manufacturer's circuit breaker can have different short circuit performance than other manufacturers' circuit breakers as long as they meet the evaluation criteria provided in UL 489. This variance in short circuit performance in and of itself justifies the need to evaluate and mark which circuit breakers are suitable for protection of components and equipment used in a group motor application, thus leaving out the ones that are not.
3) Industrial control equipment, such as motor starters, tested to UL 508 are not required to be marked with the specific manufacturer and part number of the circuit breaker used in the short circuit testing. This deficiency along with the varying short circuit performance of circuit breakers discussed in item 2 above supports the need for the requirement contained in existing 430.53(C). While some manufacturers make both motor starters and circuit breakers, leading to the assumption that testing was conducted with starters and circuit breakers built by that manufacturer, not all of them do. There is no marking requirement for the starter to guide the installer and AHJ as to which manufacturer's circuit breaker and part number to use. How will the installer and inspector know whether the circuit breaker used in the group installation will provide a level of protection which meet the minimum safety levels that this code is supposed to provide per 90.1?
Panel Meeting Action: Reject
Panel Statement: While the panel recognizes there may be an issue with the lack of a marking on end-use equipment that designates the particular circuit breaker utilized in the group motor installation testing, simply listing the circuit breaker for group installation will not provide the needed end-use equipment marking.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-45 Log #2879 NEC-P11 **Final Action: Reject**
(430.53(D)(4) (new) and Table 430.53(D)(4) (new))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
Submitter: Robert Padgham, Jacksonville, FL
Recommendation: Revise 430.53(D)(4) as follows and add Table 430.53(D)(4).
430.53(D)(4) The ampacity of conductors to the motor shall be allowed to be as small as that required by 430.22 when the conductors' short-circuit current rating is not exceeded as determined by Table 430.53(D)(4).
Table 430.53(D)(4) Conductor Short-Circuit Current Ratings. Conductors are considered to be protected under short-circuit conditons when their short-circuit temperature limit is not exceeded. Conductor heating under short-circuit conditions is determined by (1) or (2):
(1) Short-Circuit Formula for Copper Conductors
$(I^2/A^2)\,t = 0.0297 \log_{10} ((T_2 + 234)/(T_1 + 234))$
(2) Short-Circuit Formula for Aluminum Conductors
$(I^2/A^2)\,t = 0.0125 \log_{10} ((T_2 + 228)/(T_1 + 228))$
where
I = short-circuit current in amperes
A = conductor area in circular mils
t = time of short-circuit in seconds (for times less than or equal to 10 seconds)
T_1 = initial conductor temperature in degrees Celsius
T_2 = final conductor temperature in degrees Celsius
Copper conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Copper conductor with thermoplastic insulation $T_2 = 150$
Copper conductor with crosslinked polyethylene insulation $T_2 = 250$
Copper conductor with ethylene propylene rubber insulation $T_2 = 250$
Aluminum conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Aluminum conductor with thermoplastic insulation $T_2 = 150$
Aluminum conductor with crosslinked polyethylene insulation $T_2 = 250$
Aluminum conductor with ethylene propylene rubber insulation $T_2 = 250$
Substantiation: North American industry is in a daily struggle to compete with global competitors. As such, we need every possible chance to reduce costs, but with safety as the number one directive. That is the intent of this proposal.
The existing NEC requirements for group motor installations dictate that the ampacity of the conductors to the motor be at least 1/3 of the branch circuit conductor ampacity. At first, this sizing seems reasonable when considering that the branch circuit device is being asked to provide short-circuit protection for the smaller tap conductors. But, this is often extremely conservative and frequently results in a conductor sized much larger than is actually required according to the laws of physics. By using formulas that have been widely utilized by IEEE, the Canadian Electrical Code, and the IEC, much smaller conductors can be installed. This will provide significant cost savings for utilization equipment making North American manufacturers much more competitive in the global marketplace.
An example would be helpful. Assume a branch circuit conductor is a 3/0 with an ampacity of 200 amperes. According to the 2005 NEC, the smallest conductor to a motor in a group installation would be a 4 AWG with an ampacity of 85 amperes, even if it were only supplying a 5 hp motor at 7.6 amperes. (Three times the ampacity of a 6 AWG, with an ampacity of 65 only gives 195 amperes, which doesn't meet the 200 ampere requirement.) According to the physics formula, and UL standards, a 200 ampere Class J fuse will protect a 10 AWG conductor for faults up to 200,000 amperes. (Maximum I^2t let-through of a 200 ampere Class J fuse at 600 volts with 200,000 amperes available is 300×10^3 ampere squared seconds, while the short-circuit withstand of a 10 AWG copper conductor is 303×10^3 ampere squared seconds.) As we can imagine the cost savings here will be substantial, and within the safety umbrella of internationally accepted standard physics formulas.
The physics formulas submitted with this proposal are the accepted basis for conductor short-circuit temperatures throughout the world. They are found in the ANSI/IEEE Red, Gray, Buff, and Blue Books and in the Canadian Electrical Code. Similar versions of these formulas are found in IEC 60204-1 (IEC Machinery Standard), SAE HS-1738 (Automotive Industry Machinery Standard), and IEC 60364-4-43 (IEC Installation Standard).
Let's give North American industry every possible (safe) option to be competitive in the global market by accepting this proposal.
Panel Meeting Action: Accept in Principle
Add new 430.53(D)(4) as follows:
430.53(D)(4) Under engineering supervision, the ampacity of conductors to the motor shall be permitted to be that allowed by 430.22 when the conductors' short-circuit current rating is not exceeded. Conductors are considered to be protected under short-circuit conditions when their short-circuit temperature limit is not exceeded as calculated by the following general formulas:
(1) Short-Circuit Formula for Copper Conductors
$(I^2/A^2)t = 0.0297 \log_{10} ((T_2 + 234)/(T_1 + 234))$
(2) Short-Circuit Formula for Aluminum Conductors
$(I^2/A^2)t = 0.0125 \log_{10} ((T_2 + 228)/(T_1 + 228))$
where
I = short-circuit current in amperes
A = conductor area in circular mils
t = time of short-circuit in seconds (for times less than or equal to 10 seconds)
T_1 = initial conductor temperature in degrees Celsius
T_2 = final conductor temperature in degrees Celsius
Copper conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Copper conductor with thermoplastic insulation $T_2 = 150$
Copper conductor with crosslinked polyethylene insulation $T_2 = 250$
Copper conductor with ethylene propylene rubber insulation $T_2 = 250$

Aluminum conductor with paper, rubber, varnished cloth insulation $T_2 = 200$
Aluminum conductor with thermoplastic insulation $T_2 = 150$
Aluminum conductor with crosslinked polyethylene insulation $T_2 = 250$
Aluminum conductor with ethylene propylene rubber insulation $T_2 = 250$

Panel Statement: The panel accepts the submitter recommendation and the use of formulas rather than tables and has reformatted the recommendation to reflect this. In addition the application has been limited to being performed only under engineering supervision.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 9 Negative: 6
Explanation of Negative:
BRINKMEYER, W.: See my explanation of negative vote on Proposal 11-34.
FAHEY, R.: See my Explanation of Negative Vote on Proposal 11-34.
GLOVER, W.: The action on this proposal should have been Accept.
The calculations may be difficult for some persons to perform, but I do not agree they are of such a difficulty to require by code an engineer. We should insist on qualified persons making the calculations (on this and any other calculation in the code) rather than insisting on engineers. There are other personnel with skills and knowledge related to the design, construction and operation of electrical equipment and installations that are fully qualified to perform these calculations.
GOETZ, C.: By accepting this proposal the motor tap conductors are permitted to be of unlimited length and there is no requirement for the conductors to be enclosed or otherwise protected from physical damage as is stipulated in the current 430.53(D)(2) and (3). In the first sentence, the phrase “short circuit current rating” is misleading and inconsistent with the terminology of the substantiation and that used in the referenced documents. Conductors do not have short circuit current ratings. The proposed equation should be rearranged so that it is clear that the conductor area, A, is the number to be found from the equation based upon entering appropriate data under engineering supervision. While the submitter used the maximum allowable I squared t for a specific size and type of fuse, this data is not required by the proposed new text. Presumably, the lowest published numbers available will be sought so that conductors even smaller than those determined by the example in the substantiation would meet this requirement. Not all overcurrent protective devices have such standardized characteristics whereby replacement overcurrent protective devices characteristics may vary from the original calculations. Replacement branch circuit short circuit and ground fault protection having characteristics greater than those used originally to justify the reduced conductor size could lead to dangerous overheating and damage to the tap conductor insulation. Therefore, it is strongly suggested that a warning marking be placed by the branch circuit protective device so that when a replacement branch-circuit short -circuit and ground-fault protective device is subsequently installed, that the calculations be re-performed under engineering supervision to ensure that the new overcurrent protective device provides protection under short circuit conditions that are suitable for the conductors that are already installed.
TODD, L.: See my explanation of negative vote on Proposal 11-34.
WRIGHT, J.: NEMA does not support the Panel Meeting Action. The proposed changes to the tap rules, even under engineering supervision, could reduce electrical safety. The proposed tap rules require an in-depth knowledge of the overcurrent device characteristics. In particular, this information is required not only during initial system installation, but throughout the maintenance life of the system two ensure replacement by an identical device.
Comment on Affirmative:
COLE, T.: While I agree with the panel on the intent of the proposal, I believe the proposal can be simplified by making reference to the same formula that was accepted in Proposal 11-34. This should be corrected at the comment stage.

11-46 Log #254 NEC-P11 **Final Action: Reject**
(430.53(D)(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
No conductor to the motor shall have an ampacity less than one-third that of the branch-circuit conductors, with a minimum in accordance with 430.22; the conductors to the motor overload device being not more than 7.5 m (25 ft) long and being protected from ~~physical~~ damage.
Substantiation: Use of the word “physical” is superfluous - the purpose is obvious.,
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.) Let’s take care of that for good: for our purposes, “damage” means “physical damage.”
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-33.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-47 Log #253 NEC-P11 **Final Action: Reject**
(430.53(D)(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
“...(1) be suitably protected from ~~physical~~ damage and enclosed by either an enclosed controller or by a raceway, and shall be not more than 3 m (10 t)t long, or (2)...”.
Substantiation: Use of the word “physical” is superfluous - the purpose is obvious.,
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.) Let’s take care of that for good: for our purposes, “damage” means “physical damage.”
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-33.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-48 Log #1730 NEC-P11 **Final Action: Reject**
(430.59 (New))

Submitter: Paul S. Hamer, Chevron Texaco Energy Research and Technology Company
Recommendation: Add a new section:
430.59 Ground-Fault Protection of Motor Branch Circuits. A motor branch circuit shall be protected from ground faults by the branch-circuit short-circuit and ground-fault protective device, or it shall be permitted to be protected by a ground-fault circuit interrupter (GFCI), a three-phase ground-fault circuit-interrupter system (GFCIS-3Ph) or by ground-fault protection of equipment.
FPN No. 1: See Article 100 for the definitions of ground-fault circuit interrupter, three-phase ground-fault circuit-interrupter system, and ground-fault protecton of equipment.
FPN No. 2: For three-phase systems rated above 150 volts to ground, the capacitive-charging current of an individual feeder or branch circuit (a current that is also sensed during a system ground fault on another feeder or branch circuit) can exceed the 6 mA current threshold of a ground-fault circuit interrupter (GFCI) and result in false trips. This may occur for circuit length of approximately 300 m (1000 ft) for a 480 V solidly-grounded system or 90 m (300 ft) for a 480 V high-resistance grounded or ungrounded system. If line-to-ground connected surge capacitors are applied at a motor, a GFCI cannot be used. The application of a three-phase ground-fault circuit-interrupter system (GFCIS-3Ph) will not be susceptible to false trips due to the capacitive effect.
Substantiation: See my companion proposals for Article 100 and section 210.8(D). If the proposals are accepted, this proposal would allow the option (using the wording “shall be permitted”) of using a ground-fault circuit interrupter (GFCI), a three-phase ground-fault circuit-interrupter system (GFCIS-3Ph), or ground-fault protection of equipment for motor branch circuit ground-fault protection.
FPN No. 1 is proposed to refer back to the definitions of the ground-fault protection techniques. FPN No. 2 is added as explanatory information to avoid misapplication of the GFCI on three-phase systems rated above 150 volts to ground (see the proposal for 210.8(D) for further explanation of the capacitive charging effect.
Panel Meeting Action: Reject
Panel Statement: The panel is encouraged by the work of the submitter but is concerned that the proposal is premature. No information is yet available as to the effectiveness of the product. In order to use the product as ground-fault protection in the Code, it should be listed. The proposed section of the Code addresses equipment protection rather than personnel protection. The panel recognizes that the application of this system is permitted to be used for motor circuits as an added technology.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-49 Log #1731 NEC-P11 **Final Action: Reject**
(430.64 (New))

Submitter: Paul S. Hamer, Chevron Texaco Energy Research and Technology Company
Recommendation: Add a new section:
430.64 Ground-Fault Protection of Motor Feeder Circuits. A motor feeder circuit shall be protected from ground faults by the feeder short-circuit and ground-fault protective device, or it shall be permitted to be protected by a ground-fault circuit interrupter (GFCI), a three-phase ground-fault circuit-interrupter system (GFCIS-3Ph), or by ground-fault protection of equipment.
FPN No. 1: See Article 100 for the definitions of ground-fault circuit interrupter, three-phase ground-fault circuit interrupter system, and ground-fault protection of equipment.
FPN No. 2: For three-phase systems rated above 150 volts to ground, the capacitive-charging current of an individual feeder or branch circuit (a current that is also sensed during a system ground fault on another feeder or branch circuit) can exceed the 6 mA current threshold of a ground-fault circuit interrupter (GFCI) and result in false trips. This may occur for circuit length of approximately 300 m (1000 ft) for a 480 V solidly-grounded system or 90 m (300 ft) for a 480V high-resistance grounded or ungrounded system. If line-to-ground connected surge capacitors are applied at a motor, a GFCI cannot be used. The application of a three-phase ground-fault circuit-interruptr system (GFCIS-3Ph) will not be susceptible to false trips due to the capacitive effect.
Substantiation: See my companion proposals for Article 100 and section 210.8(D). If the proposals are accepted, this proposal would allow the option (using the wording "shall be permitted") of using a ground-fault circuit interrupter (GFCI), a three-phase ground-fault circuit-interrupter system (GFCIS-3Ph), or ground-fault protection of equipment for motor feeder circuit ground-fault protection.
FPN No. 1 is proposed to refer back to the definitions of the ground-fault protection techniques. FPN No. 2 is added as explanatory information to avoid misapplication of the GFCI on three-phase systems rated above 150 volts to ground (see the proposal for 210.8(D) for further explanation of the capacitive charging effect.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-48.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-50 Log #1773 NEC-P11 **Final Action: Reject**
(Table 430.72(B), Note 2)

Submitter: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services
Recommendation: Notes:
2. 400 percent of value specified in Table <u>310.16</u> for 60° C conductors.
Substantiation: Note #2 of Table 430.72(B) states 400 percent of value specified in Table 310.17 for 60° C conductors. Since Table 310.17 is for <u>free air ampacities only</u> and Note #2 of Table 430.72(B) is given under column B for conductors <u>within enclosures</u> , Table 310.17 should not be used for this situation.
Panel Meeting Action: Reject
Panel Statement: The reference to Table 310.17 is correct for conductors in enclosures that are not bundled.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
FAHEY, R.: The panel action should have been to accept this proposal to revise Table 430.72(B) Note No. 2. The submitter is correct that Note No. 2 should reference Table 310.16. Most control conductors are, in fact, bundled when installed in a neat and workmanlike manner inside an enclosure, therefore, these control conductors are not installed in free air. Table 310.17 applies to conductors outside of an enclosure in free air, where the conductors are in fact cooled by free air. The conductors contained within an enclosure are not subject to the same conditions of cooling that exist in free air; therefore Table 310.16 should be applied in Note No. 2 as requested in the proposal.

11-51 Log #252 NEC-P11 **Final Action: Reject**
(430.73)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Where damage to a motor control circuit would constitute a hazard, all conductors of such a remote motor control circuit that are outside the control device itself shall be installed in a raceway or be otherwise suitably protected from ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious, especially given the section title, "Mechanical protection of conductor," used as the title of 430.73, is an unusual example of clear terminology.
Submitting proposals removing the adjective "physical" may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-33.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-52 Log #838 NEC-P11 **Final Action: Accept in Principle**
(430.73)

Submitter: Stephen W. Drayton, Eastern Idaho Electrical JATC
Recommendation: Assign 430.74 to the 2nd paragraph of 430.73 and title it as "ELECTRICAL ARRANGEMENT OF CONTROL CIRCUITS", and keep the paragraph as written. Renumber existing 430.74 as 430.75.
Substantiation: For the user of the NEC, this important paragraph has been "hidden" under mechanical protection for too long. This will allow the user to find the information easier.
Panel Meeting Action: Accept in Principle
Revise Section 430.73 as follows:
430.73 Mechanical Protection of Conductor.
<u>(A) Protection from Physical Damage.</u> (first paragraph of existing Section 430.73 follows)
<u>(B) Electrical Arrangement of Control Circuits.</u> (second paragraph of existing Section 430.73 follows)
Panel Statement: The revisions maintain current section numbering and provide means to identify separate conditions included under Section 430.73.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-53 Log #1503 NEC-P11 **Final Action: Accept in Principle**
(430.73)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: In second sentence, change "one side" to "one conductor".
Substantiation: Editorial.
Panel Meeting Action: Accept in Principle
Revise the second paragraph of 430.73 to read as follows:
Where the motor control circuit is intentionally grounded, the motor control circuit shall be arranged so that an accidental ground in the control circuit remote from the motor controller will (1) not start the motor and (2) not bypass manually operated shutdown devices or automatic safety shutdown devices.
Panel Statement: The wording provided by the panel more clearly states the requirement and meets the intent of the submitter.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-53a Log #CP1100 NEC-P11 **Final Action: Accept**
(430.81(A))

Submitter: Code-Making Panel 11,
Recommendation: Replace the words "protective device" in 430.81(A) with "disconnecting means".
Substantiation: The words "disconnecting means" more clearly include the types of devices that can be used as motor controllers.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
SAPORITA, V.: Replacing the words "protective device" with "disconnecting means" makes a subtle but significant change. It would preclude the application of a 1/8 HP or less stationary motor from beng installed where a Type S fuse is protecting the motor and where removal of the fuse would serve as the disconnecting means. The specific words in 430.81(A) have been in the NEC as written since at least the 1947 edition.

11-54 Log #1082 NEC-P11 **Final Action: Accept in Principle**
(430.87 Exception No. 2 (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
Exception No. 2: A branch circuit overcurrent device serving as the controller as permitted in 430.81(B) may serve more than one motor.
Substantiation: Edit. Where more than one clock motor or similar impedance protected motor is on the same circuit, the provisions of 430.81(A) should be permitted.
Panel Meeting Action: Accept in Principle
Add Exception No. 2 to read as follows:
Exception No. 2: A branch circuit disconnecting means serving as the controller as allowed in 430.81(A) shall be permitted to serve more than one motor.
Panel Statement: The revision is made to correct the difference between the recommended text and the submitter's substantiation. In addition the panel has replaced "overcurrent device" with "disconnecting means" to correlate with the panel action on Proposal 70-53A (Log #CP1100).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-55 Log #1956 NEC-P11 **Final Action: Accept**
(430.91)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Delete the following text:
~~430.91 Motor Controller Enclosure Types. Table 430.91 provides the basis for selecting enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings. These internal conditions shall require special consideration by the installer and user.~~
~~Table 430.91 Motor Controller Enclosure Selection.~~
Substantiation: This proposal is made as part of a suggestion for dealing with Comments that were HELD during the 2005 cycle. Four Comments (1-229, 1-230, 1-231, and 1-233) on Proposal 1-157 were held, with the Panel Statement on the other three referring back to the Panel Action and Statement on 1-231. This proposal builds upon Proposals 1-152 and 1-157 of the 2005 cycle, and is essentially the same as Comment 1-231.
Due to lack of any other guidance within the Code, Table 430.91 has been applied to enclosures for numerous kinds of equipment, even though it is stated as applying only to motor controller enclosures. This has resulted in considerable confusion. Bringing the requirements of 430.91 into a general application area of the Code and specifically stating the kinds of equipment to which they apply will add clarity. The equipment types in the list all are required, by existing industry standards, to use a Type number marking.
Therefore, a companion proposal proposes creating a new 110.20 from 430.91, and Table 430.91. 430.91 and Table 430.91 should be deleted ONLY IF proposed new 110.20 is accepted.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
CACCAMESE, J.: This proposal should be accepted pending determination of the action by Panel 1 for Article 110 regarding the relocation of the information presently located in section 430.91 and Table 430.91.

11-56 Log #2106 NEC-P11 **Final Action: Accept**
(Table 430.91)

TCC Action: The Technical Correlating Committee directs that this proposal be sent to Code-Making Panel 1 for action. This action will be considered by Code-Making Panel 1 as a Public Comment. The actions taken on Proposals 1-95 and 11-55 relocates Table 430.91 to 110.20.
Submitter: Jim Wiseman, Schneider Electric
Recommendation: Revise Table 430.91 as shown below:

[Proposal 11-56 (Log #2106)]

Second and third lines of Table 430.91 presently show the following:

	3	3R	3S	3X	3RX	3SX	4	4X	6	6P
Rain, snow, and sleet	X	X	X	X	X	X	X	X	X	X
Sleet[2]	—	—	X	—	—	X	—	—	—	—

Change those lines to read:

	3	3R	3S	3X	3RX	3SX	4	4X	6	6P
Rain, snow, and sleet	X	X	—	X	X	—	X	X	X	X
Rain, snow and sleet[2]	—	—	X	—	—	X	—	—	—	—

Substantiation: Table 430.91 does not readily show the distinction between either Type 3 and Type 3S or Type 3X and Type 3SX enclosures. A Type 3 enclosure provides a degree of protection against rain, snow, and sleet. A Type 3S enclosure also provides a degree of protection against rain, snow, and sleet, but additionally, its mechanism shall be operable when ice covered (as stated in footnote 2 .) The same relationship exists between Types 3X and 3SX. These distinctions are more readily seen with the Table information presented as proposed.
Panel Meeting Action: Accept
Panel Statement: The panel agrees with the recommendation but refers to the panel actions on Proposals 11-7 and 11-55. The panel recommends that this proposal be referred to Panel 1 for action as a public comment.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-57 Log #69 NEC-P11 **Final Action: Reject**
(430, Part VIII)

Submitter: Michael Rytelewski, Rytel Electric #8372
Recommendation: Add new text to read:
<u>All industrial control panels and motor control cubicles that are a part of the motor control center assembly, shall conform to the requirements of Article 409.</u>
Substantiation: The addition of adding Article 409 to Article 430 part VIII would ensure that all control panels would adhere to the same standard, Article 409.
Panel Meeting Action: Reject
Panel Statement: Factory built equipment is specially designed and manufactured for installation in a motor control center. These parts are intended to be installed using existing provisions within Article 430.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-58 Log #2644 NEC-P11 **Final Action: Accept**
(430.95)

Submitter: Kevin J. Lippert, Eaton Corporation
Recommendation: Revise text to read:
430.95 Service ~~Entrance~~ Equipment.
The proposal addresses only the title, the actual requirement remains unchanged.
Substantiation: The word "Entrance" should be deleted. Throughout the Code, the term "service entrance" is usually reserved for identifying the service conductors/cables. When referring to equipment, the correct term is "service equipment".
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-59 Log #251 NEC-P11 **Final Action: Reject**
(430.97(A))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Busbars shall be protected from ~~physical~~ damage and be held firmly in place.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.
Submitting proposals removing the adjective "physical" may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in

1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-33.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-60 Log #1209 NEC-P11 **Final Action: Reject**
(430.102(A))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
430.102 Location.
(A) Controller. An individual disconnecting means shall be provided for each controller and shall disconnect the controller. The disconnecting means shall be located in sight from <u>and readily accessible from</u> the controller location.
Substantiation: There are instances that arise in the field where a window is between the controller and the disconnecting means required by this section, yet if a workman had to access it or monitor it from being closed while he or she were working on the controller, it could present a safety issue. Adding the requirement that the disconnect also be readily accessible from the controller location would give enforcement and industry clear guidelines to apply in the field.
Panel Meeting Action: Reject
Panel Statement: The disconnecting means for the controller is not always required to be readily accessible from the controller. See 430.107 for readily accessible requirements. Existing Code text requires that at least one of the disconnecting means be readily accessible.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:
CACCAMESE, J.: In addition to the substantiation provided by the submitter, a window as a barrier for example, there are other obstacles (elevation, fencing, and inaccessible terrain) that would prevent access even though a disconnect is "within sight". The submitter's concern is well founded, and even though section 430.107 provides the "readily accessible" requirements, further evaluation is warranted due to safety issues associated with controller disconnect accessibility.
FAHEY, R.: The panel action should have been to accept this proposal to revise Section 430.102(A). The submitter has provided adequate substantiation in that a safety issue exists in the present Code. The purpose of disconnecting means requirements is to provide a safe installation during testing and maintenance of motors and driven machinery. There have been instances where the controller was located in a locked room with a window between it and the motor and its driven machinery but still met the definition of "within sight of".
If the disconnects are important enough to be within sight of both the controller and the motor, the disconnects should then be important enough to be readily accessible, and capable of being reached quickly for operation.
CMP-11 took a bold step towards enhancing worker safety during the 2002 code cycle. If the panel chooses to reject this proposal, it would be contradictive to those panel actions based on the substantiation presented at that time. Acceptance of this proposal will give the AHJ an avenue to enforce the purpose of disconnecting means requirements and provide much needed worker safety.
TODD, L.: Disconnecting means should be readily accessible even if covered in other sections, since there seems to be confusion adding it here would make the situation safer for workers. I agree with the commens of Mr. Caccamese.

11-61 Log #1211 NEC-P11 **Final Action: Reject**
(430.102(A))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
430.102 Location.
(A) Controller. An individual disconnecting means shall be provided for each controller and shall disconnect the controller. The disconnecting means shall be located in sight from <u>and accessible from</u> the controller location.
Substantiation: There are instances that arise in the field where a window is between the controller and the disconnecting means required by this section, yet if a workman had to access it or monitor it from being closed while he or she were working on the controller, it could present a safety issue. Adding the requirement that the disconnect also be readily accessible from the controller location would give enforcement and industry clear guidelines to apply in the field.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 11-60. In addition, the definition of "in sight from" allows up to 50 feet between the disconnecting means and the controller. The disconnecting means and the controller do not have to be accessible from each other.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:
CACCAMESE, J.: See my explanation of negative vote on Proposal 11-60.
COLE, T.: Having worked in industrial establishments, I have seen the condition arise which the submitter is referring to. There are many situations in which control rooms are kept locked so that only operators have access. Since this is a control room there are always windows which one can look through to see the controller. Locating a disconnect in this controlled access room and having the controller on the other side of a locked door does not enhance safety in case of an emergency. By adding the words <u>and accessible from</u> would ensure under emergency situations that the disconnect could be deactivated. Time is of the essence when someone is either hung up in the equipment or is being electrocuted.
TODD, L.: See my explanation of negative vote on Proposal 11-60.

11-62 Log #3447 NEC-P11 **Final Action: Reject**
(430.102(A) Exception No. 1)

Submitter: Louis A. Barrios, Jr., Shell Global Solutions
Recommendation: Modify existing Exception No. 1 to read:
~~For motor circuits over 600 volts, nominal, a~~ <u>A</u> controller disconnecting means capable of being locked in the open position shall be permitted to be out of sight of the controller, provided the controller is marked with a warning label giving the location of the disconnecting means.
Substantiation: Removing the restriction that this exception only applies to motor circuits over 600 volts would afford the same level of protection whether the motor circuit was 4160V or 480V. This proposal is an alternative to the proposal to add a new Exception No. 3 to 430.102(A).
Panel Meeting Action: Reject
Panel Statement: No documentation has been provided to reduce the level of safety by expanding
the exception for under 600 volt motor circuits. Allowing this exception for lower voltages may reduce worker safety. For under 600 volt equipment, the physical limitations that apply to over 600 volt equipment do not apply.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
GLOVER, W.: The action on this proposal should have been Accept.
The proposal does not reduce safety, but applies the same rules to equipment less than 600V. Current code wording sometimes requires the installation of redundant disconnects. Redundant disconnects may sometimes be convenient, but they do not improve safety and they do add cost. This is specifically the case for motor operated valves (MOVs) as discussed in Proposals 11-63 and 11-81.

11-63 Log #3446 NEC-P11 **Final Action: Reject**
(430.102(A) Exception No. 3 (New))

Submitter: Louis A. Barrios, Jr., Shell Global Solutions
Recommendation: Add a new Exception No. 3 to read:
In industrial installations with written safety procedures, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the disconnecting means shall not be required to be in sight from the motor and the driven machinery location provided the disconnecting means is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
Substantiation: The controllers for motor operated valves installed in industrial facilities are typically integral (installed in the same enclosure) as the motor. These valves are supplied by 3-phase 480V power remotely from the valve by a feeder fused disconnect switch or circuit breaker located in a motor control center or outdoor switchrack. The proposed new exception, similar to the one already approved for the motor disconnecting means, would permit safely isolating and locking out the motor operated valve without having to install a redundant disconnecting means at the MOV.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Upon evaluation of 430.102(B) the requested exception already exists. Reference is made to the submitter's recommendation which addresses the disconnecting means with respect to the motor and driven machinery location. The illustration in the substantiation is for a motor with an integral controller.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
GLOVER, W.: The action on this proposal should have been Accept.
The exception granted in 430.102(B) may not accommodate the situation presented in the submitter's substantiation. The submitter is specifically requesting an extension to this exception (for motors) to allow the same exception (for controllers) in the case of motor operated valves (MOVs). The question arises as a result of the controller location, which in the case of MOVs is integral with the motor. The 430.102(B) exception exempts the motor disconnecting means from being in sight of the motor if all conditions are met, it does not specifically exempt the controller disconnecting means from being

within sight of the controller.

The panel may find it preferable to implement a separate section for MOVs as suggested in Proposal 11-81 or removal of the 600V limitation as suggested in Proposal 11-62.

11-64 Log #1212 NEC-P11 **Final Action: Reject**
(430.102(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:

(B) Motor. A disconnecting means shall be located in sight from <u>and accessible from</u> the motor location and the driven machinery location.

Substantiation: There are instances that arise in the field where a window is between the motor and the disconnecting means required by this section, yet if a workman had to access it or monitor it from being closed while he or she were working on the motor or driven machinery, it could present a safety issue. Adding the requirement that the disconnect also be readily accessible from the motor and driven machinery location would give enforcement and industry clear guidelines to apply in the field.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 11-66. In addition, the definition of "in sight from" allows up to 50 feet between the disconnecting means and the motor. The disconnecting means and the motor do not have to be accessible from each other.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

CACCAMESE, J.: See my explanation of negative vote on Proposal 11-60.

COLE, T.: Having worked in industrial establishments, I have seen the condition arise which the submitter is referring to. There are many situations in which control rooms are kept locked so that only operators have access. Since this is a control room there are always windows which one can look through to see the controller. Locating a disconnect in this controlled access room and having the controller on the other side of a locked door does not enhance safety in case of an emergency. By adding the words <u>and accessible from</u> would ensure under emergency situations that the disconnect could be deactivated. Time is of the essence when someone is either hung up in the equipment or is being electrocuted.

11-65 Log #1267 NEC-P11 **Final Action: Reject**
(430.102(B))

Submitter: Mark Shapiro, Farmington Hills, MI
Recommendation: Revise to read:

"Motor. A disconnecting means shall be located in sight from the motor location ~~and the driven machinery location~~ ."

Substantiation: The requirement here, under the title "Motors" is to also have a disconnect in sight of the driven machinery. There are numerous cases where large parts of driven machinery are not in sight of their motors. This requirement became a problem, in a way that it was not before, with the revision of this section in the 2002 NEC.

Before the 2002 revision to this section, the exception to 430.120(B) was really the rule. Then, a lockable disconnect ahead of the controller took care of all of the elements mentioned in this section; the controller, the motor, and the driven machinery. Now, (B) is the default and the exception is truly secondary. In the past, this was not an issue, relative to the driven machinery, because the disconnect at the controller is generally manufactured to be lockable.

The unintended consequence of the '02 change, to require disconnects in sight of motors, was to also create a tougher rule for the driven machinery. If the machinery is a conveyer line that snakes around a warehouse, the literal reading of the rule now requires a disconnecting means at every point where the conveyer makes a turn. There must be a lot of conveyers in violation, because I have never seen this done.

For long presses and transfer lines represent other cases where the machinery could easily be out of sight of its motor and there could be the need for disconnects in sight of the driven machinery.

Keep in mind that for the purposes of this section, we are talking about a horsepower-rated disconnect, not a push-button or an E-stop cord that will signal a controller.

However, for installations where this could present a problem, there are safety standards, such as the ANSI B11 series, that do address the issue. They outline providing means to control the power without needing these multiple disconnects.

Panel Meeting Action: Reject

Panel Statement: The panel contends that the disconnecting means shall be located within sight of the motor and driven machinery location. The requirement that the disconnecting means be in sight of the driven machinery affords needed safety for personnel servicing the driven machinery. "Within sight of the driven machinery" does not necessarily mean within sight of the entire machine.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-66 Log #1307 NEC-P11 **Final Action: Reject**
(430.102(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:

(B) Motor. A disconnecting means shall be located in sight from <u>and readily accessible from</u> the motor location and the driven machinery location.

Substantiation: There are instances that arise in the field where a window is between the motor and the disconnecting means required by this section, yet if a workman has to access it or monitor it from being closed while he or she were working on the motor or driven machinery, it could present a safety issue. Adding the requirement that the disconnect also be readily accessible from the motor and driven machinery location would give enforcement and industry clear guidelines to apply in the field.

Panel Meeting Action: Reject

Panel Statement: The disconnecting means for the motor is not always required to be readily accessible from the motor. See 430.107 for readily accessible requirements. Existing Code text requires that at least one of the disconnecting means be readily accessible.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

CACCAMESE, J.: See my explanation of negative vote on Proposal 11-60.

FAHEY, R.: The panel action should have been to accept this proposal to revise Section 430.102(B). The submitter has provided adequate substantiation in that a safety issue exists in the present Code. The purpose of disconnecting means requirements is to provide a safe installation during testing and maintenance of motors and driven machinery. There have been instances where the controller was located in a locked room with a window between it and the motor and its driven machinery but still met the definition of "within sight of".

If the disconnects are important enough to be within sight of both the controller and the motor, the disconnects should then be important enough to be readily accessible, and capable of being reached quickly for operation.

CMP-11 took a bold step towards enhancing worker safety during the 2002 code cycle. If the panel chooses to reject this proposal, it would be contradictive to those panel actions based on the substantiation presented at that time. Acceptance of this proposal will give the AHJ an avenue to enforce the purpose of disconnecting means requirements and provide much needed worker safety.

11-67 Log #2704 NEC-P11 **Final Action: Accept**
(430.102(B))

TCC Action: The Technical Correlating Committee directs the panel to review the action on Proposals 11-67 and 11-68 and revise their action to make it clear as to what part of 430.102(B) the Exception is intended to apply. This action will be considered by the Panel as a Public Comment.

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:

(B) Motor. A disconnecting means shall be located within sight from the motor location and the driven machinery location. <u>The disconnecting means required in accordance with 430.102(A) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.</u>

Exception: The disconnecting means shall not be required to be in sight from the motor and driven machinery location under either condition (a) or (b), provided the disconnecting means required in accordance with 430.102(A) is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

(a) Where such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property.

(b) In industrial locations, with written safety procedures, where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

FPN No. 1: Some examples of increased or additional hazard include, but are not limited to, motors rated in excess of 100 hp, multimotor equipment, submersible motors, motors associated with adjustable speed drives, and motors located in hazardous (classified) locations.

FPN No. 2: For information on lockout/tagout procedures, see NFPA-70E-2004, Standard for Electrical Safety in the Workplace.

~~The disconnecting means required in 430.102(A) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.~~

Substantiation: The last sentence of 430.102(B) is causing NEC users to question the application of the exception. This sentence location gives the impression of contradicting the exception. The last sentence is a continuation of the idea expressed in this section and should follow immediately after the first sentence. The remainder of the text expresses and explains an exception to the general rule and should follow the complete expression of the general rule to eliminate this confusion.

Panel Meeting Action: Accept

Panel Statement: The panel notes that only the changes identified by legislative text are intended and the action on Proposal 11-68 is not affected.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
GOETZ, C.: Acceptance of this proposal undoes panel action from the 2005 cycle. Additionally, when taken together with panel action on proposal 11-68, the resulting revision to 430.102(B) seems to allow both the disconnect in sight of the motor (first sentence) and the disconnect in sight of the controller (second sentence), covered by section 430.102(A), to be absent from a motor installation. This would create confusion over what is intended by Section 430.102(A) which does not include a similar exception. The submitters concerns would be addressed by revising section 430.102 (B) to individually number the two sentences as follows:
430.102(B) Motor.
(1) A disconnecting means shall be located within sight from the motor location and the driven machinery.
Exception: (text and FPN's as shown in proposal 11-68)
(2) The disconnecting means required by 430.102(A) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.

11-68 Log #1732 NEC-P11 **Final Action: Accept in Principle**
(430.102(B) Exception)

TCC Action: See Technical Correlating Committee Note on Proposal 11-67.
Submitter: Paul S. Hamer, Chevron Texaco Energy Research and Technology Company
Recommendation: Revise as follows:
(B) Motor. A disconnecting means shall be located in sight from the motor location and the driven machinery location.
Exception: The disconnecting means shall not be required to ~~be in sight from the motor and the driven machinery location~~ under either condition (a) or (b), provided the disconnecting means required in accordance with 430.102(A) is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
(a) Where such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property.
(b) In industrial installations, with written safety procedures, where conditions of maintenance and supervision ensure that only qualified persons service the equipment.
FPN No. 1: Some examples of increased or additional hazards include, but are not limited to, motors rated in excess of 100 hp multimotor equipment, submersible motors, motors associated with adjustable speed drives and motors located in hazardous (classified) locations.
FPN No. 2: For information on lockout/tagout procedures, see NFPA 70E-2004, Standard for Electrical Safety in the Workplace.
The disconnecting means required in accordance with 430.102(A) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.
Substantiation: This proposal corrects an error in transcription from the 2005 NEC cycle. See Proposal 11-65 (Log #1122) from the May 2004 Report on Proposals.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the first sentence of the exception to read as follows:
Exception: The disconnecting means shall not be required ~~to be in sight from the motor and the driven machinery location~~ under either condition (a) or (b), provided the disconnecting means required in accordance with 430.102(A) is individually capable of being locked in the open position.
Panel Statement: The panel has corrected an editorial oversight by removing the word "to".
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-69 Log #1268 NEC-P11 **Final Action: Reject**
(430.102(B) Exception)

Submitter: Mark Shapiro, Farmington Hills, MI
Recommendation: Revise the exception to broaden the permission to use "written safety procedures" beyond industrial installations.
(B) In ~~industrial~~ installations, with written safety procedures, where <u>the</u> conditions of maintenance and supervision ensure that only qualified persons service the equipment.
Substantiation: This proposal differs from a companion proposal by allowing "written safety procedures" in all types of buildings.
I occasionally consult with a major university where I have been impressed with the very professional level of their engineering and electrical departments. They have rigorous lockout tag out and safe work practices programs. And, I have more confidence that they will use those programs than I have for many an industrial plant. But, because hey are not industrial, they cannot use this exception.
Panel Meeting Action: Reject
Panel Statement: It is not the intent of Panel 11 to reduce the level of safety by expanding the
exception for other than industrial installations. Section 90.4 provides a possible solution for the submitter.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
CACCAMESE, J.: The panel reaffirms the need to maintain the language in the code that helps to protect workers involved in maintenance and repair.

11-70 Log #1269 NEC-P11 **Final Action: Reject**
(430.102(B) Exception)

Submitter: Mark Shapiro, Farmington Hills, MI
Recommendation: Revise the exception to broaden the permission to use "written safety procedures" beyond industrial installations.
(b) In industrial, <u>commercial or institutional</u> installations, with written safety procedures, where <u>the</u> conditions of maintenance and supervision ensure that only qualified persons service the equipment.
Substantiation: This proposal differs from a companion proposal by allowing "written safety procedures" only in industrial, commercial, or institutional installations. I prefer the companion proposal but include this version in case the panel does not wish to broaden the rule to allow it to apply in all types of buildings and installations.
I occasionally consult with a major university where I have been impressed with the very professional level of their engineering and electrical departments. They have rigorous lockout tagout and safe work practices programs. And, I have more confidence that they will use those programs than I have for many an industrial plant. But, because they are not industrial, they cannot use this exception.
Panel Meeting Action: Reject
Panel Statement: It is not the intent of Panel 11 to reduce the level of safety by expanding the
exception for other than industrial installations. Section 90.4 provides a possible solution for the submitter.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
CACCAMESE, J.: See my explanation of vote on Proposal 11-69.

11-71 Log #1115 NEC-P11 **Final Action: Accept**
(430.103)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
The disconnecting means shall be designed so that it cannot be closed automatically.
Substantiation: The ubiquitous time (clock) switch appears to meet the criteria for motor disconnect means and controllers in 430.104, 430.109(C), 430.110(A), 430.111(A) and (B)(1), 430.81(A) and 430.83(C). Although they have an external level operated switch mechanism, if the clock motor continues to run it can automatically return to the on position, after manually being switched off.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-72 Log #1099 NEC-P11 **Final Action: Reject**
(430.108)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "requirements" to "provisions."
Substantiation: Edit. The phrase "shall be permitted" through 430.109 and 430.110 do not indicate requirements, per se, but alternatives.
Panel Meeting Action: Reject
Panel Statement: The term "requirements" is used as the preferred term for clarity and is mandatory in nature and complies with 3.2.1 of the NEC Style Manual.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-73 Log #1146 NEC-P11 **Final Action: Accept in Principle**
(430.108)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Every disconnecting means in the motor branch circuit ~~between the point of attachment to the feeder and the point of connection to the motor~~ shall comply with the requirements of 430.109 and 430.110.
Substantiation: Edit. Branch circuit covers the superfluous description. All branch circuits do not originate from a feeder, e.g., where supplied directly from the service equipment, where the present requirement does not apply.
Panel Meeting Action: Accept in Principle
Revise 430.108 to read as follows:
430.108 Every disconnecting means in the motor circuit between the point of attachment to the feeder or branch circuit and the point of connection to the motor shall comply with the requirements of 430.109 and 430.110
Panel Statement: The panel action should meet the submitter's intent as indicated in his substantiation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-74 Log #1015 NEC-P11 **Final Action: Reject**
(430.109(A)(1))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
A listed motor circuit switch, rated in horsepower suitable for the current type, (ac or dc), number of phases to be disconnected, and a horsepower rating at the applicable voltage not less than the motor horsepower. For combination loads, the disconnecting means current and horsepower ratings shall be in accordance with 430.110(C).
Substantiation: Horsepower ratings are based on voltage, current type, number of phases. I have seen installations where switch ratings were based on arithmetic addition of horsepowers and currents, since many do not seem to be aware of the requirements of 430.110(C), and almost always result in lower ratings than required.
Panel Meeting Action: Reject
Panel Statement: Motor circuit switches are investigated under UL 98. The UL marking requirements under this standard should satisfy the submitter's concerns.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-75 Log #1080 NEC-P11 **Final Action: Accept in Principle in Part**
(430.110 Exception)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
Exception: A listed ~~nonfused~~ motor circuit switch without fuseholders having a horsepower rating not less than the motor horsepower, or a molded case switch shall be permitted to have an ampere rating not less than ~~115~~ 100 percent of the full-load current rating of the motor.
Substantiation: Edit. Nonfusible motor-circuit switches and molded case switches are rated for current at 100 percent of their rating. Motor nameplates do not have current, but current ratings. Molded case switches are permitted in 430.109(A). I believe the term "without fuseholders" is used by UL. A fuseholder that is jumped would be nonfused.
Panel Meeting Action: Accept in Principle in Part
Revise the exception to read:
Exception: A listed ~~nonfused~~ unfused motor circuit switch, without fuseholders, having a horsepower rating not less than the motor horsepower shall be permitted to have an ampere rating less than 115 percent of the full-load current rating of the motor.
Panel Statement: The panel rejects the change "not less than 100 percent." The exception reflects the same percentage value as does the main rule. The panel rejects the addition of the words "or a molded case switch." The remainder of the proposal is accepted to be consistent with the product standards. Molded case switches are rated in amperes. The exception does not apply to molded case switches.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-76 Log #2131 NEC-P11 **Final Action: Accept in Principle**
(430.110(C)(1))

Submitter: Russell LeBlanc, Peterson School of Engineering
Recommendation: Before the exception add these words after the last sentence:
In cases where different horsepower ratings are obtained when applying these tables, a rating at least equal to the larger of the values obtained shall be used.
Substantiation: It's unclear what to do when different values are obtained.
440.12(A)(2) has wording to explain what needs to be done.
Panel Meeting Action: Accept in Principle
Before the exception, add these words after the last sentence:
In cases where different current ratings are obtained when applying these tables, the largest value obtained shall be used.
Panel Statement: The panel changed the word "horsepower" to "current" as more appropriate to the action being performed.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-77 Log #1951 NEC-P11 **Final Action: Accept**
(430.126(A))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise 430.126(A) as shown:
(A) General. Adjustable Speed drive systems shall protect against motor overtemperature conditions ~~.~~ where the motor is not rated to operate at the nameplate rated current over the speed range required by the application . This ~~Overtemperature~~ protection shall be provided ~~is~~ in addition to the conductor protection required in 430.32. Protection shall be provided by one of the following means:
Change the word "controller" to "system" in 430.126 (A) (2)
(2) Adjustable speed drive system ~~controller~~ with load and speed sensitive overload protection and thermal memory retention upon shutdown or power loss.
Add the following exception to 430.126(A)(2):
Exception 1: Thermal memory retention upon shutdown or power loss is not required for continuous duty loads.
Modify 430.126 (A)(4) as indicated:
(4) Thermal sensor embedded in the motor whose communications are ~~that is~~ received and acted upon by an adjustable speed drive system .
Relocate FPN from 430.126(C) to 430.126(A), and revise as follows:
FPN: The relationship between motor current and motor temperature changes when the motor is operated by an adjustable speed drive. In certain applications, overheating of motors can occur ~~W~~ w hen operated at reduced speed, ~~overheating of motors may occur~~ even at current levels less than ~~or equal to~~ a motor's rated full load current. ~~This is~~ The overheating can be the result of reduced motor cooling when its shaft-mounted fan is operating less than rated nameplate RPM. As part of the analysis to determine whether overheating will occur, it is necessary to consider the continuous torque capability curves for the motor given the application requirements. This will assist in determining whether the motor overload protection will be able, on its own, to provide protection against overheating. These overheating protection requirements are only intended to apply to applications where an adjustable speed drive, as defined in 430.2, is used.
For motors that utilize external forced air or liquid cooling systems, overtemperature can occur if the cooling system is not operating. Although this issue is not unique to adjustable speed applications, externally cooled motors are most often encountered with such applications. In these instances, overtemperature protection using direct temperature sensing is recommended (i.e. 430.126(A)(1), (A)(3) or (A)(4)) or additional means should be provided to assure that the cooling system is operating (flow or pressure sensing, interlocking of adjustable speed drive system and cooling system, etc.).
Substantiation: Requirements for overtemperature are application dependent and are not required in all circumstances. The revision to 430.126(A) reflects conditions where such protection is needed, as given in the original substantiation for the addition of this section.
The means to provide overtemperature protection are not limited to the controller or drive and can be part of the system.
The exception recognizes that the thermal memory requirements are intended mainly for protection of short-time, intermittent, periodic or varying duty loads. The FPN is relocated and revised as it more appropriately applies to all adjustable speed drives, not to only multiple motor applications, but does not apply in all applications. The additional text in the FPN is intended to provide guidance to help AHJs in their consideration of the analysis of potential motor overheating. The additional text in the FPN is intended to provide guidance to help AHJs in their consideration of the analysis of potential motor overheating when forced air or liquid cooling systems are used to obtain the desired motor torque capability over the speed range required by the application. When the forced cooling is present and functioning, overtemperature protection is provided by the overload protection mechanism. This FPN text addition supports the NEMA proposal to remove section 430.126(B).
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
HAMER, P.: The proposed Exception No. 1 should not be included. Thermal memory is necessary to avoid damage to the motor if it is subject to repeated accidental overloads, even if the load is classified as "continuous duty."

11-78 Log #3114 NEC-P11 **Final Action: Reject**
(430.126(A)(1))

Submitter: Jeffrey Small, General Electric
Recommendation: Add text to read as follows:
A thermal protector shall not be used on constant torque applications where motor current does not decrease as motor speed decreases, unless motor is marked for conditions.
Substantiation: Motors in constant torque applications are at risk of thermal when the current is below nameplate current, unless motor is specifically designed and rated for the purpose.
Panel Meeting Action: Reject
Panel Statement: No technical information provided to substantiate a problem exists with present overtemperature requirements for constant torque motors; therefore the panel does not concur with the need to omit these types of motors from having overtemperature protection.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-79 Log #1952 NEC-P11 **Final Action: Accept**
(430.126(B))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Delete 430.126(B) and the associated FPN.
~~(B) Motors with Cooling Systems. Motors that utilize external forced air or liquid cooling systems shall be provided with protection that shall be continuously enabled or enabled automatically if the cooling system fails.~~
~~FPN: Protection against cooling system failure can take many forms. Some examples of protection against inoperative or failed cooling systems are direct sensing of the motor temperature as described in 430.32(A)(1), (A)(3), and (A)(4) or sensing of the presence or absence of the cooling media (flow or pressure sensing).~~
Renumber items (C) and (D) accordingly.
Note: This is a companion proposal to 430.126(A), see second paragraph of proposed FPN.
Substantiation: Since 430.126(A) covers all types of motors, including those with an external source of cooling, and the method of thermal protection should provide continuous protection against overheating during operation, regardless of the cause, then 430.126(B) is unnecessary. There would be no change in the requirements for continuous thermal protection of such motors if 460.126(B) is removed.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-80 Log #1948 NEC-P11 **Final Action: Accept**
(430.126(C))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise text to read as follows:
430.126(C) Multiple Motor Applications.
For multiple motor applications, individual motor overtemperature protection shall be provided as required in 430.126(A) .
Relocate FPN from 430.126(C) to 430.126(A).
Note: This is a companion proposal to 430.126(A).
Substantiation: Provides guidance to where and how overtemperature protection for multiple motors shall be provided for multiple motor applications.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-81 Log #1693 NEC-P11 **Final Action: Reject**
(430.150)

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.
Recommendation: Add text to read as follows:
Article 430, Part XI. Valve Actuator Motors.
430.150 General. The installation provisions of Part I through Part 1X are applicable unless modified or supplemented by Part XI.
430.151 Marking on Valve Actuator Motors
(A) Usual Valve Actuator Motor Applications. A valve actuator motor shall be marked with the following information:
(1) Manufacturer's name.
(2) Rated voltage
(3) Rated frequency and number of phases of an ac motor
(4) Rated full load speed
(5) Rated ambient temperature
(6) Time rating. The time rating shall be in seconds or minutes.
(7) Insulation class
(8) Connection diagram
(9) Enclosure type
(10) Duty
(11) Order number
(12) Serial number
Additional information regarding operation characteristics, manufacturer, and the like shall be permitted to be included on the nameplate.
430.152 Motor Branch-Circuit Short-Circuit and Ground-Fault Protection
(A) The valve actuator motor branch circuit short-circuit and ground-fault protective device rating shall be determined under engineering supervision and shall comply with Article 240.
430.153 Protection Conductors - Minimum Size and Ampacity.
(A) Branch/Feeder Circuit Conductors, 600V and less. Circuits conductors supplying valve actuator motors shall comply with Article 310.
430.154 Overload Protection.
(A) Valve actuator motors shall contain overload protection provided by the valve manufacturer as part of the actuator motor assembly.
430.155 Disconnecting Means. This section is intended to require disconnecting means for each valve actuator motor capable of disconnecting the valve actuator motor and controller from the source of supply.
(A) Minimum Size. The disconnecting means may be an integral part of the motor branch-circuit short-circuit ground-fault device. If a remote disconnecting means is used it shall have a rating not less than the branch-circuit short-circuit ground-fault protection device that is protecting the circuit.
(B) Controller. An individual disconnecting means shall be provided for each controller and shall disconnect the controller. The disconnecting means shall be located in sight of the controller location.
Exception: The disconnecting means shall not be required to be in sight from the controller under either condition (a) or (b), provided the disconnecting means is capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
(a) Where such location of the disconnecting means introduces additional or increased hazards to persons or property
(b) In industrial locations, with written safety procedures, where conditions of maintenance and supervision ensure that only qualified persons service the equipment.
(c) Motor. A disconnecting means shall be located within sight from the valve actuator motor location.
Exception: The disconnecting means shall not be required to be in sight from the motor under either condition (a) or (b), provided the disconnecting means is capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
(a) Where such location of the disconnecting means introduces additional or increased hazards to persons or property
(b) In industrial locations, with written safety procedures, where conditions of maintenance and supervision ensure that only qualified persons service the equipment.
FPN No. 1: An example of increased or additional hazard is where the motor operated valve is used for a process emergency shutdown and the failure of the disconnecting means near the motor operated valve controller would prevent the valve from operating.
FPN No. 2: For information on lockout/tagout procedures, see NFPA 70E-2004, Standard for Electrical Safety in the Workplace.
430.156 Haza rdous (Classified) Locations. Valve actuator motors located in hazardous (classified) locations shall comply with 500.8, 501.125(A)(1) and 501.125(B).
430.157 Grounding. Valve actuator motors shall be grounded in accordance with Article 250.
Substantiation: This is a companion proposal for a new addition for valve actuator motors. Companion proposal section numbers are: Figure 430.1, 430.2, and 430.6(D).
The NEC doesn't presently address valve actuator motors. Users in the industrial/petrochemical have tried for years to apply Article 430 to valve actuator motors without success. These motors do not fit into many of the present rules that are in Article 430. I believe they need their own section and special rules.
Panel Meeting Action: Reject
Panel Statement: While the scope of Article 430 does cover valve actuator motors, additional provisions may be needed to adequately address the application of this equipment. However, there are a number of issues raised by the submitter's proposal that need to be better addressed.
The panel is concerned that the proposed requirements could be applied in cases where they are not warranted such as valve modulating motors. In addition, the proposed requirements related to wire sizing overcurrent protective device sizing and the need for a disconnecting means for the motor controller are not well specified or addressed. Information from the valve actuator manufacturer is needed in order to more precisely specify requirements for this equipment.
The panel also notes that general references to other articles without providing specific sections are not permitted by the manual of style. In

addition, addressing hazardous location applications is outside the scope of this article.

The panel suggests using the current structure of Article 430 and in particular Section 430.22(E) and providing the modifications necessary to accommodate valve actuator motors within this structure.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

CACCAMESE, J.: The addition of new Part XI provides a necessary means to provide a method to protect workers performing maintenance or repair/replacement to motorized actuators. I concur with the submitter that these units provide a unique application that differs from the motor types presently listed in Article 430.

GLOVER, W.: The action on this proposal should have been Accept in Principle.

Refer to my comments on Proposals 11-62 and 11-63. Acceptance of either of these proposals would accomplish the intent of this submitter that is not covered by existing Article 430 language.

11-82 Log #365 NEC-P11 **Final Action: Accept in Principle**
(430.227)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read:

430.227 Disconnecting Means. The controller disconnecting means shall be capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.

Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430-102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and substantiation on Proposal 11-83.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

CACCAMESE, J.: The additional sentence in this proposal "Portable means for adding a lock to a switch or circuit breaker shall not be permitted" is important and should be added to 430.102(B), 440.14 and all other sections in 430 and 440 that do not have this language. Without this language, the red plastic covers that snap over operating handles and would accept a lock would met the existing language.

11-83 Log #2037 NEC-P11 **Final Action: Accept**
(430.227)

Submitter: James T. Dollard, Jr., IBEW Local 98

Recommendation: Revise text to read as follows:

430.227 Disconnecting Means

The controller disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

Substantiation: The problem with the present wording of this section is that the disconnect in many motor installations over 600-volts nominal is a circuit breaker in a switchboard/starter or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where motors at over 600-volts are installed we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances. The same level of safety is needed for these disconnecting means for motors operating at over 600 volts.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-84 Log #2178 NEC-P11 **Final Action: Accept in Principle**
(430.227)

Submitter: Dann Strube, Strube Consulting

Recommendation: Add new sentence:

The provisions for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

Substantiation: To match other code rules and to comply with OSHA rules.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and substantiation on Proposal 11-83.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-85 Log #95 NEC-P11 **Final Action: Reject**
(430.242)

Submitter: Adam Krouse, Dewitt, MI

Recommendation: Revise as follows:

"The frames of stationary motors shall be grounded ~~under any of the following conditions:~~ where not isolated or guarded."

Delete paragraphs (1) through (4).

Retain the last sentence.

Substantiation: This section is so permissive that it is not necessary to ground most electric motors that operate from a 120/240 volt single-phase electrical system, or a 208Y/120 volt 3-phase electrical system if supplied by a nonmetallic wiring method. All that needs to be done is to make sure the motor is insulated from ground. It does not matter whether the ungrounded motor is exposed to human contact. This would explain the numerous installations I find where motor powered equipment in industrial plants have the ground wires cut off and complaints of shocks from the equipment. Apparently, it is not necessary to ground all motors exposed to human contact.

Panel Meeting Action: Reject

Panel Statement: Only the frames of stationary motors that are isolated or guarded are not required to be grounded. Most motors in fact are required to be grounded in accordance with 430.242. No evidence has been provided to support the proposed revision.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-86 Log #1147 NEC-P11 **Final Action: Accept**
(430.242(3))

TCC Action: The Technical Correlating Committee directs the panel to clarify the action on this proposal as to whether or not they intend to include references to the other Articles between 500 and 517. This action will be considered by the panel as a public comment.

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

(3) If in a hazardous (classified) location as described in 500.5 and 517.60 ~~covered in Articles 500 through 517.~~

Substantiation: Edit. To conform to Style Manual requirements.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-87 Log #106 NEC-P11 **Final Action: Accept**
(430.243)

Submitter: Brian Gregory, Linwood, MI

Recommendation: Revise as follows:

The frames of portable motors supplied by a premises wiring system ~~that operate at over 150 volts to ground~~ shall be ~~guarded or~~ grounded unless guarded or isolated from contact .

Substantiation: It does not seem reasonable that portable motors operating at less than 150 volts to ground that are supplied by a premises wiring system should be permitted to be operated ungrounded with frames of the equipment can make contact with personnel. If there are cases where motors should not be grounded, then allow for those cases.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

GOETZ, C.: While it is understood that the panel is attempting to improve safety, acceptance of this proposal without modification will have an impact on manufacturers of motor operated appliances, which must comply with Article 430 as noted in Section 422.3. Motor operated appliances that do not involve water or use in wet locations may be connected by a two conductor attachment plug. The listing requirements for such appliances operating at 150V or less to ground require leakage currents available between accessible metal parts and ground to be below prescribed limits during various operating conditions including, in some cases, high humidity conditions. The requirements in Section 250.114 appropriately cover grounding for residential and non-residential applications of motor operated appliances. Suggest that the current fine print note number 1 be revised to become an exception that refers all motor operated appliances to comply with 250.114. In addition, (portable) equipment, connected by a cord and plug, can be double insulated which is neither grounded nor guarded. Another exception is needed to permit listed double insulated equipment to be utilized without need for additional means. The text in the exception to 250.114 could be added as exception no. 2.

11-87a Log #916 NEC-P11 **Final Action: Accept in Principle**
(430.245)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:
~~Where required~~ Grounding shall be done in the manner specified in Part VI of Article 250.
Substantiation: Edit. Where grounding is not required, but done by choice, Article 250 should apply. Where done by choice present wording does not impose requirements. Code provisions are not limited to mandatory requirements and 110.12 applies to all wiring. 250.1(1) indicates Article 250 covers installations "permitted" and the proposal would correlate this section.
Panel Meeting Action: Accept in Principle
Revise the main paragraph of 430.245 to read as follows:
430.245 Method of Grounding. Connection to the equipment grounding conductor shall be done in the manner specified in Part VI of Article 250. [Remaining subparagraphs are unchanged.]
Panel Statement: The panel has removed the words "where required," as requested, and has made changes to correlate with the action on Proposal 11-1.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-88 Log #2208 NEC-P11 **Final Action: Reject**
(430.245(B))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise as follows:
"... provided the leads to the meter are stranded conductors within Type AC cable, <u>Type PA cable,</u> interlocked metal tape Type MC cable...".
Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.
Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (430.245(B)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Type PA cable is not currently recognized in Chapter 3 as an approved wiring method.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-89 Log #2691 NEC-P11 **Final Action: Reject**
(Tables 430.247, 430.248, 430.249, 430.250)

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Relocate Table 430.247, Table 430.248, Table 430, 249, and Table 430.250.
Substantiation: If my proposal to establish new text for 430.6(A)(1) is accepted, these tables should be relocated to a new Annex F or somewhere acceptable to the panel.
Panel Meeting Action: Reject
Panel Statement: Refer to the panel action and statement on Proposal 11-18.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

ARTICLE 440 — AIR-CONDITIONING AND REFRIGERATING EQUIPMENT

11-90 Log #421 NEC-P11 **Final Action: Reject**
(440.2)

Submitter: Earl W. Roberts, Reptec
Recommendation: Change the title of "Leakage Current Detection and Interruption (LCDI) Protection" to:
"Leakage Current Detector and Interrupter (LCDI)"
Substantiation: The proposed change would correct the grammar and would correlate with the definitions of "GFCI" in Article 100 and "AFCI" in Article 210.
Panel Meeting Action: Reject
Panel Statement: Leakage Current Detection and Interruption is the phrase used by product standards and is an integral component of a cord set.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-91 Log #2843 NEC-P11 **Final Action: Reject**
(440.5)

Submitter: Doug Eckelkamp, Bell Electric
Recommendation: Revise text to read as follows:
440.5 Marking on Controllers. A controller shall be marked with the manufacturer's name, trademark, or symbol: identifying designation; voltage; phase; full-load and locked-rotor current (or horsepower) rating; <u>the short-circuit current rating</u> ; and such other data as may be needed to properly indicate the motor-compressor for which it is suitable.
<u>Exception No. 1: The short-circuit current rating is not required to be marked on the controller when the short-circuit current rating of the controller is marked elsewhere on the assembly.</u>
<u>Exception No. 2: The short-circuit rating is not required to be marked on the controller when the assembly into which it is installed has a marked short-circuit current rating.</u>
Substantiation: Correlation is needed within 430.8 as far as short-circuit current ratings are concerned. Exceptions found in 430.8 for controllers for very small motors are unnecessary.
Panel Meeting Action: Reject
Panel Statement: The submitter's concerns are already addressed in 440.4(B).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
FAHEY, R.: The panel action should have been to accept this proposal to revise Section 440.5. I do not agree with the panel statement that the concerns of the submitter are addressed in 440.4(B). Section 440.4(B) addresses multi motor and combination load equipment, and are not enforceable in Section 440.5 which deals with controllers. Therefore, the short circuit current rating should also be required for controllers in Section 440.5.
Article 430 requires the short circuit current rating to be marked on multi motor and combination load equipment in 430.7(D)(1) and for controllers in 430.8. The additional marking requirement requested in the proposal for controllers in Article 440 should be consistent with the marking requirements in Article 430. By adding the short circuit current rating to the controller it would add consistency between Article 430 and 440, but more importantly add information that would give the installer guidance as to the amount of short circuit current the controller is capable of withstanding.

11-92 Log #1069 NEC-P11 **Final Action: Accept in Principle in Part**
(440.12(A)(1) Exception and (B)(2), Exception)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
(A)(1) Exception: A listed ~~nonfusible~~ motor circuit switch <u>without fuseholders</u> having a horsepower rating not less than the equivalent horsepower rating determined in accordance with 440.12(A)(2) <u>or a molded case switch</u> shall be permitted to have an ampere rating <u>not</u> less than <u>100</u> ~~115~~ percent of the specified current.
(B)(2) Exception: A listed ~~nonfused~~ motor circuit switch <u>without fuseholders</u> having a horsepower rating not less than the equivalent horsepower determined in accordance with 444.12(B)(1) <u>or a molded case switch</u> shall be permitted to have an ampere rating not less than ~~115~~ <u>100</u> percent of the sum of all currents.
Substantiation: Edit. A switch with jumpers across the fuseholders is nonfused. UL uses the phrase "without fuseholders". Such motor circuit switches and molded case switches are listed for continuous current at their ampere rating. "Less than 100 percent" does not establish a lower limit; e.g., 50 percent is less than 115 percent.

Panel Meeting Action: Accept in Principle in Part

Revise the exceptions to read as follows:

(A)(1) Exception: A listed ~~nonfused~~ unfused motor circuit switch, without fuseholders, having a horsepower rating not less than the equivalent horsepower determined in accordance with 440.12(A)(2) shall be permitted to have an ampere rating less than 115 percent of the specified current.

(B)(2) Exception: A listed ~~nonfused~~ unfused motor circuit switch, without fuseholders, having a horsepower rating not less than the equivalent horsepower determined in accordance with 440.12(B)(1) shall be permitted to have an ampere rating less than 115 percent of the sum of all currents.

Panel Statement: The panel rejects the change "not less than 100 percent." The exception reflects the same percentage value as does the main rule. The panel rejects the addition of the words "or a molded case switch." The remainder of the proposal is accepted to be consistent with the product standards. Molded case switches are rated in amperes. The exception does not apply to molded case switches.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-93 Log #124 NEC-P11 **Final Action: Accept in Principle**
(440.14)

Submitter: Mark Halmo, PDM Group

Recommendation: Addendum to Article 440.14 A/C and Refrigeration Equipment: Disconnecting means shall not be mounted so as to cover machine data tag.

Substantiation: In my more than 18 years in the HVAC industry, I have found service disconnects mounted over the manufacturers' data tag, preventing safe acquisition of pertinent information such as voltage, etc.

Panel Meeting Action: Accept in Principle

Add the following at the end of the second paragraph of 440.14 to read as follows:

"or to obscure the equipment nameplate(s)."

Panel Statement: The panel has provided language that more clearly provides the intended change.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-94 Log #3600 NEC-P11 **Final Action: Reject**
(440.14)

Submitter: Douglas Hansen, Code Check

Recommendation: Add the following sentence to the end of the first paragraph in 440.14:

Working space about the disconnecting means shall comply with 110.26.

Substantiation: There is inconsistency in interpretation and enforcement for working space about the disconnecting means for air conditioning equipment, yet it is clearly a type of equipment that is frequently worked on while energized, and it should fall under the scope of 110.26. The wording here is the same that was added to article 480 in the 1999 cycle, clarifying the need for working space about a battery rack. This proposal is consistent with many other recent changes that promote worker safety.

Panel Meeting Action: Reject

Panel Statement: Section 110.26 already applies per 90.3.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-95 Log #493 NEC-P11 **Final Action: Accept in Principle**
(440.14 Exception No. 1)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise as follows:

Exception No. 1: Where the disconnecting means provided in accordance with 430.102(A) is capable of being locked in the open position, and the refrigerating or air-conditioning equipment is essential to an industrial process in a facility with written safety procedures, and where the conditions of maintenance and supervision ensure that only qualified persons service the equipment, a disconnecting means within sight from the equipment shall not be required. The provision for locking or adding a lock to the disconnecting means shall be installed at the switch or circuit breaker and shall remain in place with or without the lock installed. ~~shall be p ermanently installed on or at the switch or circuit breaker used as the disconnecting means.~~

Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for workers should be consistent. This wording and requirement should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.

Panel Meeting Action: Accept in Principle

Revise the last sentence of the exception to read as follows:

The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker and shall remain in place with or without the lock installed.

Panel Statement: The words "on or" were added to be consistent with the action on Proposal 11-83.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

CACCAMESE, J.: An additional sentence, "Portable means for adding a lock to a switch or circuit breaker shall not be permitted" is important language that should be added to 440.14, Exception No. 1. This will ensure that the red plastic covers that snap over operating handles and accept a lock would not be allowed.

11-96 Log #3068 NEC-P11 **Final Action: Reject**
(440.14 Exception No. 1)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Delete text as follows:

440.14 Location. ~~Exception No. 1~~

Substantiation: The entire Exception No. 1 should be deleted. If there are written procedures and only qualified persons service the equipment then all the more reason to go ahead and meet the intent of the safety rule as written in 440.14 and require that a disconnect be located within sight of the equipment. Safety for people is supposed to be the goal of the rules contained in the NEC as explained in 90.1(A). Since when did the NEC decide to put product ahead of people?

Panel Meeting Action: Reject

Panel Statement: The exception as written provides safeguards for qualified persons. The conditions listed in the exception specifically limit the application.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

CACCAMESE, J.: The installation and application of a disconnecting means within sight does not hinder the operation of air-conditioning equipment as applied to an industrial process when the conditions include written safety procedures, and the conditions of maintenance and supervision are only performed by qualified personnel. By placing a disconnect switch within sight, safety is assured.

11-97 Log #412 NEC-P11 **Final Action: Accept**
(440.21)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

III. Branch-Circuit Short-Circit and Ground-Fault Protection

440.21 General

The provisions of Part III specify devices intended to protect the branch-circuit conductors, control apparatus, and motors in circuits supplying hermetic refrigerant motor-compressors against overcurrent due to short circuits and ground fault ~~grounds~~ . They are in addition to or amendatory of the provisions of Article 240.

Substantiation: This proposal is an effort to promote consistency with the use of terms related to grounding and bonding. Ground fault is defined in 250.2 and is more appropriate to be used here because this is the type of event that the protection required in this part of Article 440 is intended to provide. This change brings the proposed text in this section consistent with the title of this section which is "Branch-circuit Short-Circuit and Ground-Fault Protection."

Note: There are also proposals to revise the current definition of the the word "ground" in Article 100 which could impact how it is currently used in this section.

Panel Meeting Action: Accept

Panel Statement: The panel notes that the word "fault" should be "faults" and directs that this change be made.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-98 Log #2831 NEC-P11 **Final Action: Reject**
(440.22(A))

Submitter: Nathan Goff, AMF Electric

Recommendation: Add a new last sentence to 440.22(A):

Circuit breakers that open as a result of a ground fault or short circuit at or near their maximum interrupting rating shall be tested, serviced, or replaced before reenergizing the motor circuit.

Substantiation: OSHA CFR 29 1910.334(b)(2) is so concerned about the safety of workers when it comes to reenergizing circuits after a fault that it prohibits the resetting of a circuit breaker without first checking out the circuit to make sure that the fault has been cleared. The manufacturers fully agree with this approach as can be seen in the NEMA sponsored article, written by Vince Baclawski, that appeared in the January, 1995 issue of EC&M Magazine.

"After a high level fault has occurred in equipment that is properly rated and installed, it is not always clear to investigating electricians what damage has occurred inside encased equipment. The circuit breaker may well appear virtually clean while its internal condition is unknown. For such situations, the NEMA AB4 "Guidelines for Inspection and Preventive Maintenance of MCCBs Used in Commercial and Industrial Applications" may be of help. Circuit breakers unsuitable for continued service may be identified by simple inspection under these guidelines. Testing outlined in the document is another and more definite step that will help to identify circuit breakers that are not suitable for continued service."

The addition of this material will help warn workers that they should not simply reset a circuit breaker after it has tripped. And they should be especially careful when the circuit breaker saw a short-circuit at or near its interrupting rating.

Panel Meeting Action: Reject

Panel Statement: The proposal is unenforceable as written and is not part of the electrical installation requirements of the NEC. Refer to the recommendations in NFPA 70B.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

CACCAMESE, J.: Should be accept in principle in part. Change to Fine Print Note: "Circuit breakers that open as a result of a ground fault or short circuit at or near their maximum interrupting rating should be tested, serviced or replaced before reenergizing the motor circuit. NEMA AB4 Guidelines for Inspection and Preventive Maintenance of MCCBs Used in Commercial and Industrial Applications is a source for correct procedures to follow." Comment: The submitter's substantiation shows the need for the installer/maintainer being aware of the hazard of re-energizing a breaker without clearing of a fault; however a FPN would make the qualified person performing work aware of the existence of the procedures needed for safe practices.

11-99 Log #1004 NEC-P11 **Final Action: Reject**
(440.32)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise second paragraph:

For a wye-start delta-run connected motor-compressor the ~~selection~~ ampacity of the branch circuit conductors between the controller and the motor-compressor shall be ~~permitted to be based on~~ not less than 72 percent of either the motor-compressor full load current or the branch circuit selection current, whichever is greater.

Delete the FPN.

Substantiation: Edit. The proposal is a positive statement consistent with similar Code wording. The FPN is superfluous. 90.1(C) states the Code is not intended as an instruction manual. Proposal removes any implication that conductor selection is based on 125 percent of 72 percent.

Panel Meeting Action: Reject

Panel Statement: The current text in 440.32 properly and clearly provides the requirements. The existing text more clearly expresses the requirements. The proposed text does not improve clarity.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-100 Log #3409 NEC-P11 **Final Action: Reject**
(440.32)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: In the second paragraph, delete "selection of" and change the terminology "based on" to "sized at".

Substantiation: The NEC has always required the 72% multiplier through the terminology "based on"; start with 58% (the base number) and then apply the appropriate multiplier. This is also the approach in 430.22(C); in the latter section "based on" must be maintained because the multiplier might be any number of possibilities due to duty cycle applications covered elsewhere in that section. The current literal text in Article 440 is confusing in this context and may suggest to some, especially those familiar with the "based on" wording in 430.22(C), that 72% should be multiplied by 125%.

Panel Meeting Action: Reject

Panel Statement: The present language along with the FPN provides clarity to the 72% requirement. Removal of "selection of" and changing "based on" to "sized at" do not improve the clarity of this section.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-101 Log #410 NEC-P11 **Final Action: Accept**
(440.53)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

440.53 Overload Relays

Overload relays and other devices for motor overload protection that are not capable of opening short circuits shall be protected by fuses or inverse time circuit breakers with ratings or settings in accordance with Part III unless identified ~~approved~~ for group installation or for part-winding motors and marked to indicate the maximum size of fuse or inverse time circuit breaker by which they shall be protected.

Exception: The fuse or inverse time circuit breaker size marking shall be permitted on the nameplate of the ~~approved~~ equipment in which the overload relay or other overload device is used.

Substantiation: The change is an effort to promote consistency in how the term "approved" is being used throughout the NEC. Both words are defined in Article 100.

Approved. Acceptable to the authority having jurisdiction.

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular Code requirement.

It appears as though the more appropriate word to use here is "identified" because these marks would be provided by the manufacturer and the equipment would probably be evaluated for this use and thus identified. The AHJ would generally not be doing this on this equipment.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-102 Log #411 NEC-P11 **Final Action: Accept**
(440.54(A))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

(A) Overload Protection. The motor-compressor shall be provided with overload protection selected as specified in 440.52(A). Both the controller and motor overload protective device shall be identified ~~approved~~ for installation with the short-circuit and ground-fault protective device for the branch circuit to which the equipment is connected.

Substantiation: The change is an effort to promote consistency in how the term "approved" i being used throughout the NEC. Both words are defined in Article 100.

Approved. Acceptable to the authority having jurisdiction.

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular Code requirement.

It appears as though the more appropriate word to use here is "identified" because these marks would be provided by the manufacturer and the equipment would probably be evaluated for this use and thus identified. The AHJ would generally not be doing this on this equipment.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-103 Log #408 NEC-P11 **Final Action: Accept**
(440.55(A))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

(A) Overload Protection. The motor-compressor shall be provided with overload protection as specified in 440.52(A). Both the controller and the motor overload protective device shall be identified ~~approved~~ for installation with the short-circuit ground-fault protective device for the branch circuit to which the equipment is connected.

Substantiation: The change is an effort to promote consistency in how the term "approved" is being used throughout the NEC. Both words are defined in Article 100.

Approved. Acceptable to the authority having jurisdiction.

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular Code requirement.

It appears as though the more appropriate word to use here is "identified" because these marks would be provided by the manufacturer and the equipment would probably be evaluated for this use and thus identified. The AHJ would generally not be doing this on this equipment.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

11-104 Log #2350 NEC-P11 **Final Action: Reject**
(440.55(B))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Increase voltage to 277.

Substantiation: 277 volts is a commonly utilized voltage, to restrict the receptacle rating to 250 volts requires 277v AC units to "hard wired". It is much safer to be able to replace this AC unit when one simply has to plug it in. Maintenance people may not be qualified to hard wire this equipment but that will not stop them. Note that there is no restriction on 277V receptacles installed for luminaries.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any proposed text to implement the change. The increased shock hazard at 277 volts to ground versus 120 volts to ground does not warrant this increase. The submitter's comparison of "phase to phase" voltage (250 volts) to "phase to ground"

voltage (277 volts) is inappropriate.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
COLE, T.: Although I agree with the panel that the proposal should be stated in a way that reflects the change being requested, I also agree with the concept of the submitter. There are many applications in which installers and maintenance people work on 480V and higher systems that have greater potential of being shocked. Why is unplugging a motor any more dangerous? If there is such a concern, why do we allow it in lighting systems? Refer to 210.6(C)1 through 6. It does seem that we are being consistent.
Comment on Affirmative:
CACCAMESE, J.: An unskilled maintenance worker should not work on a 277-volt hard-wired appliance. The danger of injury would increase greatly if the voltage to ground were increased to 277-volts as recommended in the proposal.

11-105 Log #2341 NEC-P11 **Final Action: Reject**
(440.60)

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Increase voltage to 277V in the first paragraph.
Delete the second paragraph.
Substantiation: 277 volts is a commonly utilized voltage, to restrict the receptacle rating to 250 volts requires 277v AC units to "hard wired". It is much safer to be able to replace this AC unit when one simply has to plug it in. Maintenance people may not be qualified to hard wire this equipment but that will not stop them. Note that there is no restriction on 277V receptacles installed for luminaries.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-104.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
COLE, T.: Although I agree with the panel that the proposal should be stated in a way that reflects the change being requested, I also agree with the concept of the submitter. There are many applications in which installers and maintenance people work on 480V and higher systems that have greater potential of being shocked. Why is unplugging a motor any more dangerous? If there is such a concern, why do we allow it in lighting systems? Refer to 210.6(C)1 through 6. It does not seem that we are being consistent.
Comment on Affirmative:
CACCAMESE, J.: See my explanation of vote on Proposal 11-104.

11-106 Log #2340 NEC-P11 **Final Action: Reject**
(440.62(A)(2))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Increase voltage to 277V.
Substantiation: 277 volts is a commonly utilized voltage, to restrict the receptacle rating to 250 volts requires 277v AC units to "hard wired". It is much safer to be able to replace this AC unit when one simply has to plug it in. Maintenance people may not be qualified to hard wire this equipment but that will not stop them. Note that there is no restriction on 277V receptacles installed for luminaries.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-104.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
COLE, T.: Although I agree with the panel that the proposal should be stated in a way that reflects the change being requested, I also agree with the concept of the submitter. There are many applications in which installers and maintenance people work on 480V and higher systems that have greater potential of being shocked. Why is unplugging a motor any more dangerous? If there is such a concern, why do we allow it in lighting systems? Refer to 210.6(C)1 through 6. It does not seem that we are being consistent.
Comment on Affirmative:
CACCAMESE, J.: See my explanation of vote on Proposal 11-104.

11-107 Log #3607 NEC-P11 **Final Action: Reject**
(440.65)

Submitter: Jim M. Schmer, Boise, ID
Recommendation: In 440.65 Leakage Current Detection (LCDI), or Arc Fault Circuit Interrupter (AFCI).
Substantiation: There seems to be a miss print in the heading of 440.65 where "and" should have been "or".
Panel Meeting Action: Reject
Panel Statement: The word "and" is appropriate because both devices are addressed in 440.65. The requirements clearly indicate that only one device must be provided.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

(Note: The sequence 11-108 was not used)

ARTICLE 445 — GENERATORS

13-4 Log #2270 NEC-P13 **Final Action: Reject**
(445.3 (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
455.xx Generators shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/EGSA/NECA 404-2000, Recommended Practice for Installing Generator Sets, ANSI/NECA 406-2003, Recommended Practice for Installing Residential Generator Sets, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 445. However, safety would be improved by offering more detailed installation guidance for generators.
Panel Meeting Action: Reject
Panel Statement: Repetitive information concerning installation standards is covered in Article 110.12 of the NEC.
The Code is not intended as a design specification or an instruction manual.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14
Ballot Not Returned: 1 Gustafson, R.

13-5 Log #3598 NEC-P13 **Final Action: Reject**
(445.8 (New))

Submitter: Joe McCann, City of Coral Springs
Recommendation: Add new text to read:
445.8 Application of Other Articles. Chapters One through four shall apply generally per 90.3 and 110.3(b). Equipment shall be installed and used in accordance with instructions included in the listing and labeling.
Substantiation: Generators should comply to the manufacturers instructions according to 110.3(B) (Installation and Use) and be capable of carrying any load applied automatically. Small generators are being permanently installed that cannot pickup automatically the connected load of the residence or business.
Panel Meeting Action: Reject
Panel Statement: NEC Chapters 1 through 4 apply to the installation of generators, including 90.3 and 110.3(B). The proposal duplicates existing NEC text.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14
Ballot Not Returned: 1 Gustafson, R.

13-6 Log #1598 NEC-P13 **Final Action: Accept**
(445.12(D))

TCC Action: The Technical Correlating Committee understands that the Panel Action replaces the word "neutrals" with "neutral points".
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 445.12(D):
Change "neutral" to "neutral point."
The revised text would appear as follows:
(D) Balancer Sets. Two-wire, dc generators used in conjunction with balancer sets to obtain neutral~~s~~ points for 3-wire systems shall be equipped with overcurrent devices that disconnect the 3-wire system in case of excessive unbalancing of voltages or currents.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

STAFFORD, T.: Based on comments made by Task Group members it doesn't look like this proposal was completed at the TG level. Based upon supporting material submitted to the Panel it appears that the work on the Task Group was not complete, nor in agreement. Supporting materials submitted also specified that the entire list of proposals created and submitted by the task group should be rejected.

13-7 Log #2891 NEC-P13 **Final Action: Accept**
(445.13)

TCC Action: The Technical Correlating Committee understands that the Panel also accepted the addition of the word "that" in the last phrase of the third sentence.

Submitter: Mark R. Hilbert, Wolfeboro, NH

Recommendation: Revise text to read:

445.13 Ampacity of Conductors. The ampacity of the conductors from the generator terminals to the first distribution device(s) containing overcurrent protection shall not be less than 115 percent of the nameplate current rating of the generator. It shall be permitted to size the neutral conductors in accordance with 220.61. Conductors that must carry ground-fault currents shall not be smaller than that required by ~~250.24(C)~~ 250.30(A) . Neutral conductors of dc generators that must carry ground-fault currents shall not be smaller than the minimum required size of the largest conductor.

Substantiation: Accepting the revised text will identify that the conductors in question are part of a "system" as opposed to a service which is supplied by a utility. 250.30(A)(2) and (8) contain the proper sizing requirements and are a more appropriate reference for the systems which are the subject of 445.13.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: The reference 250.30(A), is too general since it includes grounding electrode conductors which are not intended to carry ground fault currents, 250.30(A)(8) is the correct reference for the grounded circuit conductor and 250.122 in total is the correct reference for the equipment grounding conductor. Using the proposed reference would leave the wrong impression that grounding electrode conductors carry ground fault current.

13-8 Log #832 NEC-P13 **Final Action: Accept in Principle**
(445.18)

Submitter: Thomas H. Wood, Cecil B. Wood Inc.

Recommendation: Revise Section 445.18 to read as follows:

445.18 Disconnecting Means Required for Generators.

<u>(A)</u> Generators shall be equipped with disconnect(s) by means of which the generator and all protective devices and control apparatus are able to be disconnected entirely form the circuits supplied by the generator except where both of the following conditions apply:

(1) The driving means for the generator can be readily shut down.

(2) The generator is not arranged to operate in parallel with another generator or other source of voltage.

<u>(B) A single generator supplying more than one load, or multiple generators operating in parallel, shall be permitted to supply:</u>

<u>(1) A vertical switchboard with separate sections, or</u>

<u>(2) Individual enclosures with overcurrent protection tapped from a single feeder for load separation and distribution.</u>

Substantiation: The supply tap box on generators equipped with disconnecting means with or without overcurrent protection is not generally designed or manufactured for installation of multiple devices to serve separate circuits for emergency loads, fire pumps, legally required standby loads, and optional standby loads, although some AHJs have interpreted the mandated separation of wiring for emergency and standby loads in other Articles of the Code to require just that. The recommended addition clarifies that the disconnect(s), that also provide separation of the emergency and standby circuits, may be provided using a single feeder from the generator set to separately mounted enclosed disconnects with overcurrent protection or a distribution switchboard that separates emergency and standby load disconnects in different vertical sections. Multiple generators operating in parallel are treated similarly downstream of the paralleling switchboard. (Separately enclosed overcurrent devices or overcurrent devices mounted in separate vertical sections of a distribution switchboard can provide physical separation of the different systems or branches of distribution and define that the origin of the emergency, legally required standby, and optional standby systems is at the feeder overcurrent protection device, not the generator terminals. A related proposal has been submitted for 700.9).

This proposal was developed by the Task Group directed by the TCC to consider comments 13-6 and 13-71 and if appropriate to develop proposals for the 2008 NEC. The task group consisted of the following: Thomas H. Wood; Chair (Chair NFPA-70, panel 13), Hugh O. Nash; (Chair NFPA 99), Douglas S. Erickson; (Chair NFPA 110), James Costley; and Herb Whittall.

Panel Meeting Action: Accept in Principle

Relocate the proposed revision to a new 445.19 to read as follows:

445.19 Generators Supplying Multiple Loads.

<u>A single generator supplying more than one load, or multiple generators operating in parallel, shall be permitted to supply:</u>

<u>(1) A vertical switchboard with separate sections, or</u>

<u>(2) Individual enclosures with overcurrent protection tapped from a single feeder for load separation and distribution.</u>

Panel Statement: While the panel supported this change, it did not believe this change belonged under 445.18 but more appropriately as a new section 445.19.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: This change would permit multiple generators with no disconnect for each generator connected to a common bus. It is necessary to separate the requirements for disconnecting devices for each generator from the requirements for supplying multiple loads. The proposed wording does not do that.

13-9 Log #2121 NEC-P13 **Final Action: Accept in Principle**
(445.18)

Submitter: Bud Swathwood, Bud Swathwood Consulting

Recommendation: Insert after "generator" and before "except" the words... and <u>locked in the open position</u> except where both the following conditions apply:

Substantiation: This is a proposal for a safety factor for someone working on the generator or the equipment connected to the system.

Panel Meeting Action: Accept in Principle

Revise 445.18, first sentence, to read as follows:

Generators shall be equipped with disconnect(s), <u>lockable in the open position</u> , by means of which the generator and all protective devices and control apparatus are able to be disconnected entirely from the circuits supplied by the generator except where both of the following conditions apply:

Panel Statement: The revised wording clarifies the submitter's intent.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

STAFFORD, T.: While the panel action is agreed with, it is desired that the action taken by Panel 13 provide additional safety features. By using wording as written in 430.102(B) exception and as accepted by Panel 12 in this code cycle in ROP 12-9: "The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted." would provide additional safety requirements, meet the intent of the submitter, and standardize wording for all applicable portions of the NEC.

13-10 Log #810 NEC-P13 **Final Action: Reject**
(Table 445.19 (New))

Submitter: Mark Stahley, Facilities Management Partners

Recommendation: A table is needed for calculating minimum dedicated generator loads (nonlinear). As a Stratford Career Institute student, I can only make a proposal, not test it.

Substantiation: A table is needed for calculating minimum generator capacity reserved for nonlinear loads. It seems to me that even though nonlinear lighting loads gain mechanical advantage through the electrical equivalent of "ropes and pulleys" the "fatigue" factor remains the same, so that the capacity for an X watt incandescent bulb putting out 1 footcandle should be the same or greater than a fluorescent of Y watts putting out 1 footcandle.

Panel Meeting Action: Reject

Panel Statement: No specific text was proposed. The proposal does not meet the requirements of Section 4.3.3. of the NFPA Regulations Governing Committee Projects.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14

Ballot Not Returned: 1 Gustafson, R.

13-11 Log #1716 NEC-P13 **Final Action: Accept in Principle**
(445.19)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information since there was a similar proposal for 590.6(A).
Submitter: Ray Stanko, Underwriters Laboratories, Inc.
Recommendation: Add text to read as follows:
Ground-Fault Circuit Interrupter Protection for Receptacles on Portable Generators. All 125-volt, single-phase, 15- 20-, and 30 ampere receptacle outlets that are a part of a portable generator shall have ground-fault circuit interrupter protection for personnel.
Substantiation: By requiring GFCI protection for personnel for these receptacle outlets on portable generators, this new section will meet the intent of providing GFCI protection as covered in 590.6, where these portable generators are often used as temporary power. Electrical equipment, such as table saws, pressure washer, and hand-held tools should have adequate GFCI protection for personnel on construction sites and similar locations. There are many hazards associated with temporary installations, such as cut and abraded wire, wet locations, and similar hazardous applications requiring GFCI protection no matter the power source. This new section will ensure that portable generators will have adequate personnel protection for these receptacles whether the generators are on a construction site or used elsewhere. During power outages from storms and other natural disasters, persons who may not be familiar with adequate safety procedures frequently use these generators to supply power in less than optimal conditions.
Panel Meeting Action: Accept in Principle
Add a new 445.20, to read as follows:
Ground-Fault Circuit Interrupter Protection for Receptacles on Portable Generators. All 120 and 120/240 volt, single-phase, 15-, 20-, and 30 ampere receptacle outlets that are a part of a portable generator shall have <u>listed</u> ground-fault circuit interrupter protection for personnel.
Panel Statement: The panel clarified that this requirement applies to 120 volt and 120/240 Volt receptacles, and added the word "listed" to avoid unreliable ground fault protection.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
ELKINS, D.: This proposal should be rejected or accepted in principle with an industrial exception. The proposal ignores industrial applications of portable generators in which loss of power can have safety consequences. Examples might include: refrigeration compressors for cryogenic storage of flammable materials, flood lighting for workers on elevated structures, magnetically held cutting/welding tools or ventilation/pressurization for enclosures in a hazardous location. This proposal could be supported if an exception is added as follows: "In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified personnel are involved, portable generators without GFCI receptacles may be applied when serving loads whose loss are judged by the AHJ to have safety consequences."
SWAYNE, R.: The need for ground fault protection for receptacles on portable generators, if necessary, should be in 250.34. The need for ground fault protection should be determined by CMP 5 which has the expertise for grounding requirements.
Comment on Affirmative:
NASBY, J.: NEMA is concerned is with the application of this requirement to all generators, in particular where these generators supply power to fixed wiring systems that may not be compatible with GFCI protection.

ARTICLE 450 — TRANSFORMERS AND TRANSFORMER VAULTS

9-129 Log #1480 NEC-P09 **Final Action: Reject**
(450.3)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
<u>(A)</u> Transformers 600 Volts, Nominal, or Less. Overcurrent protetion shall be provided in accordance with Table 450.3 <u>(A).</u>
<u>(B)</u> Transformers Over 600 Volts, Nominal. Overcurrent protection shall be provided in accordance with Table 450.3 <u>(B)</u> .
Exception: Code language to remain unchanged for the exception.
The existing tables should remain unchanged, other than changing their locations and names to (A) for less than 600 volts and (B) for over 600 volts.
Substantiation: Throughout the rest of the Code, the provisions for systems operating over 600 volts appear after the requirements of those operating below 600 volts. This makes perfect sense, considering the fact that there are many more systems that operate at less than 600 volts than those operating over 600 volts.
A companion proposal to 450.7 will be submitted to provide correlation.
Panel Meeting Action: Reject
Panel Statement: Most transformers within the scope of the NEC are step down transformers. It is more logical to cover these transformers in Article 450 in the direction of power flow, first the higher voltage and then the lower voltage.
Such a change may lead to confusion for persons already familiar with the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-130 Log #3526 NEC-P09 **Final Action: Reject**
(450.3(A) Note 6 and Table 450.3(B), Note 4 (New))

Submitter: Steven R. Musial, II, CJL Engineering
Recommendation: Article 450 does not address a method of sizing primary and secondary transformer conductors. Add Note 6 to Table 450.3(A) and add Note 4 to Table 450.3(B) which states:
"Transformer primary conductors shall be capable of carrying at least 1.25 times the transformer primary load amps. Transformer secondary conductors shall be capable of carrying at least 1.25 times the transformer secondary full load amps."
Substantiation: Transformer primary and secondary conductors should be capable of carrying <u>continuous</u> primary full load amps and <u>continuous</u> secondary full load amps.
Panel Meeting Action: Reject
Panel Statement: Conductor protection is beyond the scope of the article. See 450.3 FPN No. 1.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-131 Log #432 NEC-P09 **Final Action: Accept**
(Table 450.3(B) Note 2)

Submitter: Brian Dolan, IBEW/NECA Technical Institute
Recommendation: Delete the last sentence of Note 2 as follows:
~~If both breakers and fuses are utilized as the overcurrent device, the total of the device ratings shall not exceed that allowed for fuses.~~
Substantiation: Since the "secondary protection" portion of Table 450.3(B) does not distinguish between fuses and circuit breakers, the last sentence is unnecessary.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-132 Log #1273 NEC-P09 **Final Action: Accept**
(Table 450.3(B) Note 2)

Submitter: Jim Davis, Electrical Education Services, LLC
Recommendation: Revise as follows:
2. Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses grouped in one location. Where multiple overcurrent devices are utilized, the total of all device ratings shall not exceed the allowed value of a single overcurrent device. ~~If both breakers and fuses are utilized as the overcurrent device, the total of the device ratings shall not exceed that allowed for fuses.~~
Substantiation: Unlike Table 450.3(A), Table 450.3(B) is not organized to differentiate between circuit breakers and fuses, and the text of the proposed deleted sentence is irrelevant and potentially confusing.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-133 Log #1599 NEC-P09 **Final Action: Accept**
(450.5)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 450.5:
Change "neutral reference" to "neutral point."
The revised text would appear as follows:
Grounding autotransformers covered in this section are zigzag or T-connected transformers connected to 3-phase, 3-wire ungrounded systems for the purpose of creating a 3-phase, 4-wire distribution system or providing a neutral ~~reference~~ <u>point</u> for grounding purposes. Such transformers shall have a continuous per-phase current rating and a continuous neutral current rating. Zig-zag connected transformers shall not be installed on the load side of any system grounding connection, including those made in accordance with 250.24(B), 250.30(A)(1), or 250.32(B)(2).

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

In this section, the terms "neutral point" should be used instead of "neutral reference" since "neutral point" is being defined by the proposed definitions.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Panel Statement: Note to the Technical Correlating Committee is that acceptance is strictly conditional on the definition of terms in the substantiation being accepted by CMP-5.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-134 Log #2401 NEC-P09 **Final Action: Accept**
(450.5)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-119 since this proposal changed 250.32(B)(2) into an exception. This action will be considered by the Panel as a Public Comment.

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Revise text to read:

450.5 Grounding Autotransformers. Grounding autotransformers covered in this section are zigzag or T-connected transformers connected to 3-phase, 3-wire ungrounded systems for the purpose of creating a 3-phase, 4-wire distribution system or providing a neutral reference for grounding purposes. Such transformers shall have a continuous per-phase current rating and a continuous neutral current rating. Zigzag connected transformers shall not be installed on the load side of any system grounding connection, including those made in accordance with 250.24(B) <u>or</u> 250.30(A)(1) ~~, or 250.32(B)(2)~~ .

FPN: The phase current in a grounding autotransformer is one-third the neutral current.

Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.

Panel Meeting Action: Accept

Panel Statement: Note to the Technical Correlating Committee: Acceptance is strictly conditional on the companion proposal noted in the substantiation being accepted by CMP-5.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-135 Log #492 NEC-P09 **Final Action: Accept in Principle**
(450.5(B)(2))

Submitter: David Murray, IPC Resistors Inc.

Recommendation: Insert the following wording at the beginning of paragraph 450.2(B)(2):

<u>Where provision is made to automatically de-energize all ungrounded conductors upon the detection of a ground fault,</u> an overcurrent protective device of adequate short-circuit rating...

Add the following sentence at the end of the paragraph 450.2(B)(2):

"... or any series connected devices in the neutral connection thereto. <u>For high-resistance grounded systems where provision is not made to de-energize all ungrounded conductors upon the detection of a ground fault, and where the maximum ground fault current is controlled at 10A or less, and where the electrical system rated voltage is 600V or less, and where the zig-zag grounding auto transformer and the neutral grounding resistor are rated for continuous duty, an overcurrent protective device of adequate short circuit rating that will open simultaneously all ungrounded conductors when it operates shall be applied in the zig-zag grounding auto transformer branch circuit and shall be rated or set at a currant not exceeding 20 amperes.</u>

Optionally, the following additional wording could be added because it represents good engineering practice:

"The overcurrent protective device shall have auxiliary contacts for provision for remote alarming whenever the overcurrent protective decive is open."

Substantiation: 450.5(B)(2) requires an overcurrent protective device (OCD) set not higher than 125 percent of the grounding autotransformer's rated per-phase current, and furthermore that all three phases must be simultaneously opened when the OCD operates.

This works well for low-resistance grounded systems, which typically operate with a ground fault current in the neutral grounding resistor of between 50-400A, which corresponds to 17-133A of per-phase current for the zig-zag grounding autotransformer. It's no problem to find a circuit breaker to protect devices rated in the range of 17-133A. It is also very necessary to protect the grounding autotransformer (always a "zig-zag" transformer that passes only zero sequence ground fault current) in low-resistance grounding applications because the transformer and resistor are normally noncontinuous rated, for only 10 seconds of operation. In low-resistance grounded applications, the purpose of the grounding zig-zag autotransformer is to develop a ground reference voltage for a ground fault protective device to sense and trip the faulted feeder within a second or less.

This code rule is not entirely practical for high-resistance grounded systems, which are typically 480V delta with a 5A (sometimes up to 10A) neutral grounding resistor and zig-zag grounding autotransformer. In this application, the grounding autotransformer is not used to generate a ground reference voltage for a ground fault protective device, but rather for a ground fault alarm device only. The faulted circuit is not de-energized, but is allowed to remain energized until the fault is located and repaired, because the ground fault current is so small. In this case, the grounding transformer and associated neutral grounding resistor are always continuously rated. The neutral grounding resistor prevents the ground fault current from being higher than 5A (10A), which corresponds to 1.67A (3.3A) per phase in the zig-zag grounding autotransformer. It is impossible for the transformer to become overloaded because the 5A (10A) resistor limits the current to 1.67A (3.3A) per phase. The resistor and transformer are rated to carry this current continuously.

The code requirement of an overcurrent device that simultaneously trips all three phases at once, and which is set to 125 percent of 1.67A per phase, or 2.1A, is impractical - there is no 480V, 100 kAIC, 3-pole breaker on the market that is rated smaller than 15A, that trips all three phases simultaneously (ruling out a fused disconnect switch). 100 kAIC is often required due to the high available fault current on the secondary bus of a main power transformer. The best that can be done is to supply a current-limiting molded case breaker, rated 15-20A, 3-pole, 100 kAIC at 600 V, for short circuit protection and disconnecting means. Overload protection should not be required because the neutral grounding resistor limits the current to 1.67A per phase. Breaker examples include Square D model FIL36020 (rated 20A),Siemens model CED63B015 (rated 15A),Cutler-Hammer model FB3015PL (rated 15A), and others. The breaker should also have auxiliary contacts which are remotely monitored to provide alarm if the breakers are inadvertently left open because an open breaker means the grounding system has been disconnected.

IEEE Std. 142-1991, "Recommended Practice for Grounding of Industrial and Commercial Power Systems," paragraph 1.4.7, page 30, states, "...It is generally desirable to connect a grounding transformer directly to the main bus of a power system, without intervening circuit breaker or fuses, to prevent the transformer from being inadvertently taken out of service by the operation of the intervening devices. (In this case, the transformer is considered part of the bus and is protected by the relaying applied for bus protection). Alternatively, the grounding transformer should be served by a dedicated feeder circuit breaker, as shown in fig. 5(a), or connected between the main transformer and the main switchgear...".

My Recommendation:

The NFPA requirement for 125 percent overcurrent protection of continuous-rated zig-zag grounding autotransformers on high resistance grounded systems (where the resistor current is in the range of 1-10A max., and hence the corresponding transformer per phase current is in range of 0.3-3A max.), is neither practical nor possible. Hence, the 125 percent rating rule should be amended to permit up to 20A rated circuit breaker for high-resistance grounded, continuously rated, zig-zag grounding autotransformers, where the neutral ground fault current is 10A or less, where the system voltage is 600V or less, and where the ungrounded conductors are not de-energized by a protective device upon a first ground fault. The reason I say 20A instead of 15A is that Square D's smallest current-limiting 480V molded case circuit breaker is rated 20A. Siemens, Cutler-Hammer and GE all make 15A current-limiting 480V molded case circuit breakers.

By comparison, the Canadian Electrical Code requires overcurrent protection only for noncontinuous rated neutral grounding devices, which are found only on low-resistance grounded systems. See CSA Standard C22.1-2002, Rule 10-1104(3).

Panel Meeting Action: Accept in Principle

Revise 450.5(B) to read as follows:

(B) Ground Reference for Fault Protection Devices. A grounding autotransformer used to make available a specified magnitude of ground-fault current for operation of a ground-responsive protective device on a 3-phase, 3-wire ungrounded system shall conform to 450.5(B)(1) and (B)(2).

(1) Rating. The autotransformer shall have a continuous neutral-current rating sufficient for the specified ground-fault current.

(2) Overcurrent Protection. Overcurrent protection shall comply with (a) and (b).

(a) Operation and Interrupting Rating. An overcurrent protective device having an interrupting rating in compliance with 110.9 and that will open simultaneously all ungrounded conductors when it operates shall be applied in the grounding autotransformer branch circuit.

(b) Ampere Rating. The overcurrent protection shall be rated or set at a current not exceeding 125 percent of the autotransformer continuous per-phase current rating or 42 percent of the continuous-current rating of any series connected devices in the autotransformer neutral connection. Delayed tripping for temporary overcurrents to permit the proper operation of ground-responsive tripping devices on the main system shall be permitted but shall not exceed values that would be more than the short-time current rating of the grounding autotransformer or any series connected devices in the neutral connection thereto.

Exception: For high impedance-grounded systems covered in 250.36, where the maximum ground-fault current is designed to be not more than 10 amperes, and where the grounding autotransformer and the grounding impedance are rated for continuous duty, an overcurrent device rated not more than 20 amperes that will simultaneously open all ungrounded conductors shall be permitted to be installed on the line side of the grounding autotransformer.

Panel Statement: The revisions are editorial in nature. Not all impedances are resistors. The material is an exception to the general procedure that applies only to high-impedance grounded systems covered in 250.36, and is therefore more clearly stated as an exception to the general rule.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-136 Log #1479 NEC-P09 **Final Action: Reject**

(450.7)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

450.7 Parallel Operation. Transformers shall be permitted to be operated in parallel and switched as a unit, provided the overcurrent protection for each transformer meets the requirements of 450.3(A) for primary and secondary protective ~~over 600 volts~~ devices 600 volts or less , or 450.3(B) for primary and secondary protective devices ~~600 volts or~~ ~~less~~ over 600 volts .

Substantiation: Please refer to my proposal to change the section and table of 450.3

Throughout the rest of the Code, the provisions for systems operating over 600 volts appear after the requirements of those operating below 600 volts. This makes perfect sense, considering the fact that there are many more systems that operate at less than 600 volts than those operating over 600 volts.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 9-29.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-137 Log #250 NEC-P09 **Final Action: Reject**

(450.8(A))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

Appropriate provisions shall be made to minimize the possibility of damage to transformers from external causes where the transformers are exposed to ~~physical damage~~ blows or abrasion.

Substantiation: Use of the word “physical” is superfluous - the intention is obvious. In some instances, one could argue for the use of “mechanical” to differentiate that from e.g., “thermal” damage, but context makes the intended sense quite clear, rendering this unnecessary.

The proposed rewording is an attempt at precision. If you retain the repeat of the word “damage, I would then have to fall back to arguing that in that case the term “physical” should be eliminated.

Submitting proposals removing the adjective “physical” may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of “physical” is not only poor writing–look at William Zinsser’s classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to “physical damage,” in 1959, from “mechanical injury” (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, “Is anyone claiming electrical equipment needs protection from non-physical injury?” (Substitute the snide adjective of your choice.)

Panel Meeting Action: Reject

Panel Statement: The use in CMP-9’s articles is consistent with the rest of the Code. CMP-9 understands that this is a global proposal and if this terminology changes, it must be evaluated by the Technical Correlating Committee and guidance provided to code making panels so the results will be consistent.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-138 Log #918 NEC-P09 **Final Action: Accept**

(450.10)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text:

Where grounded , exposed noncurrent-carrying metal parts of transformer installations including fences, guards, and so forth, shall be grounded and bonded ~~where required~~ , under the conditions and in the manner specified for electric equipment and other exposed parts in Part V, Part VI, Part VII of Article 250.

Substantiation: To conform to the Style Manual. Grounding and bonding done by choice and not required, should be covered. Code provisions are not limited to mandatory requirements and 110.12 applies to all installations, 250.1(1) indicates Article 250 applies to installations “permitted” and the proposal correlates this section.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-139 Log #481 NEC-P09 **Final Action: Reject**

(450.13(B))

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona

Recommendation: Revise text to read:

(B) Hollow Space Installations. Dry-type transformers 600 volts, nominal, or less and not exceeding 50 kVA shall be permitted in hollow spaces of buildings not permanently closed in by structure or used as a plenum or other air handling spaces as identified in 300.22 , provided they meet ventilation requirements of 450.9 and separation from combustible materials requirements of 450.21(A). Transformers so installed shall not be required to be readily accessible.

Exception: Totally enclosed nonventilated transformers or transformers listed and identified for specific use may be used in other air handling spaces identified by 300.22(C)(2).

Substantiation: This will clarify that transformers with ventilation openings that contain plastics, varnish coated windings and other components that may produce smoke and toxic vapors that could escape through the ventilation openings and contaminate this space used for environmental air shall not be installed in this space unless listed for such installation

See the Exception to 300.22(C)(2) that will only allow an integral fan “where specifically identified for such use.”

This will also mirror the requirements in 300.22(C)(1) “...for totally enclosed, nonventilated, insulated busway..., surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers.”

Note: Supporting material is available for review at NFPA headquarters.

Panel Meeting Action: Reject

Panel Statement: Transformers have been used in these applications for years. There has been no technical substantiation submitted that indicates problems are encountered with existing installations. The language in the other referenced sections in the substantiation is intended to prohibit devices that may produce an arc in this area such as plug-in connection or motors. Transformers do not exhibit this concern.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

Comment on Affirmative:

BELISLE, R.: The submitter proposal to eliminate mounting of transformers above plenum ceilings is a concept worthy of thought. The panel statement of CMP-9 relates to a concern over items that may produce an arc, stating that transformers do not present such a hazard. The submitter is concerned about the lack of an enclosure that would contain any toxic vapor or smoke during a fault or failure. The introduction of either smoke or toxic vapor in a plenum area should raise concern. My notes indicate that there wasn’t adequate documentation to support such claims of any hazard. We would be interested in any fact finding data that may be available to base future decisions on.

9-140 Log #565 NEC-P09 **Final Action: Reject**
(450.13(B))

Submitter: Jeffrey A. Fecteau, City of Peoria, Arizona
Recommendation: Revise as follows:
(B) Hollow Space Installations. Dry-type transformers 600 volts, nominal, or less and not exceeding 50 kVA shall be permitted in hollow spaces of buildings not permanently closed in by structure <u>or used as a plenum or other air handling spaces as identified in Section 300.22</u> , provided they meet ventilation requirements of 450.9 and separation from combustible materials requirements of 450.21(A). Transformers so installed shall not be required to be readily accessible.
<u>Exception: Totally enclosed nonventilated transformers or transformers listed and identified for specific use may be used in other air handling spaces identified by 300.22(C)(2).</u>
Substantiation: This will clarify that transformers with ventilation openings that contain plastics, varnish coated windings and other components that may produce smoke and toxic vapors that could escape through the ventilation openings and contaminate this space used for Environmental Air shall not be installed in this space unless listed for such installation.
See the Exception to 300.22(C)(2) will only allow an integral fan “where specifically identified for such use.”
This will also mirror the requirements in 300.22(C)(1) “...for totally enclosed, nonventilated, insulated busway..., surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Transformers have been used in these applications for years. There has been no technical substantiation submitted that indicates problems are encountered with existing installations. The language in the other referenced sections in the substantiation is intended to prohibit devices that may produce an arc in this area such as plug-in connection or motors. Transformers do not exhibit this concern.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
BELISLE, R.: See my comment on Proposal 9-139.

9-141 Log #1270 NEC-P09 **Final Action: Reject**
(450.13(B))

Submitter: Mark Shapiro, Farmington Hills, MI
Recommendation: Revise the first sentence to permit 75 kVA transformers in hollow spaces.
“Dry-type transformers 600 volts, nominal, or less and not exceeding ~~50 kVA~~ <u>75 kVA</u> shall be permitted in hollow spaces of buildings not permanently closed in by structure, provided they meet the ventilation requirements of 450.9 and separation from combustible materials requirements of 450.21(A).”
Substantiation: It has been over 30 years since the 1971 NEC first permitted 50 kVA transformers to be exempt from being readily accessible. Since then, innumerable 75 kVA transformers have been installed (unknowingly in violation of the code) in suspended ceiling areas, above 200 amp panelboards, without any apparent incidents.
Let’s notch the permission up to a level that is still safe and removes unnecessary difficulty and uncertainty.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided adequate technical substantiation.
In order to make this change, CMP-9 would require documentation of the basis for the present 50 kVA limitation and why that limitation is no longer valid.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-142 Log #2402 NEC-P09 **Final Action: Reject**
(450.15 (New))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add new text to read:
<u>450.xx Disconnecting Means. An individual disconnecting means shall be provided for each transformer rated 75 kVA or greater, and shall disconnect the primary conductors from the transformer. The disconnecting means shall be located in sight from the transformer.</u>
<u>Exception No. 1: Where the disconnecting means is capable of being locked in the open position, and the transformer is essential to an industrial process in a facility with written safety procedures, and where the conditions of maintenance and supervision ensure that only qualified persons service the equipment, a disconnecting means within sight from the transformer shall not be required. The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.</u>
Substantiation: Nearly every piece of equipment in the National Electrical Code requires a local means of disconnect for the purposes of protecting our workforce. The exception to this is transformers, which are, in fact, more dangerous than other pieces of equipment in many ways.
The secondary conductors are typically considered unprotected by the primary device.
Many inspectors and designers do not believe the working space rules of 110.26(A) apply to transformers, resulting in less than ideal working conditions.
The internal components of a transformer (including field wiring) make the transformer very difficult to work on safely, and many times require the disconnection of conductors while troubleshooting, testing or maintaining the transformer.
Panel Meeting Action: Reject
Panel Statement: The principal application of in-sight disconnecting means generally involves motor-operated equipment in some form that is capable of sudden mechanical movement. This does not apply to a transformer. If this rule is eventually accepted in any form, it would need to allow for remote disconnects that are capable of being locked open.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
BELISLE, R.: The proposal to require a disconnecting means within sight of a transformer would eliminate many unsafe situations that occur regularly in the construction and maintenance industry.
The ability to lock out a transformer in the immediate area provides a safer workplace.
Current code does not require a locking means for transformers disconnect at this time. The installation requirement should mirror that of motors and other equipment requiring disconnecting. We would recommend this proposal be accepted in principle and add the requirement for “ <u>The provisions for locking shall remain in place with or without the lock installed</u> .” therefore not allowing a portable locking means that is not always available when needed.

9-143 Log #2271 NEC-P09 **Final Action: Reject**
(450.20(A) (New))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
450.xx Dry-type transformers shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 409-2002, Recommended Practice for Installing and Maintaining Dry-Type Transformers, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 450. However, safety would be improved by offering more detailed installation guidance for dry-type transformers.
Panel Meeting Action: Reject
Panel Statement: It is inappropriate to reference a particular guide since there are many installation and maintenance guides from other sources, in particular the manufacturer. The requirement in 110.12 is sufficient.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-144 Log #2272 NEC-P09 **Final Action: Reject**
(450.20(B))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
450.xx Liquid-filled transformers shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 410-2005, Standard for Installing and Maintaining Liquid-Filled Transformers, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment covered by Article 450. However, safety would be improved by offering more detailed installation guidance for liquid-filled transformers.
ANSI/NECA 410-2005 is currently under development and will be published before the Public Comment deadline.
Panel Meeting Action: Reject
Panel Statement: It is inappropriate to reference a particular guide since there are many installation and maintenance guides from other sources, in particular the manufacturer. The requirement in 110.12 is sufficient.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-145 Log #2756 NEC-P09 **Final Action: Accept**
(450.21(A))

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: In (A) dealing with spacing of a transformer from combustible materials change 305 mm to 300 mm.
Substantiation: It does not seem as though the spacing requirement is so critical that a difference of 5 mm will make a difference. For usability of the code and learning SI units it seems more desirable to round off the spacing to an even 300 mm.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-146 Log #2757 NEC-P09 **Final Action: Accept**
(450.22)

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: In the second paragraph dealing with spacing of a transformer from combustible materials change 305 mm to 300 mm.
Substantiation: It does not seem as though the spacing requirement is so critical that a difference of 5 mm will make a difference. For usability of the code and learning SI units it seems more desirable to round off the spacing to an even 300 mm.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-147 Log #2634 NEC-P09 **Final Action: Reject**
(450.23(A)(1)(c))

Submitter: Jonathan Piel, Roger Bengston, Cooper Power System
Recommendation: Delete requirement (c):
A liquid containment area is required.
Substantiation: 1) The requirement has proven unnecessary for the purpose of practical fire protection hazards for indoor installations of less-flammable liquid-filled transformers.
2) History: Since 1978 the NEC has recognized significantly less installation safeguards required for less-flammable fluid-filled transformers compared to mineral oil filled transformers. From 1978 to 1981 containment was not a requirement in 450.23. The push for the 1981 NEC Article 450 to add the requirements for a containment-area and heat-release-rates was based on the concept of having a pool fire.
3) History: By 1984, the NEC heat release rate requirements were removed.
4) History: The pool fire scenario for less-flammable liquid-filled transformers was never incorporated by Underwriters Laboratories in their listing (Classification) requirements.
5) Science: High temperature, high fault current, high voltage “worse case scenario” tests performed under Underwriters Laboratories witnessing resulted in no ignition of a pool of any listed less flammable dielectric liquid tested. [1]
6) Science: High temperature, sustained high current, low voltage tests “worse case scenario” designed and performed under FM Global witnessing resulted in no ignition of a pool of any listed less-flammable dielectric liquid. [2, 3, 4]
7) Experience: Field case histories of less-flammable liquid-filled transformers that have experienced severe internal arcing faults are consistent with the sustained high current laboratory testing outlined above. Even when the arcing has been so severe as to burn through the tank walls, no ignition of the liquid has occurred. [5]
8) Experience: There has never been a pool fire reported involving less-flammable-dielectric fluids since their introduction in 1975, with over two hundred-thousand transformers in service. [6]
9) Current Situation: NEC 450-23(a)(1)(d) states, “The installation complies with all restrictions provided for in the listing of the liquid.” The two NRTL listing agencies for less-flammable liquid are Underwriters Laboratories (UL) and FM Global (FM). UL and FM have also evaluated the history, science, and experience of fire risk. Since 1999 both UL and FM have been unified in not considering potential heat release rates for less-flammable fluids but rather focusing on tank rupture and fire prevention. [7, 8] Both UL and FM less-flammable transformer fluid listings have very stringent listing requirements to prevent eventful failures. [9, 10, 11, 12, 13] The key prevention safeguards include (not limited to):

- Limiting fault currents to safe levels
- Limiting internal pressures to safe levels
- Requiring the use of dielectric fluids that essentially cannot ignite to prevent pool fires

These combined requirements have contributed to the 30-year, ~250,000 transformer flawless safety record; there have been no pool fires involving less-flammable fluids with over 4,000,000 unit service years.
10) Conclusion: The 1981 perceived need to add containment of less-flammable fluids to the existing 1978 requirements has not been bourne out, consistent with science, experience, and NRTL requirements. Fluid containment is not required for practical safeguarding of persons and property from hazards arising from the use of transformers with less-flammable fluids.
References:

[1] S. D. Northrup, RTE, Protection of Transformers for the Prevention of Rupture, Explosion and Fire , presented to the Edison Electric Institute, January 17, 1985.
[2] C. Patrick McShane, Transformer Fluid Flammability Studies , presented at the 1997 Doble Client International Conference, Doble Publication 64PAIC97, pp. 5-3.1 through 5-3.6.
[3] Garrett P. McCormick, Final Report on FMRC Pool Fire Tests , January 11, 1995.
[4] Paul H. Dobson and C. D. Wolske, FM Global Research, Transformer Fluid Fire Testing With Mineral Oil, R-Temp, and Envirotemp FR3 , November 2002; (video footage at: http://www.cooperpower.com/FT3/detail/Demonstration/FluidIgnitionTests.asp)
[5] CPS Bulletin 92047, Case History , August 1998.
[6] Mark W. Earley, NFPA Engineering Services Division, Minimizing the Hazards of Transformer Fires , Fire Journal, January/February 1988.
[7] Excerpt from Factory Mutual Property Loss Prevention Data Sheets 5-4, 14-8. January 1997. (recognizing fire safety, this edition removed heat release rate)
[8] CPS Bulleting 96059, Factory Mutual Drops Heat Release Criteria , October 1996.
[9] Excerpt from Factory Mutual Property Loss Prevention Data Sheets 5-4, 14-8. May 2003. (recognizing fire safety, this edition increased gallons, decreased distances)
[10] Excerpt from the May 1999 FMRC Approval Guide - Electrical Equipment .
[11] CPS Bulletin 96016, UL Classification Marking, April 2000.
[12] Dale A. Hallerberg, P.E., Underwriters Laboratories, Inc., Less-Flammable Liquids Used in Transformers . IEEE Ind. Applicat. Mag., vol. 5, pp. 50-55, Jan./Feb. 1999.
[13] C. Patrick McShane, CPS, Introduction of the First Listing Standard for Liquid-Filled Distribution and Power Transformers , presented to the 28th International conference on Fire Safety, July 27, 1999.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The scope of Section 90-1, states: “ The purpose of this code is the practical safeguarding of persons and property from hazards arising from the use of electricity.” If the installation of liquid filled electrical equipment can result in damage to property or hazards to individuals by the release of liquid, then the requirement for containing liquid electrical insulating materials should stand.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-148 Log #536 NEC-P09 **Final Action: Reject**
(450.45(C))

Submitter: Elliot Miller, Thoridon Electric
Recommendation: Revise text to read:
For a vault vented by natural circulation of air to an outdoor area, the combined net area of all ventilated openings, ~~after deducting the area occupied by screens, gratings or louvers,~~ after deducting the area consisting of material within the screens, gratings, or louvers, shall not be less than 1900 mm 2 (3 in. 2) per kVA of transformer capacity in service, and in no case shall the net area be less than 0.1 m 2 (1 ft 2) for any capacity under 50 kVA.
Substantiation: There needs to be clarification as to whether the entire area occupied by the means of ventilation needs to be deducted or just the area where the air can’t flow through needs to be deducted.
Panel Meeting Action: Reject
Panel Statement: The measurement is a nominal one, capable of hard conversion (i.e., inexact) into metric values (as done in the present NEC). This is clear enough without adding additional text to the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

ARTICLE 455 — GENERATORS

13-12 Log #1022 NEC-P13 **Final Action: Accept in Principle**
(455.3)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change “requirements” to “provisions.”
Substantiation: Applicable provisions which are not requirements per se, should also apply. “Applicable provisions” is used in 400.2. Similar wording should be used where referring to the same thing. To avoid confusion.
Panel Meeting Action: Accept in Principle
Revise to 455.3 to read as follows:
Phase converters shall comply with this article and with the applicable provisions of other articles of this Code.

Panel Statement: The panel agreed with the proposal but placed the wording in the same order as in 400.2.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-13 Log #3552 NEC-P13 **Final Action: Reject**
(455.7(C) (New))

Submitter: Patrick Gaffney, Ronk Electrical Industries, Inc.
Recommendation: Add a new section 455.7(C) or Exception #1:
Where a power loss hazard exists, 240.4(A) shall apply and conductor overload protection shall not be required. Short circuit protection shall be provided.
Substantiation: Clarifies that 240.4(A) shall supersede 455.7 in applications where a loss of power could endanger safety, i.e. fire pumps, emergency sirens, valve actuators on pipelines (for emergency shut downs), etc.
Panel Meeting Action: Reject
Panel Statement: The submitter has not substantiated that a phase converter can supply sufficient short circuit to operate "short circuit protection". Phase converters must be sized to provide the maximum continuous current, such as motor locked rotor current. Therefore, the overcurrent protection sizing requirements in 445.7 (A) and (B) are adequate.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

ARTICLE 460 — CAPACITORS

11-109 Log #1497 NEC-P11 **Final Action: Accept in Principle**
(460.10)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete:
"... in accordance with Article 250".
Substantiation: Edit. 250.1 indicates Article 250 covers (1) required grounding; (2) permitted grounding: (3) not permitted grounding; and (4) substitution for grounding. Apparent intent is to apply (1) required grounding, which is clarified by the proposal. Some sections requiring grounding do not refer to Article 250, e.g. 490.36. Article 250 already applies, per 90.3.
Panel Meeting Action: Accept in Principle
Revise 460.10 to read as follows:
460.10 Grounding. Capacitor cases shall be connected to the equipment grounding conductor.
Exception: Capacitor cases shall not be connected to the equipment grounding conductor where the capacitor units are supported on a structure designed to operate at other than ground potential.
Panel Statement: The panel removed the words "in accordance with Article 250" and included direction for connection to the equipment grounding conductor to clarify the requirement and to correlate with the action on Proposal 11-1.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
BUNCH, R.: Need to review the final proposed 460.10 to be sure that capacitors which are plastic cases do not end up being interpreted as requiring to have the case grounded.

11-110 Log #1498 NEC-P11 **Final Action: Accept in Principle**
(460.27)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete:
"... in accordance with Article 250".
Substantiation: Edit. 250.1 indicates Article 250 covers (1) required grounding; (2) permitted grounding: (3) not permitted grounding; and (4) substitution for grounding. Apparent intent is to apply (1) required grounding, which is clarified by the proposal. Some sections requiring grounding do not refer to Article 250, e.g. 490.36. Article 250 already applies, per 90.3.
Panel Meeting Action: Accept in Principle
Revise 460.27 to read as follows:
460.27 Grounding. Capacitor cases shall be connected to the equipment grounding conductor. If the capacitor neutral point is connected to a grounding electrode conductor, the connection shall be made in accordance with Part III of Article 250.
Exception: Capacitor cases shall not be connected to the equipment grounding conductor where the capacitor units are supported on a structure designed to operate at other than ground potential.
Panel Statement: The panel agrees that a general reference to Article 250 is not appropriate but instead of removing the reference has added more specific direction as to the intended part of Article 250 to be used. In addition, the panel has included direction for connection to the equipment grounding conductor to clarify the requirement and to correlate with the action on Proposal 11-1. The panel also changed "neutral" to "neutral point" to correlate with the TCC Task group definition identified in the substantiation of Proposal 11-38.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

ARTICLE 470 — RESISTORS AND REACTORS

11-111 Log #249 NEC-P11 **Final Action: Reject**
(470.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Resistors and reactors shall not be placed where exposed to ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-33.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-112 Log #299 NEC-P11 **Final Action: Reject**
(470.18(A))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Protected Against ~~Physical~~ Damage. Resistors and reactors shall be protected against ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 11-33.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-113 Log #1499 NEC-P11 **Final Action: Accept**
(470.19)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete:
"... in accordance with Article 250".
Substantiation: Edit. 250.1 indicates Article 250 covers (1) required grounding; (2) permitted grounding: (3) not permitted grounding; and (4) substitution for grounding. Apparent intent is to apply (1) required grounding, which is clarified by the proposal. Some sections requiring grounding do not refer to Article 250, e.g. 490.36. Article 250 already applies, per 90.3.
Panel Meeting Action: Accept
Panel Statement: The panel refers to the panel action on Proposal 11-1 and advises that the action on Proposal 11-113 removes the words "in accordance with Article 250" from the action on Proposal 11-1. The result will read as follows:

470.19 Grounding. Resistor and reactor cases or enclosures shall be connected to the equipment grounding conductor.

Exception: Resistor or reactor cases or enclosures supported on a structure designed to operate at other than ground potential shall not be connected to the equipment grounding conductor.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

ARTICLE 480 — STORAGE BATTERIES

13-14 Log #3128 NEC-P13 **Final Action: Reject**
(480)

Submitter: Jeremy Enders, East Lansing, MI

Recommendation: Add a new title Part I Battery Installation ahead of 480.3, and add a new Part II Equipment and Wiring to follow 480.10 with the text of the sections in the new Part II as follow:

Part II Equipment and Wiring

480.41 System Grounding. For a power source, one conductor of a two-wire system with a voltage over 50 volts and the reference (center tap) conductor of a bipolar system shall be solidly grounded or shall use other methods that accomplish equivalent system protection in accordance with 250.4(A) and that utilize equipment listed and identified for the use.

Exception: Systems complying with 690.35.

480.71 Installation.

(A) General. The interconnected battery cells shall be considered grounded where the power source is installed in accordance with 480.41.

(B) Dwellings.

(1) Operating Voltage. Storage batteries for dwellings shall have the cells connected so as to operate at less than 50 volts nominal. Lead-acid storage batteries for dwellings shall have no more than twenty-four 2-volt cells connected in series (48 volts nominal).

Exception: Where live parts are not accessible during routine battery maintenance, a battery system voltage in accordance with 609.7 shall be permitted.

(2) Guarding of Live Parts. Live parts of battery systems for dwellings shall be guarded to prevent accidental contact by persons or objects, regardless of voltage or battery type.

FPN: Batteries in renewable energy production systems are subject to extensive charge-discharge cycles and typically require frequent maintenance, such as checking electrolyte and cleaning connections.

(C) Current Limiting. A listed, current-limiting, overcurrent device shall be installed in each circuit adjacent to the batteries where the available short-circuit current from a battery or battery bank exceed the interrupting or withstand rating of other equipment in that circuit.

FPN: See 690.16 for installation of current-limiting fuses in photovoltaic power systems.

(D) Battery Nonconductive Cases and Conductive Racks. Flooded, vented, lead-acid batteries with more than twenty-four 2-volt cells connected in series (48 volts, nominal) shall not use conductive cases or shall not be installed in conductive cases. Conductive racks used to support the nonconductive cases shall be permitted where no rack material is located within 150 mm (6 in.) of the tops of the nonconductive cases.

This requirement shall not apply to any type of valve-regulated lead-acid (VRLA) battery or any other types of sealed batteries that may require steel cases for proper operation.

(E) Disconnection of Series Battery Circuits. Battery circuits subject to field servicing, where more than twenty-four 2-volt cells are connected in series (48 volts nominal), shall have provisions to disconnect the series-connected strings into segments of 24 cells or less for maintenance by qualified persons. Non-load-break bolted or plug-in disconnects shall be permitted.

(F) Battery Maintenance Disconnecting Means. Battery installations, where there are more than twenty-four 2-volt cells connected in series (48 volts, nominal), shall have a disconnecting means, accessible only to qualified persons, that disconnects the grounded circuit conductor(s) in the battery electrical system for maintenance. This disconnecting means shall not disconnect the grounded circuit conductor(s) for the remainder of the photovoltaic electrical system. A non-load-break-rated switch shall be permitted to be used as the disconnecting means.

(G) Battery Systems of More Than 48 Volts. On systems where the battery system consists of more than twenty-four 2-volt cells connected in series (more than 48 volts, nominal), the battery system shall be permitted to operate with ungrounded conductors, provided the following conditions are met:

(1) The source and output circuit shall comply with 480.41.

(2) The dc and ac load circuits shall be solidly grounded.

(3) All main ungrounded battery input/output circuit conductors shall be provided with switched disconnects and overcurrent protection.

(4) A ground-fault detector and indicator shall be installed to monitor for ground faults in the battery bank.

480.72 Charge Control.

(A) General. Equipment shall be provided to control the charging process of the battery. Charge control shall not be required where the design of the source is matched to the voltage rating and charge current requirements of the interconnected battery cells and the maximum charging current multiplied by 1 hour is less than 3 percent of the rated battery capacity expressed in ampere-hours or as recommended by the battery manufacturer. All adjusting means for control of the charging process shall be accessible only to qualified persons.

FPN: Certain battery types such as valve-regulated lead acid or nickel cadmium can experience thermal failure when overcharged.

(B) Diversion Charge Controller.

(1) Sole Means of Regulating Charging. A power system employing a diversion charge controller as the sole means of regulating the charging of a battery shall be equipped with a second independent means to prevent overcharging of the battery.

(2) Circuits with Direct-Current Diversion Charge Controller and Diversion Load. Circuits containing a dc diversion charge controller and a dc diversion load shall comply with the following:

(1) The current rating of the diversion load shall be less than or equal to the current rating of the diversion load charge controller. The voltage rating of the division load shall be greater than the maximum battery voltage. The power rating of the diversion load shall be at least 150 percent of the power rating of the power source.

(2) The conductor ampacity and the rating of the overcurrent device for this circuit shall be at least 150 percent of the maximum current rating of the diversion charge controller.

(3) Systems Using Utility-Interactive Inverters. Power systems using utility-interactive inverters to control battery state-of-charge by diverting excess power into the utility system shall comply with (1) and (2):

(1) These systems shall not be required to comply with 480.72(B)(2). The charge regulation circuits used shall comply with the requirements of 690.8

(2) The conductor ampacity and the rating of the overcurrent device for this circuit shall be at least 150 percent of the maximum current rating of the diversion charge controller.

480.74 Battery Interconnections. Flexible cables, as identified in Article 400, in sizes 2/0 AWG and larger shall be permitted within the battery enclosure from battery terminals to a nearby junction box where they shall be connected to an approved wiring method. Flexible battery cables shall also be permitted between batteries and cells within the battery enclosure. Such cables shall be listed for hard-service use and identified as moisture resistant.

Substantiation: Battery systems are being installed as a part of renewable energy systems, especially in dwelling occupancies, and there are no rules for installing these systems. There is a good set of rules in Part VIII of Article 690, but those rules only apply to photovoltaic systems. Battery systems are being installed as a part of renewable energy systems that have nothing to do with photovoltaics.

Panel Meeting Action: Reject

Panel Statement: This proposal was extracted from Article 690 and still contains those references in it. It needs to be written and substantiated for general application of battery installations in dwellings.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14

Ballot Not Returned: 1 Gustafson, R.

13-15 Log #1093 NEC-P13 **Final Action: Accept in Part**
(480.3)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Change “requirements” to “applicable provisions” or alternatively, delete this section.

Substantiation: Edit. Some code provisions are not requirements. Per 90.5(B), some rules are permissive. 430.5 uses the term “applicable provisions”. This section is already covered by 90.3.

Panel Meeting Action: Accept in Part

Change “requirements” to “applicable provisions”

Panel Statement: The submitter offered the panel two alternativ,es and the panel accepted the first one as reflected in this change.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14

Ballot Not Returned: 1 Gustafson, R.

13-16 Log #1947 NEC-P13 **Final Action: Reject**
(480.5 (New))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Add text to read as follows:

480.5 Disconnecting Means. A disconnecting means shall be provided for all ungrounded conductors derived from a stationary battery system. A disconnecting means shall be readily accessible and located within sight of the battery system.

Substantiation: All batteries systems require maintenance if they are to remain functional. In some cases, such as in 700.3(C) and (D), the NEC requires battery system maintenance, and requires documentation of the maintenance. To safely perform maintenance on a stationary battery system, a disconnect means should be provided within sight of the battery system.

Panel Meeting Action: Reject
Panel Statement: There was no substantiation provided for requiring a disconnect for batteries of all voltage and current levels. Additionally there are no requirements specified in the proposal for the disconnect construction and ratings.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 11 Negative: 3
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

NASBY, J.: The NEMA Proposal Substantiation reads: All batteries systems require maintenance if they are to remain functional. In some cases, such as in 700.3(C) and (D), the NEC requires battery system maintenance, and requires documentation of the maintenance. To safely perform maintenance on a stationary battery system, a disconnect means should be provided within sight of the battery system.

The substantiation identified means for isolating the battery for periodic maintenance as needed. The type and construction details are best developed in product standards. The Code is not intended as a design specification.

Further, these batteries will typically be capable of large short circuit currents, and since these batteries will normally contain an explosive mixture of hydrogen and oxygen from charging, that a disconnecting provision is vital. This is regardless of whether the battery voltage is a shock hazard or not. Moreover, a bank of six or 12 volt batteries may pose a shock hazard in situ (connected in series) even though each individual battery does not.

STAFFORD, T.: This panel member feels that it is necessary for all stationary battery systems to be required to have a readily accessible disconnecting means. It is understood by those performing work on such stationary battery systems that potentially hazardous conditions could occur regardless of the size or number of batteries in the stationary battery system. In addition a second paragraph stating: The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted. See additional comments on proposal 13-9.

SWAYNE, R.: The proposal should be accepted. A disconnect is necessary to insure that there is no current flow. Lifting a battery interconnection strap under load would result in arcing and a potentially hazardous condition for personnel and property.

ARTICLE 490 — EQUIPMENT, OVER 600 VOLTS, NOMINAL

9-149 Log #2326 NEC-P09 **Final Action: Reject**
(490.2.Arc Resistant Switchgear (New))

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.
Recommendation: Add the following definition:

Arc Resistant Switchgear. Switchgear in an enclosure that is capable of withstanding the effects of an internal arcing fault.

FPN: See IEEE Standard C37.20.7 for performance and testing requirements.
Substantiation: Arc resistant switchgear is being utilized in the industry. This term is not recognized or defined in the NEC. Inclusion of this definition will provide users a consistent definition.
Panel Meeting Action: Reject
Panel Statement: This definition is not needed.

CMP-9 changed the text of the definition; See panel action and statement of Proposal 9-5 for the definition of “Metal-Enclosed Power Switchgear”.

Additional information should be a product standards issue.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-150 Log #2327 NEC-P09 **Final Action: Reject**
(490.21(A)(1)(a))

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.
Recommendation: Revise text as follows:

Circuit breakers ~~installed indoors~~ shall be mounted in metal-enclosed units <u>of listed arc resistant construction</u> or fire-resistant cell-mounted units. ~~or they shall be permitted to be open-mounted in locations accessible to qualified persons only.~~
Substantiation: An arc flash within the equipment, even with the door closed, can cause thermal, sound, pressure; shrapnel, and blast hazards resulting in injuries to the operating personnel even when wearing personal protective equipment. Personal protective equipment is tested for protection against thermal hazards only. A non arc resistant switchgear is tested to withstand bolted fault only. A listed arc resistant switchgear is designed and tested to withstand effects of internal faults as well as bolted fault and will provide protection against thermal, pressure, blast, and shrapnel hazards. Arc resistant switchgear is tested as per IEEE C37.20.7 and is available from multiple equipment suppliers. Open mounted circuit breakers are not available in industry any longer and present a safety hazard to personnel.

Panel Meeting Action: Reject
Panel Statement: All MV switchgear may not need to be of the arc resistant type as many existing installations have been applied for years without incident. This decision should be left to the designer of a particular facility and the installation requirements. The designer of a facility may choose other methods to ensure personnel safety when working around switchgear therefore forgoing the additional cost, bulkiness and installation issues associated with arc resistant switchgear.

Supporting notes:

(1)Arc resistant switchgear is offered by most manufacturers but is not necessarily offered in all lines of gear. Typically metal-clad gear is built in an arc resistant version but many metal-enclosed lines are not offered with this option. This is because switchgear can be applied safely with appropriate installations and work practices.

(2)Arc resistant switchgear may require larger spaces both from a footprint and a height standpoint to accomplish the installation and is not needed in all instances.

(3)As written, this proposal would require a single section added to an existing 50 section line-up to be arc resistant. Having only one section arc resistant does little to increase safety plus may create impossible installation challenges.

(4)This proposal as written would require a MV starter installed in a remote site such as an oil well or irrigation pump to be arc resistant. The designer of this type facility may deem this unnecessary due to restricted access and appropriate work practices of maintenance personnel.

In summary, the decision of whether to utilize an arc resistant design of switchgear should lie with the designer of a facility and depend on specifications and working conditions. Arc resistant switchgear should not be mandated by the Code in all applications.

The submitter has not provided adequate substantiation for deleting open-mounted circuit breakers or deletion of “installed indoors”.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-151 Log #3523 NEC-P09 **Final Action: Reject**
(490.21(A)(1)a.)

Submitter: James R. White, Shermco Industries, Inc.
Recommendation: Revise text as follows:

Circuit breakers installed indoors shall be mounted in metal-enclosed units of listed arc resistant construction, or fire-resistant cell-mounted units, ~~or they shall be permitted to be open mounted~~ in locations accessible to qualified persons only.

Other text remains unchanged.
Substantiation: Open-mounted circuit breakers are no longer available and present a safety hazard to personnel. Arc flash and arc blast are recognized hazards by OSHA and the NFPA 70E. Metal-enclosed switchgear is not currently constructed to withstand the pressures of an internal arcing fault. Even with the door closed and latched an arc can cause thermal, sound, pressure; shrapnel, and blast hazards resulting in injuries to the operating personnel, even when wearing PPE. Although PPE is available to protect personnel from incident energies created by an arc, there is no protective equipment rated for the arc blast hazard. Listed arc resistant switchgear is designed and tested to withstand effects of internal faults, as well as bolted faults and will provide protection against the above hazards. Arc resistant switchgear that is tested in accordance with IEEE C37.20.7 is averrable from multiple equipment suppliers.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 9-150.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-152 Log #3069 NEC-P09 **Final Action: Reject**
(490.21(A)(4)(2))

Submitter: Eric Gesualdi, Lyondell Chemical Company
Recommendation: Article 490 Equipment Over 600 Volts, Nominal

490.21(A)(4) Circuit Breaker Rating

(2) The Interrupting rating of a circuit breaker shall not be less than the maximum fault current the circuit breaker will be required to interrupt, including contributions from all connected sources of energy.

Recommendation: Add a FPN as follows:

FPN: For supervised locations, circuit breakers may not need to be rated based on the contributions from all connected sources of energy if the circuit breaker is part of a secondary selective system that operates with the tie breaker open when both main breakers are closed and has a transfer scheme that limits the time the sources can be operated in parallel during source transfers and alarms when time is exceeded.
Substantiation: Adherence to “490.21(A)(4) Circuit Breaker Rating” increase both equipment cost and equipment complexity. Adding the FPN, allows under supervision and specific conditions, the option to reduce circuit breaker ratings.

Panel Meeting Action: Reject
Panel Statement: During the period of time when the tie breaker is closed, CMP-9 concludes that the interrupting rating of the circuit breaker must be evaluated on the basis of contribution from all connected sources.
In addition, the proposed text has mandatory applicability and would be more properly expressed as an exception.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 1
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:
YOUNG, R.: The panel should have voted to Accept this proposal. This proposal recognizes a system to provide reliable power to loads in large manufacturing facilities. These secondary selective systems are common in double ended substations where maintaining power to loads is critical for operation or system safety such as continuous manufacturing facilities and generating stations. These schemes utilize automatic transfer logic that parallels sources only momentarily and prohibit continuous paralleling. IEEE 666, “Design Guide for Electric Power Service Systems for Generating Stations”, specifically allows this arrangement.
Transformer impedances required to continuously parallel the sources would limit the ability to start very large motors common in these facilities when operating on a single source. Also, the probability of a fault during the very brief transfer period is much lower than the risk of fault or misoperation of a system with a reactor and paralleled breaker to limit the fault current during the transition.

9-153 Log #3522 NEC-P09 **Final Action: Reject**
(490.21(B) (New))

Submitter: James R. White, Shermco Industries, Inc.
Recommendation: Add new Section B. Renumber/reidentify existing section B and other sections.
Load interrupting switches shall be mounted in metal-enclosed units of listed arc resistant construction and in locations accessible to qualified persons only.
FPN: See IEEE Standard C37.20.7 for testing requirements of arc resistant switchgear.
Other text remains unchanged.
Substantiation: Arc flash and arc blast are recognized hazards by OSHA and the NFPA 70E. Standard-construction metal-enclosed switchgear cannot withstand the pressures of an internal arcing fault. Even with the door closed and latched an arc can cause thermal, sound, pressure, shrapnel, and blast hazards resulting in injuries to the operating personnel, even when wearing PPE. Although PPE is available to protect personnel from incident energies created by an arc, there is no protective equipment rated for the arc blast hazard. Listed arc resistant switchgear is designed and tested to withstand the effects of internal faults, as well as bolted faults and will provide protection against the above hazards. Arc resistant switchgear that is tested in accordance with IEEE C37.20.7 is available from multiple equipment suppliers.
Panel Meeting Action: Reject
Panel Statement: See panel actions and statements on Proposals 9-149 and 9-150.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-154 Log #2328 NEC-P09 **Final Action: Reject**
(490.21(B)(7) and 490.21(B)(7), FPN (New))

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.
Recommendation: Add the following to the end of 490.21(B)(7) and a new FPN to 490.21(B)(7) to read:
The switch shall be mounted in metal-enclosed unit(s) of listed arc resistant construction.
FPN: See IEEE/ANSI Standard C37.20.7 for testing requirements of arc resistant switchgear.
Other text remains unchanged.
Substantiation: An arc flash within the equipment, even with the door closed, can cause thermal, sound, pressure; shrapnel, and blast hazards resulting in injuries to the operating personnel even when wearing personal protective equipment. Personal protective equipment is tested for protection against thermal hazards only. A non arc resistant switchgear is tested to withstand bolted fault only. A listed arc resistant switchgear is designed and tested to withstand effects of internal faults as well as bolted fault and will provide protection against thermal, pressure, blast, and shrapnel hazards. Arc resistant switchgear is tested as per IEEE/ANSI C37.20.7 and is available from multiple equipment suppliers. This is not intended to apply to motor starters with fuses and contactors typically known as NEMA E2 contactors.
Panel Meeting Action: Reject
Panel Statement: See panel actions and statements on Proposals 9-149 and 9-150.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-155 Log #2038 NEC-P09 **Final Action: Accept in Principle**
(490.44(C))

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
490.44 (C) Switching Mechanism The switching mechanism shall be arranged to be operated from a location outside the enclosure where the operator is not exposed to energized parts and shall be arranged to open all ungrounded conductors of the circuit simultaneously with one operation. Switches shall be capable of being locked in the open position. <u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.</u>
Substantiation: This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.
This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.
Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances
The same level of safety is needed for these disconnecting means for all equipment operating at over 600-volts nominal.
Panel Meeting Action: Accept in Principle
Add a last sentence to existing text that reads as follows:
The provisions for locking shall remain in place with or without the lock installed.
Panel Statement: The proposal as written is not appropriate for a section addressing a fused interrupter switch.
The statement was editorially modified for reader clarity and understandability. The additional words in the submitter’s language would do nothing to clarify the issue. The existing language already requires locking provisions, the only concept added is to ensure permanent rather than portable means for lockout.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.
Comment on Affirmative:
BELISLE, R.: We feel that the addition of the following language would clarify the provisions for locking requirements and assist in enforcement interpretation.
Add the following after the last sentence:
“Portable means for adding a lock shall not be permitted.”

9-156 Log #2039 NEC-P09 **Final Action: Accept in Principle**
(490.45(A))

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
490.45 (A) Circuit Breakers Circuit breakers equipped with stored energy mechanisms shall be designed to prevent the release of the stored energy unless the mechanism has been fully charged. <u>Circuit breakers shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.</u>
Substantiation: This proposed requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.
This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.
Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances
The same level of safety is needed for these disconnecting means for all equipment operating at over 600-volts nominal.
Panel Meeting Action: Accept in Principle
Renumber existing 490.46 to 490.47. 490.47 to remain in Part III.
Create new section 490.46
490.46 Circuit Breaker Locking. Circuit breakers shall be capable of being locked in the open position or, if they are installed in a drawout mechanism,

that mechanism shall be capable of being locked in such a position that the mechanism cannot be moved into the connected position. In either case, the provision for locking shall remain in place with or without the lock.

Panel Statement: The proposal as written is not appropriate for a section addressing a circuit breaker interlock.

CMP-9 created a new section that addresses the concern of the submitter.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-157 Log #2329 NEC-P09 **Final Action: Reject**
(490.46)

Submitter: Daleep C. Mohla, DCM Electrical Consulting Services, Inc.

Recommendation: Revise text as follows:

Metal enclosed and metal clad switchgear installed as high-voltage service equipment shall be of arc resistant construction, and include a ground bus for the connection of service cable shields and to facilitate the attachment of safety grounds, for personnel protection.

Substantiation: Service equipment disconnects are normally utilized to isolate electrical power to the facility by users as well as emergency fire fighting personnel. An arc flash within the equipment, even with the door closed, can cause thermal, sound, pressure; shrapnel, and blast hazards resulting in injuries to the operating personnel even when wearing personal protective equipment. Personal protective equipment is tested for protection against thermal hazards only. A non arc resistant switchgear is tested to withstand bolted fault only. A listed arc resistant switchgear is designed and tested to withstand effects of internal faults as well as bolted fault and will provide protection against thermal, pressure, blast, and shrapnel hazards. Arc resistant switchgear is tested as per IEEE C37.20.7 and is available from multiple equipment suppliers.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 9-150.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-158 Log #3410 NEC-P09 **Final Action: Accept in Principle**
(490.46)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Revise to read as follows:

490.46 Metal Enclosed and Metalclad Service Equipment.

(A) General. Metal-enclosed and metalclad switchgear installed as high voltage service equipment shall consist of a substantial metal structure and a sheet metal enclosure. Where installed over a combustible floor, suitable protection thereto shall be provided. The metal enclosed and metalclad switchgear shall include a service conductor termination compartment that separates the service conductors and service conductor terminations from an isolating switch or linkages, if present, the service disconnecting means, and all wiring and equipment on the load side of the service disconnecting means.

FPN: Local serving utilities may have additional requirements for high-voltage service equipment. See ANSI/IEEE C2-2002 Sections 18 and 38 for further information.

(B) Service Conductor Termination Compartment. The service cables shall terminate in a separate compartment. The compartment shall comply with 490.46(B)(1) through (B)(6):

(1) Door. The compartment shall include a hinged door with provision for applying a separate lock in the field.

(2) Marking. The compartment shall be equipped with a label identifying its function and the service voltage.

(3) Busbars. Where service conductor termination compartments contain exposed busbars the compartment shall include:

(1) A removable or hinged inner barrier marked with the nominal voltage(s) present

(2) A bare bus bar extension on each phase for voltage testing and application of safety grounds

(4) Separable Connectors. Where service conductor termination compartments incorporate the use of high voltage insulated separable connectors without exposed, bare or insulated bus within the compartment, the compartment shall include either:

(1) Provisions to disconnect and isolate the service cable connector from the service equipment; or

(2) Provisions to facilitate the application of safety grounds to the service conductors

(5) Ground Bus. A ground bus shall be extended into the compartment for connection of service cable termination shields and to facilitate the attachment of safety grounds for personnel protection.

(6) Included Equipment. The service conductor termination compartment shall be dedicated to this use and shall be reserved for the equipment in 490.46(B)(6)(1) through 490.46(B)(6)(6).

(1) Service conductors and terminations

(2) Surge arresters

(3) Metering transformers

(4) Busbars and their supports, insulators, associated components

(5) Line-side components of the service disconnecting means

(6) Current transformers and associated wiring for protective relaying.

(C) Service Overcurrent Protective Devices. High voltage service overcurrent devices shall be designed or installed so they are de-energized while being replaced or maintained. Access to these devices shall not expose personnel to live parts connected to the service conductors.

FPN: Barriers, rack-out mechanisms, and interlocks with load break or isolating switches are recognized safeguards to provide this isolation.

Substantiation: The submitter has no strong technical position on the merits of this proposal, but is concerned that it will end up being around for a long time with no effective response from the NEC Committee. See, for example, Proposal 13-28 and Comment 13-8 in the 2002 code cycle, which means that an underlying proposal must have been generated before the first Friday in November, 1999. This proposal is a placeholder to allow CMP 9 to pursue action on its own in the event there has been no consensus on the technical issues reached by the affected industry interests. A companion proposal has been submitted to correlate 230.211 with this action. This language was previously published as the submitter's comment on affirmative vote in the 2005 NEC ROP, Proposal 9-141, but the wording is slightly modified to incorporate the current wording of 490.46.

Panel Meeting Action: Accept in Principle

Change the submitter's text to read as follows:

490.46 Metal Enclosed and Metalclad Service Equipment.

(A) General. Metal-enclosed and metalclad switchgear installed as high voltage service equipment shall consist of a substantial metal structure and a sheet metal enclosure. Where installed over a combustible floor, suitable protection thereto shall be provided. The metal enclosed and metalclad switchgear shall include a service conductor termination compartment that separates the service conductors and service conductor terminations from an isolating switch or linkages, if present, the service disconnecting means, and all wiring and equipment on the load side of the service disconnecting means.

FPN: Local serving utilities may have additional requirements for high-voltage service equipment. See ANSI/IEEE C2-2002 Sections 18 and 38 for further information.

(B) Service Conductor Termination Compartment. The service cables shall terminate in a separate compartment. The compartment shall comply with 490.46(B)(1) through (B)(6):

(1) Door or Cover . The compartment shall include a bolted cover or a hinged door with provision for applying a separate lock in the field.

(2) Marking. The compartment shall be equipped with a label identifying its function and the service voltage.

(3) ~~Busbars.~~ Testing ~~Where service conductor termination compartments contain exposed busbars the compartment shall include:~~

~~(1) A removable or hinged inner barrier marked with the nominal voltage(s) present~~

~~(2) A bare bus bar extension on each phase for voltage testing and application of safety grounds.~~

Provisions shall be supplied on the line terminals or connecting bus in the compartment shall include provisions for voltage testing and application of safety grounds.

(4) Ground Bus. A ground bus shall be extended into the compartment for connection of service cable termination shields and to facilitate the attachment of safety grounds for personnel protection.

(5) Separable Connectors. Where service conductor termination compartments incorporate the use of high voltage insulated separable connectors without exposed, bare or insulated bus within the compartment, the compartment shall include either:

(1) Provisions to disconnect and isolate the service cable connector from the service equipment; or

(2) Provisions to facilitate the application of safety grounds to the service conductors

~~(5) Ground Bus. A ground bus shall be extended into the compartment for connection of service cable termination shields and to facilitate the attachment of safety grounds for personnel protection.~~

~~(6)~~ (6) Included Equipment. The service conductor termination compartment shall be dedicated to this use and shall be reserved for the equipment in 490.46(B)(6)(1) through 490.46(B)(6)(7).

(1) Service conductors and terminations

(2) Surge arresters

(3) Metering transformers

(4) Busbars and their supports, insulators, associated components

(5) Line-side components of the service disconnecting means

(6) Current transformers and associated wiring for protective relaying.

(7) devicesAdditional equipment that facilitates metering, grounding, or other service-entrance related functions.

(C) Service Overcurrent Protective Devices. High voltage service overcurrent devices shall be designed or installed so they are de-energized while being replaced or maintained. Access to these devices shall not expose personnel to live parts connected to the service conductors.

FPN: Barriers, rack-out mechanisms, and interlocks with load break or isolating switches are recognized safeguards to provide this isolation.

Panel Statement: This text should replace the existing text in 490.46 contained in the 2005 NEC.

The change in (B)(1) provides for an alternatively safe installation utilized bolted covers to provide the compartment's isolation.

The modified language in (B)(3) retains the important concept of providing for the connection of ground and test devices but revised to avoid overly prescriptive language, permitting multiple design solutions that may be acceptable to the user. Additionally the language proposed for (B)(5) has been moved next to this section to consolidate all ground and test requirements.

An item (7) is added to (B)(6) to ensure the list is not overly limiting. There are many devices that may need to be included in this compartment depending on the user needs and requirements.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 8 Negative: 2
Ballot Not Returned: 1 de Vega, H.
Explanation of Negative:

SENGUPTA, S.: The submitter's substantiation does not address the safety benefits of the proposal over existing practices. The proposal looks like a design specification, and the code is not intended to be such unless all safety related installations are covered.

I believe that this article needs attention by the code. I recommend that the TCC coordinate this issue, based on the actions of CMP 9 of 2005 NEC.

YOUNG, R.: The Panel should have voted to Reject this proposal. The submitter provided no substantiation as to the safety benefits to be added by these new requirements over existing practices. These are design specifications.

Comment on Affirmative:

HARTWELL, F.: The action on Proposal 9-156 creates an inadvertent numbering conflict with this section. The panel intent was to place the action on Proposal 9-156 directly after the existing code text on circuit breakers. This section should be assigned a higher number in Part III, presumably 490.57.

9-159 Log #3521 NEC-P09 **Final Action: Reject**
(490.46)

Submitter: James R. White, Shermco Industries, Inc.
Recommendation: Revise text as follows:

Metal enclosed and metal clad switchgear installed as high-voltage service equipment <u>shall be of arc resistant construction, and</u> include a ground bus for the connection of service cable shields and to facilitate the attachment of safety grounds, for personnel protection.

Other text remains unchanged.

Substantiation: Arc flash and arc blast are recognized hazards by OSHA and the NFPA 70E. Standard-construction metal-enclosed switchgear cannot withstand the pressures of an internal arcing fault. Even with the door closed and latched an arc can cause thermal, sound, pressure, shrapnel, and blast hazards resulting in injuries to the operating personnel, even when wearing PPE. Although PPE is available to protect personnel from incident energies created by an arc, there is no protective equipment rated for the arc blast hazard. Listed arc resistant switchgear is designed and tested to withstand the effects of internal faults, as well as bolted faults and will provide protection against the above hazards. Arc resistant switchgear that is tested in accordance with IEEE C37.20.7 is available from multiple equipment suppliers.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 9-150.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-160 Log #507 NEC-P09 **Final Action: Reject**
(490.47)

Submitter: William Whitlow, Stevens & Wilkinson
Recommendation: Add new text to read as follows:

490.47 Warning Light. A red warning light inside each compartment shall be illuminated whenever the main bus is energized. This light shall be readily visible when the compartment door is open.

Substantiation: Unfortunately, you cannot tell just by looking at a bus if it is energized. We still occasionally hear stories of someone opening a door "to look at something" and accidentally touching a live part. Perhaps they thought they had disconnected the power, or maybe they just got careless.
Panel Meeting Action: Reject
Panel Statement: The Code is not written for untrained persons, particularly with respect to installations within the scope of this article. A pilot light off by reason of bulb failure or other cause would be an even greater hazard. The only solution is for qualified persons to access this equipment, and for such personnel to treat all conductive elements as energized until proven otherwise by test.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-161 Log #298 NEC-P09 **Final Action: Reject**
(490.51(C))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

Protection. Adequate enclosures or guarding, or both, shall be provided to protect portable and mobile equipment from ~~physical~~ damage.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The use in CMP-9's articles is consistent with the rest of the Code. CMP-9 understands that this is a global proposal and if this terminology changes, it must be evaluated by the Technical Correlating Committee and guidance provided to code making panels so the results will be consistent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10
Ballot Not Returned: 1 de Vega, H.

9-162 Log #1543 NEC-P09 **Final Action: Accept**
(490.53)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 490 and revise text as shown for the affected NEC sections.

490.53: All energized switching and control parts shall be enclosed in ~~effectively~~ grounded metal cabinets or enclosures. These cabinets or enclosures shall be marked "DANGER — HIGH VOLTAGE — KEEP OUT" and shall be locked so that only authorized and qualified persons can enter. Circuit breakers and protective equipment shall have the operating means projecting through the metal cabinet or enclosure so these units can be reset without opening locked doors. With doors closed, reasonable safe access for normal operation of these units shall be provided.

Substantiation: 490.53: The definition is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." This section is revised to be more prescriptive.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

9-163 Log #1600 NEC-P09 **Final Action: Accept in Principle**
(490.72(D))

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Task Group on the definition of "Neutral Conductor" for review and comment

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 490.72(D):

Change "neutral" to "neutral conductor currents."

The revised text would appear as follows:

(D) Ground Current Detection. Means shall be provided for detection of the sum of the neutral conductor currents and ground currents and shall trip the circuit-interrupting device if the sum of those currents exceeds the greater of 5 amperes or 7 percent of the boiler full-load current for 10 seconds or exceeds an instantaneous value of 25 percent of the boiler full-load current.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Panel Statement: The change meets the submitter's intent.

See action and statement on Proposal 9-18, item 12.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10

Ballot Not Returned: 1 de Vega, H.

ARTICLE 500 — HAZARDOUS (CLASSIFIED) LOCATIONS, CLASSES I, II, AND III, DIVISIONS 1 AND 2

14-1a Log #CP1400 NEC-P14 **Final Action: Accept**
(Articles 500, 503, 504, 506)

TCC Action: The Technical Correlating Committee advises that Article Scope Statements and Article Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee Accepts the Panel Action on 500.1, 503.1, and the revised title of Article 506.

Submitter: Code-Making Panel 14,

Recommendation: Revise the following parts of the identified sections in the 2005 NEC to read:

1) 500.1 Scope Articles 500 Through 504: Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II, Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to flammable gases, flammable liquid-produced vapors, combustible liquid-produced vapors, combustible dusts, or ignitible fibers/flyings.

FPN No. 1: The unique hazards associated with explosives, pyrotechnics, and blasting agents are not addressed in this article.

FPN No. 2: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors or flammable liquids, refer to Article 505.

FPN No. 3: For the requirements for electrical and electronic equipment and wiring for all voltages in Zone 20, Zone 21, and Zone 22 hazardous (classified) locations where fire or explosion hazards may exist due to combustible dusts or ignitible fibers/flyings, refer to Article 506.

2) 500.5(A) Classifications of Locations. Locations shall be classified depending on the properties of the flammable gas, flammable liquid-produced vapor, combustible-liquid produced vapors, combustible dusts, or fibers/flyings that may be present, and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified. Each room, section, or area shall be considered individually in determining its classification.

3) 500.5(B) Class I Locations. Class I locations are those in which flammable gases, flammable liquid–produced vapors, or combustible liquid-produced vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include those specified in 500.5(B)(1) and (B)(2).

4) 500.5(B)(1) Class I, Division 1. A Class I, Division 1 location is a location

(1) In which ignitible concentrations of flammable gases, flammable liquid–produced vapors, or combustible liquid- produced vapors can exist under normal operating conditions, or

(2) In which ignitible concentrations of such flammable gases, flammable liquid–produced vapors, or combustible liquids above their flashpoints may exist frequently because of repair or maintenance operations or because of leakage, or

(3) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases, flammable liquid–produced vapors, or combustible liquid-produced vapors and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

5) 500.5(B)(2) Class I, Division 2. A Class I, Division 2 location is a location

(1) In which volatile flammable gases, flammable liquid–produced vapors, or combustible liquid-produced vapors are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment, or

(2) In which ignitible concentrations of flammable gases, flammable liquid– produced vapors, or combustible liquid-produced vapors are normally prevented by positive mechanical ventilation and which might become hazardous through failure or abnormal operation of the ventilating equipment, or

(3) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of flammable gases, flammable liquid–produced vapors, or combustible liquid-produced vapors above their flashpoints might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

6) 500.5(D) Class III Locations. Class III locations are those that are hazardous because of the presence of easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used, but in which such fibers/flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations shall include those specified in 500.5(D)(1) and (D)(2).

7) 500.5(D)(1) Class III, Division 1. A Class III, Division 1 location is a location in which easily ignitible fibers/flyings are handled, manufactured, or used.

FPN No. 1: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fibers/flyings manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

FPN No. 2: Easily ignitible fibers/flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

8) 500.5(D)(2) Class III, Division 2. A Class III, Division 2 location is a location in which easily ignitible fibers/flyings are stored or handled other than in the process of manufacture.

9) 500.8(A)(6) Where flammable gases, flammable liquid–produced vapors, combustible liquid-produced vapors, or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

10) 500.8(A)(1) Equipment shall be identified not only for the class of location but also for the explosive, combustible, or ignitible properties of the specific gas, vapor, dust, fibers/flyings that will be present. In addition, Class I equipment shall not have any exposed surface that operates at a temperature in excess of the ignition temperature of the specific gas or vapor. Class II equipment shall not have an external temperature higher than that specified in 500.8(C)(2). Class III equipment shall not exceed the maximum surface temperatures specified in 503.5.

11) 503.1 Scope. Article 503 covers the requirements for electrical and electronic equipment and wiring for all voltages in Class III, Division 1 and 2 locations where fire or explosion hazards may exist due to ignitible fibers/flyings.

12) 503.5 General. (second paragraph): Equipment installed in Class III locations shall be able to function at full rating without developing surface temperatures high enough to cause excessive dehydration or gradual carbonization of accumulated fibers/flyings. Organic material that is carbonized or excessively dry is highly susceptible to spontaneous ignition. The maximum surface temperatures under operating conditions shall not exceed 165°C (329°F) for equipment that is not subject to overloading, and 120°C (248°F) for equipment (such as motors or power transformers) that may be overloaded.

13) 503.128 Ventilating Piping — Class III, Divisions 1 and 2. (second paragraph)

Ventilating pipes shall be sufficiently tight, including their connections, to prevent the entrance of appreciable quantities of fibers/flyings into the ventilated equipment or enclosure and to prevent the escape of sparks, flame, or burning material that might ignite accumulations of fibers/flyings or combustible material in the vicinity. For metal pipes, lock seams and riveted or welded joints shall be permitted; and tight-fitting slip joints shall be permitted where some flexibility is necessary, as at connections to motors.

14) 503.130(A) Fixed Lighting. Luminaires (lighting fixtures) for fixed lighting shall provide enclosures for lamps and lampholders that are designed to minimize entrance of fibers/flyings and to prevent the escape of sparks, burning material, or hot metal. Each luminaire (fixture) shall be clearly marked to show the maximum wattage of the lamps that shall be permitted without exceeding an exposed surface temperature of 165°C (329°F) under normal conditions of use.

15) 503.140 Flexible Cords — Class III, Divisions 1 and 2.

Flexible cords shall comply with the following:

(5) Be provided with suitable means to prevent the entrance of fibers/flyings where the cord enters boxes or fittings

16) 503.145 Receptacles and Attachment Plugs — Class III, Divisions 1 and 2.

Receptacles and attachment plugs shall be of the grounding type and shall be designed so as to minimize the accumulation or the entry of fibers/flyings, and shall prevent the escape of sparks or molten particles.

Exception: In locations where, in the judgment of the authority having jurisdiction, only moderate accumulations of lint or flyings will be likely to collect in the vicinity of a receptacle, and where such receptacle is readily accessible for routine cleaning, general-purpose grounding-type receptacles mounted so as to minimize the entry of fibers/flyings shall be permitted.

17) 504.10(B) Location. (second paragraph, first sentence)

Simple apparatus shall be permitted to be installed in any hazardous (classified) location in which the maximum surface temperature of the simple apparatus does not exceed the ignition temperature of the flammable gases or vapors, flammable liquids, combustible dusts, or ignitible fibers/flyings present.

18) Article 506 Title: Zone 20, 21, and 22 Locations for Combustible Dusts or Ignitible Fibers/Flyings

19) 506.2 Definitions

Zone 20 Hazardous (Classified) Location. An area where combustible dust or ignitible fibers/flyings are present continuously or for long periods of time in quantities sufficient to be hazardous, as classified by 506.5(B)(1).

Zone 21 Hazardous (Classified) Location. An area where combustible dust or ignitible fibers/flyings are likely to exist occasionally under normal operation in quantities sufficient to be hazardous, as classified by 506.5(B)(2).

Zone 22 Hazardous (Classified) Location. An area where combustible dust or ignitible fibers/flyings are not likely to occur under normal operation in quantities sufficient to be hazardous, as classified by 506.5(B)(3).

20) 506.5 Classification of Locations.

(A) Classifications of Locations. Locations shall be classified on the basis of the properties of the combustible dust, ignitible fibers/flyings that may be present, and the likelihood that a combustible or combustible concentration or quantity is present. Each room, section, or area shall be considered individually in determining its classification. Where pyrophoric materials are the only materials used or handled, these locations are outside of the scope of this article.

(B) Zone 20, Zone 21, and Zone 22 Locations. Zone 20, Zone 21, and Zone 22 locations are those in which combustible dust, or ignitible fibers/flyings are or may be present in the air or in layers, in quantities sufficient to produce explosive or ignitible mixtures. Zone 20, Zone 21, and Zone 22 locations shall include those specified in 506.5(B)(1), (B)(2), and (B)(3).

21) 506.5(B)(1) Zone 20. A Zone 20 location is a location in which

(a) Ignitible concentrations of combustible dust or ignitible fibers/flyings are present continuously.

(b) Ignitible concentrations of combustible dust or ignitible fibers/flyings are present for long periods of time.

22) 506.5(B)(2) Zone 21. A Zone 21 location is a location

(a) In which ignitible concentrations of combustible dust or ignitible fibers/flyings are likely to exist occasionally under normal operating conditions; or

(b) In which ignitible concentrations of combustible dust or ignitible fibers/flyings may exist frequently because of repair or maintenance operations or because of leakage; or

(c) In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitible concentrations of combustible dust, or ignitible fibers/flyings and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or

(d) That is adjacent to a Zone 20 location from which ignitible concentrations of dust or ignitible fibers/flyings could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

23) 506.5(B)(3) Zone 22. A Zone 22 location is a location

(a) In which ignitible concentrations of combustible dust or ignitible fibers/flyings are not likely to occur in normal operation, and if they do occur, will only persist for a short period; or

(b) In which combustible dust, or fibers/flyings are handled, processed, or used but in which the dust, fibers, or flyings are normally confined within closed containers of closed systems from which they can escape only as a result of the abnormal operation of the equipment with which the dust, or fibers, or flyings are handled, processed, or used; or

(c) That is adjacent to a Zone 21 location, from which ignitible concentrations of dust or fibers/flyings could be communicated, unless such communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

24) 506.6(C) Reclassification Permitted. A Class II or Class III, Division 1 or Division 2 location shall be permitted to be reclassified as a Zone 20, Zone 21, or Zone 22 location, provided that all of the space that is classified because of a single combustible dust or ignitible fiber/flying source is reclassified under the requirements of this article.

25) 506.6(D) Simultaneous Presence of Flammable Gases and Combustible Dusts, Fibers/Flyings. Where flammable gases, combustible dusts, or fibers/flyings are or may be present at the same time, the simultaneous presence shall be considered during the selection and installation of the electrical equipment and the wiring methods, including the determination of the safe operating temperature of the electrical equipment.

26) 506.9(B) Listing

(1) Equipment that is listed for Zone 20 shall be permitted in a Zone 21 or Zone 22 location of the same dust, or ignitible fiber/flying. Equipment that is listed for Zone 21 may be used in a Zone 22 location of the same dust, fiber/flying.

(2) Equipment shall be permitted to be listed for a specific dust, or ignitible fiber/flying, or any specific combination of dusts, fibers/flyings.

27) 506.16 Sealing.

Where necessary to protect the ingress of combustible dust, or ignitible fibers/flyings, or to maintain the type of protection, seals shall be provided. The seal shall be identified as capable of preventing the ingress of combustible dust or ignitible fibers/flyings and maintaining the type of protection but need not be explosionproof or flameproof.

28) 506.17(5) Be provided with suitable seals to prevent the entrance of combustible dust, or ignitible fibers/flyings where the flexible cord enters boxes or fittings

29) 506.20(E)(2) Equipment Installation.

(2) For ignitible fibers/flyings, less than 165°C (329°F) for equipment that is not subject to overloading, or 120°C (248°F) for equipment (such as motors or power transformers) that may be overloaded.

Substantiation: The term “flammable” is not limited by the NFPA 30 definition and for purposes of Articles 500-506, classification does need to consider the vapor component of both flammable and combustible liquids and it is not just a NFPA 30 defined “flammable” material. The CMP proposal correctly reflects that the combustible liquid-produced vapor correctly defines this condition which is expressed differently in the other two proposals. Additionally, the change from ignitible “flyings or fibers” to “flyings/fibers” is being made globally including within Article 503 for improved grammatical reasons to eliminate the redundant use of “or”.

Panel Meeting Action: Accept

Panel Statement:

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-2 Log #209 NEC-P14 **Final Action: Accept in Principle**
(500.1, FPN 2)

NOTE: The following proposal consists of Comment 14-3 on Proposal 14-5 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 14-5 was:

Add text to read as follows:

FPN No. 2: The unique hazards associated with propellant, explosives, pyrotechnics, and blasting agents are not addressed in this Article.

The Technical Correlating Committee directs that the Panel Action on Comment 14-3 be reported as “Hold “ consistent with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects. See Technical Correlating Committee Note on Comment 14-5.

Submitter: David Wechsler, The Dow Chemical Company

Recommendation: Within Article 500, where the context of the single term used, such as “flammable gas” or “flammable vapor” of “flammable liquid” and the meaning is more universal to include both flammable and combustible materials that can form ignitible mixtures in air and burn, replace these terms with <u>“gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode...”.</u>

Specific texts to be changed include the following:

500.1 Scope - Article 500 through 504.

Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to ~~flammable gases or vapors,~~ flammable liquids, flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, combustible dust, or ignitible fibers or flyings.

505.5 Classifications of Locations.

(A) Classifications of Locations. Locations shall be classified depending on the properties of the ~~flammable vapors, liquids, or gases~~ flammable gas, flammable liquid-produced vapor mixed with air that may burn or explode, or combustible dusts or fibers that may be present, and the likelihood that a flammable or combustible concentration or quantity is present.

(B) Class I Locations. Class I locations are those in which ~~flammable gases~~ or vapors flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures.

(1) Class I, Division 1. A Class I, Division 1 location is a location

(1) In which ignitible concentrations of ~~flammable gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode can exist under normal operating conditions, or

(2) In which ignitable concentrations of ~~such gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode may exist frequently because of repair or maintenance operations or because of leakage, or

(3) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of ~~flammable gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air may burn or explode and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

(2) Class I, Division 2. A Class I, Division 2 location is a location

(1) In which volatile ~~flammable liquids or flammable gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment, or

(2) In which ignitible concentrations of ~~gases or vapors gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air are normally prevented by positive mechanical ventilation, and which might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

(3) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of ~~gases or vapors gases~~ flammable gas, flammmaable liquid-produced vapor, or combustible liquid-produced vapor mixed with air might occasionally be communicated unless such communication is prevented by adequate positive-presssure ventilation from a source of clean air and effective sareguards against ventilation failure are provided.

500.8(A)(6) Where ~~flammable gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

Substantiation: Within Article 500, where the context of the single term used, such as "flammable gas" or "flammable vapor" of "flammable liquid" and the meaning is more universal to include both flammable and combustible materials that can form ignitible mixtures in air and burn, replace these terms with "gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode...".

Specific texts to be changed include the following:

500.1 Scope - Article 500 through 504.

Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to ~~flammable gases or vapors,~~ flammable liquids, flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, combustible dust, or ignitible fibers or flyings.

505.5 Classifications of Locations.

(A) Classifications of Locations. Locations shall be classified depending on the properties of the ~~flammable vapors, liquids, or gases~~ flammable gas, flammable liquid-produced vapor mixed with air that may burn or explode, or combustible dusts or fibers that may be present, and the likelihood that a flammable or combustible concentration or quantity is present.

(B) Class I Locations. Class I locations are those in which ~~flammable gases~~ or vapors flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures.

(1) Class I, Division 1. A Class I, Division 1 location is a location

(1) In which ignitible concentrations of ~~flammable gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode can exist under normal operating conditions, or

(2) In which ignitable concentrations of ~~such gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode may exist frequently because of repair or maintenance operations or because of leakage, or

(3) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of ~~flammable gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air may burn or explode and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

(2) Class I, Division 2. A Class I, Division 2 location is a location

(1) In which volatile ~~flammable liquids or flammable gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment, or

(2) In which ignitible concentrations of ~~gases or vapors gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air are normally prevented by positive mechanical ventilation, and which might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

(3) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of ~~gases or vapors gases~~ flammable gas, flammmaable liquid-produced vapor, or combustible liquid-produced vapor mixed with air might occasionally be communicated unless such communication is prevented by adequate positive-presssure ventilation from a source of clean air and effective sareguards against ventilation failure are provided.

500.8(A)(6) Where ~~flammable gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Panel Proposal 14-1a (Log #CP1400). The panel accepts the principle that the term "flammable" is not limited by the NFPA 30 definition and, for purposes of Articles 500-506, classification does need to consider the vapor component of both flammable and combustible liquids and it is not just a NFPA 30 defined "flammable" material. The CMP proposal correctly reflects that the combustible liquid-produced vapor correctly defines this condition which is expressed differently in the other two proposals.

Additionally, the change from ignitible "flyings or fibers" to "flyings/fibers" is being made globally including within Article 503, for improved grammatical reasons to eliminate the redundant use of "or".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-3 Log #210 NEC-P14 **Final Action: Accept in Principle**
(500.1, FPN 2)

NOTE: The following proposal consists of Comment 14-5 on Proposal 14-5 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 14-5 was:

Add text to read as follows:

FPN No. 2: The unique hazards associated with propellant, explosives, pyrotechnics, and blasting agents are not addressed in this Article.

The Technical Correlating Committee directs that the Panel Action on Comment 14-5 be reported as "Hold " consistent with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects. The comment introduces a new concept that has not had public review. In addtion, the Technical Correlating Committee notes that the language in the FPN is inappropriate in that it contains an implied requirement.

Submitter: David Wechsler, The Dow Chemical Company

Recommendation: Revise text to read as follows:

Within Article 500, where the context of the single term used, such as "flammable gas" or "flammable vapor" or "flammable liquid" and the meaning is more universal to include both flammable and combustible materials that can form ignitable mixtures in air and burn, replace these terms with "flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode...".

Specific texts to be changed include the following:

500.1 Scope - Articles 500 through 504.

Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class 1, Division 1 and 2; Class II, Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to ~~flammable gases or vapors~~ , flammable liquids, flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode , combustible dust, or ignitable fibers or flyings.

500.5 Classifications of Locations.

(A) Classifications of Locations. Locations shall be classified depending on the properties of the ~~flammable vapors, liquids, or gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, or combustible dusts or fibers that may be present , and the likelihood that a flammable or combustible concentration or quantity is present.

(B) Class I Locations. Class I locations are those in which ~~flammable gases~~ or vapors flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

(1) Class I, Division 1. A Class I, Division 1 location is a location

(1) In which ignitable concentrations of ~~flammable gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode can exist under normal operating conditions, or

(2) In which ignitable concentrations of ~~such gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode may exist frequently because of repair or maintenance operations or because of leakage, or

(3) In which breakdown or faulty operation of equipment or processes might release ignitable concentrations of ~~flammable gases or vapors~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

(2) Class I, Division 2. A Class I, Division 2 location is a location

(1) In which volatile ~~flammable liquids or flammable gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment, or

(2) In which ignitable concentration of ~~gases or vapors gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or

(3) That is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of ~~gases or vapors gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

500.8(A)(6) Where ~~flammable gases~~ flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

Substantiation: The actions taken by the Committee on this proposal, while valid in this writer's opinion, have inadvertently raised a more fundamental and serious problem. When the NEC is used in conjunction with other references, such as NFPA 497 and NFPA 30, and only the NEC term "flammable" is used, there is an opinion being raised that there is indeed no requirement to classify areas containing "combustible liquids". Restating this concern, it appears that only those areas or locations addressed within the NEC, such as in Class I locations in which materials having flash points below 100F, must be classified at all. One might even be under the misimpression that only Class I, Division 1 locations contain flammable gases or vapors. Neither of these, I believe, are positions that are supported by CMP-14, but if allowed to go unchecked could result in loss of life, serious property damage, or an unsafe electrical installation within an intended hazardous (classified) location.

The recommended corrective action is for the text to be consistent when addressing Class I materials so as to agree with the Class I defined Groups. This would require the modification where "flammable vapor" is used, the following replacement text: "...flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode...".

In the quest for having the words in the various standards/codes agree with the Committee's intents, it would seem that there is yet another interesting paradox to consider. This issue seems critical as to what "Flammable" means and upon this understanding rests the entire basis for the need to classify a Class I location. For instance, refer to 500.5(B)(1) FPN No. 1 and examine the listing - only "flammable" conditions are presented.

Classification, or the need to do it, stems from NEC Article 500, 500.5(A).

"Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present, and the likelihood that a flammable or combustible concentration or quantity is present."

Reference is made to NFPA 497 and the material table which contain groups. These groups contain flammable gases, flammable liquids (NFPA Class I's), and combustible gases, liquids and vapors (NFPA Class II, III's).

Further within NFPA 497, the "generic" term "Combustible Material" is used, in addition to the extracted definitions for the terms "flammable liquid" and "combustible liquid". This "combustible material" term includes the flammable gas, flammable liquid, etc. [literal definition from NFPA 497 - Combustible Material.* A generic term used to describe a flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode] but aside from using this term within some of the 497 text, it does not enter into the NEC classification aspects, as does the term "flammable". The Group definitions however, also use the terms "flammable gas", "flammable liquid", and "combustible liquid". Table 2-1 in NFPA 497 containing the Grouped materials, list only "Selected" and not "ALL" chemicals. Referring to the NEC 500.5A, the text does not contain specific language requiring the classification of only those location(s) that contain one or more of the chemicals found in the NFPA 497 list, but rather based upon 500-5A "Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts...".

"Flammable" is defined within the NEC only as "Volatile Flammable Liquid. A flammable liquid having a flash point below 38 degree C (100 degree F), or a flammable liquid whose temperature is above its flash point, or a Class II combustible liquid that has a vapor pressure not exceeding 276 kPa (40 psia) at 38 degree C (100 degree F) and whose temperature is above its flash point."

The NEC also uses the term "flammable" in other areas. One such example is "450.24 Nonflammable Fluid-Insulated Transformers. For the purposes of this section, a nonflammable dielectric fluid is one that does not have a flash point or fire point and is not flammable in air."

In conclusion, applying the text of the NEC, there is an opinion being raised due to the actions taken on this proposal that there is indeed no requirement to classify areas containing "combustible liquids", or rather put another way, only those areas or locations addressed in the NEC definition above, such as in locations in which materials having flash points below 100F, must be classified.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Panel Proposal 14-1a (Log #CP1400). The panel accepts the principle that the term "flammable" is not limited by the NFPA 30 definition and, for purposes of Articles 500 to 506, classification does need to consider the vapor component of both flammable and combustible liquids and it is not just a NFPA 30 defined "flammable" material. The CMP proposal correctly reflects that the combustible liquid-produced vapor correctly defines this condition, which is expressed differently in the other two proposals.

Additionally, the change from ignitible "flyings or fibers" to "flyings/fibers" is being made globally, including within Article 503, for improved grammatical reasons to eliminate the redundant use of "or".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-4 Log #2179 NEC-P14 **Final Action: Accept in Principle**
(500.2)

Submitter: Dann Strube, Strube Consulting

Recommendation: Revise text to read as follows:

"...Class III Division 2; Zone 20; Zone 21; Zone 22; or any...".

Substantiation: Editorial only.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 14-9.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-8 Log #2502 NEC-P14 **Final Action: Accept**
(500.2.Dusttight)

TCC Action: The Technical Correlating Committee understands that the reference to the standard will be shown as "ANSI/ISA-12.12.01-2000" to correlate with the panel action on
Proposal 14-5.

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Dusttight. Enclosures constructed so that dust will not enter under specified test conditions.

FPN: See ANSI/ISA 12.12.01-2000, Nonincendive ElectricalEquipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations ~~, and UL 1604-1994, Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified)Locations.~~

Substantiation: UL 1604 has been withdrawn.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-5 Log #2449 NEC-P14 **Final Action: Accept**
(500.2. Dusttight, FPN, Hermetically Sealed, FPN, Nonincendive Circuit, FPN, Nonincendive Equipment, FPN, Nonincendive Field Wiring Apparatus, FPN)

Submitter: Eliana Beattie, ISA
Recommendation: 500.2 - Dusttight - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000
500.2 - Hermetically Sealed - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000
500.2 - Nonincendive Circuit - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000
500.2 - Nonincendive Equipment - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000
500.2 - Nonincendive Field Wiring Apparatus - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-6 Log #2462 NEC-P14 **Final Action: Reject**
(500.2.FSICO and FNICO)

Submitter: Eliana Beattie, ISA
Recommendation: 500.2 Definitions
Add the following to the end of the section:
FISCO . Fieldbus Intrinsically Safe Concept. An intrinsic safety protection method specifically designed for systems using two wire high speed digital field communications protocols (also known as Fieldbus).
FNICO . Fieldbus Nonincendive Concept. A nonincendive protection method specifically designed for systems using two wire high speed digital field communications protocols (also known as Fieldbus).
Substantiation: The FISCO (**F** ieldbus **I** ntrinsically **S** afe **CO** ncept) and FNICO (**F** ieldbus **N** on **I** ncendive **CO** ncept) protection concepts take advantage of functional requirements of Fieldbus systems to significantly simplify i.s. installation. These requirements include wire type and quality, supply voltage and current levels, and limitation of stored energy at the terminals of field devices. The objective of these concepts is to simplify the i.s. installation to the point where a safe installation may be effected by simply selecting devices labeled as FISCO (or FNICO) and observing basic wiring type and length restrictions. The NRTL evaluation of all devices ensures that they will be compatible with all other similarly labeled devices without further analysis on the part of the installer.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Because there is no definition of intrinsic safety in Article 500, the panel concludes that it is not appropritate to include a definition of "FISCO". The panel rejects the addition of a new definition "FNICO" because there are numerous nonincendive field wiring methods that are acceptable and a new definition could imply that "FNICO" is the only method available. If "FISCO" and "FNICO" wiring systems are installed in accordance with the control drawings, this practice would not be prohibited by the present NEC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
SCHNAARE, T.: Generally speaking, the code serves its primary users base best when it includes information about the various techniques that are allowed for installation. While I agree that the panel does not want to imply that FISCO and FNICO are the only techniques available, I also belive that the code is made stronger and easier to understand and apply when information such as this is included. If there are other deficiencies in the current code (as implied by the panel statement) then these should be addressed as well.

14-10 Log #1851 NEC-P14 **Final Action: Reject**
(500.2.General Purpose (New))

Submitter: Robert Lau, Hoffman Enclosure Inc.
Recommendation: Add a new definition:
General Purpose. Apparatus components, devices, enclosures, and equipment listed for use only in nonclassified (ordinary) locations.
Substantiation: I found several instances of the term general purpose in the 2005 NEC. My understanding of this term, when applied to enclosures, has always been any listed nonhazardous type rated enclosure. However, the NEC does not define this term. Nor does NEMA 250, UL 50, or UL 508. It should be defined in a US National Standard.
Panel Meeting Action: Reject

Panel Statement: The term "general-purpose" as it relates to enclosures is well understood in the industry and is used throughout the NEC. Defining the term in Article 500 may have the unintended consequence of impacting current listing requirements and other requirements in the NEC covering "general-purpose" enclosures.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14
Comment on Affirmative:
COOK, D.: The substantiation provided by the submitter is correct. While I do not agree with the proposed text, I understand the submitters concern. The last part of the proposed text states "equipment listed for use only in nonclassified (ordinary) locations". I am not aware of any equipment that is listed for use "only" in those locations. At least two certification laboratories list products for use in "ordinary" locations. I am not sure if that is a defined and specific term any more than "general purpose". I agree that "general purpose" is an understood term, but for code users that are applying requirements from all articles of the NEC, it does not seem to have the same meaning in every use. I believe that defined terms should be used when possible.

14-7 Log #2499 NEC-P14 **Final Action: Accept**
(500.2.Nonincendive Component)

TCC Action: The Technical Correlating Committee understands that the reference to the standard will be shown as "ANSI/ISA-12.12.01-2000" to correlate with the panel action on Proposal 14-5.
Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
Nonincendive Component. A component having contacts for making or breaking an incendive circuit and the contacting mechanism is constructed so that the component is incapable of igniting the specified flammable gas–air or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.
FPN: For further information, see ANSI/ISA 12.12.01-2000, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* ~~, UL 1604-1994, *Electrical Equipment for Use in Class I and II, Division 2, and* Class III Hazardous (Classified) Locations .~~
Substantiation: UL 1604 has been withdrawn.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-9 Log #2971 NEC-P14 **Final Action: Accept in Principle**
(500.2.Unclassified Locations)

Submitter: Nicholas P. Ludlam, FM Approvals
Recommendation: Revise text to read as follows:
Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 2; Class III, Division 1; Class III, Division 2; Zone 20; Zone 21; Zone 22 ; or any combination thereof.
Substantiation: Zones 20, 21 and 22 where added into the 2005 NEC as part of the new section 506. Zones 20, 21 and 22 are considered as Hazardous (Classified) Locations. Therefore, an area which is not classified as Zone 20, 21, or 22 should also be considered to be an Unclassified location.
Panel Meeting Action: Accept in Principle
Revise the recommended definition to read: Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; Zone 20; Zone 21; Zone 22; or any combination thereof.
Panel Statement: The panel assumes that the submitter inadvertently omitted the Class II, Division 1 location when the 2005 text was copied to revise. Otherwise panel accepts the recommended text.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14
Comment on Affirmative:
LAWRENCE, JR., W.: The original proposal submitted included the text "Class II, Division 1" that the panel comment indicates was omitted. I assume that this omission occurred during the NFPA transcription of the comment. The text, as modified by the Panel, is correct.

14-11 Log #1003 NEC-P14 **Final Action: Reject**
(500.3)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "rules" to "provisions" or alternatively, delete this section.
Substantiation: Edit. Some Code provisions are not requirements. Per 90.5(B) some rules are permissive. Sec. 430.5 uses the term "applicable provisions". This section is already covered by 90.3.
Panel Meeting Action: Reject
Panel Statement: Section 90.5 covers the use of the term "rules" in regard to mandatory and permissive requirements in this Code.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-12 Log #2458 NEC-P14 **Final Action: Reject**
(500.4(A) & 500.8 (B))

Submitter: Eliana Beattie, ISA
Recommendation: Add underlined text under 500.4(A) as follows:
500.4 General.
(A) Documentation.
<u>(1) Area Classification</u> . All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.
<u>(2) Certificate of Conformity. The documentation for electrical equipment marked in accordance with 500.8(B) shall be permitted to include a Certificate of Conformity showing compliance with the applicable standards.</u>
<u>(a) Where the Certificate number includes an "X" suffix, the electrical equipment Listing includes Special Condition for Safe Use which shall be observed.</u>
<u>(b) Where the Certificate number includes a "U" suffix, the equipment is an incomplete component and is not suitable for installation without further evaluation.</u>
Provide a new marking 500.8(B)
Marking. Equipment shall be marked to show the environment for which it has been evaluated <u>and shall also be permitted to be marked with a certificate reference, see 500.4(A).</u> Unless otherwise specified or allowed in (B)(6), the marking shall include the information specified in (B)(1) through (B)(5).
Substantiation: While listing and labeling are marks to indicate equipment meets specific standards, Certificates offer an extremely important long term benefit of providing documentation that will enable users to understand the Models certified, the applicable standards, the effective date and any special conditions for safe use, long after the normal life of most other product literature. Certificates are this important documentation that provides vital information to users to better assure that equipment will be properly installed within a hazardous (classified) location.
Examples of certificates, selected at random from public sources, are provided for improved understanding.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: This proposal would add permission to permit a certificate that is not prohibited by the current requirements. The additional text serves no purpose. The panel rejection of the proposal in no way prohibits the manufacturer and/or the certification body from providing a certificate if it is needed or desired for other reasons.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-13 Log #2448 NEC-P14 **Final Action: Accept**
(500.4(B))

Submitter: Eliana Beattie, ISA
Recommendation: 500.4(B) - FPN 2
Change ISA 12.10-1988 to ISA-12.10-1998
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-14 Log #2506 NEC-P14 **Final Action: Accept in Part**
(500.6(A), FPN 3)

TCC Action: The Technical Correlating Committee directs the panel to reconsider the action on this proposal and include the farenheit temperature in order to maintain consistency with the balance of the code. This action will be considered by the panel as a public comment.
Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
(A) Class I Group Classifications. Class I groups shall be according to 500.6(A)(1) through (A)(4).
FPN No. 1: FPN Nos. 2 and 3 apply to 500.6(A).
FPN No. 2: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classifi-
cation involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that
equipment be identified not only for class but also for the specific group of the gas or vapor that will be present.
FPN No. 3: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the Class I groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [~~100°C (212°F)~~ <u>90°C (194°F)</u>] and the small joint clearance permitted to arrest its flame.
Substantiation: The stated value is incorrect.The ignition temperature of carbon disulphide is 90C. See Table 4.4.2 of *NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas 2004 Edition.*
Panel Meeting Action: Accept in Part
Revise the recommendation for current FPN No. 3 to read: FPN No. 3: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the Class I groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [~~100°C (212°F)~~ (<u>90°C)</u> ~~(194°F)]~~ and the small joint clearance permitted to arrest its flame.
Panel Statement: The panel rejects the inclusion of the Farenheit temperature, to be consistent with the data contained in Table 4.4.2 of NFPA 497.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-15 Log #1296 NEC-P14 **Final Action: Reject**
(500.7(K))

Submitter: Jon Miller, Detector Electronics Corp.
Recommendation: Revise text to read:
500.7 Protection Techniques. Section <u>500.7(A)</u> through <u>500.7(L)</u> shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.
(A)...
(K) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons service the installation. Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment specified in 500.7(K)(1), (K)(2), or (K)((3) shall be permitted.
The type of detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented <u>and in conformance with ISA-TR12.13.03, Guide for Combustible Gas Detection as a Method of Protection,</u> when combustible gas detectors are used as a protection technique.
FPN No. 1: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors.
FPN No. 2: For further information, see ANSI/API RP 500, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1, or Division 2.
FPN No. 3: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.
(1) Inadequate Ventilation. In a Class I, Division 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Division 2 locations shall be permitted.
(2) Interior of a Building. In a building located in, or with an opening into, a Class I, Division 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.
(3) Interior of a Control Panel. In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases, or vapors, electrical equipment suitable for Class I, Division 2 locations shall be permitted.
Substantiation: There is currently no guidance on recommended practices for the use of combustible gas detection equipment as a method of protection. It is recommended that a reference to ISA-TR12.13.03 be provided within the text for such recommended practice. The ISA-TR12.13.03 is directly based upon API practices that have been applied for 30+ years in the petroleum industry.
Panel Meeting Action: Reject
Panel Statement: The proposed text cannot be included as a mandatory requirement for the application of combustible gas detectors because mandatory references to other standards are not permitted by the NEC Style Manual. Acceptance of information regarding the referenced standard in a fine print note is premature because the document is not currently available. The panel is seeking information on the availability date of the referenced standard.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-16 Log #2447 NEC-P14 **Final Action: Accept**
(500.7(K))

TCC Action: The Technical Correlating Committee assumes, based on previous actions, that the intended reference in FPN No. 3 is "ANSI/ISA-RP12.13.02-2003".
Submitter: Eliana Beattie, ISA
Recommendation: 500.7(K) - FPN 1
Change ANSI/ISA 12.13.01 to ANSI/ISA-12.13.01-2003 (IEC 61779-1 through - 5 Mod)
500.7(K) - FPN 3
Change ANSI/ISA 12.13.02 t to ANSI/ISA-RP12.13.2003 (IEC 61779-6 Mod)
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-17 Log #2495 NEC-P14 **Final Action: Accept in Principle**
(500.7(K))

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
(K) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public
access and where the conditions of maintenance and supervision ensure that only qualified persons service the installation. Gas detection equipment shall be listed for both the location in which it is installed and for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment, other than the gas detection equipment, specified in 500.7(K)(1), (K)(2), or (K)(3) shall be permitted. The type of detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented when combustible gas detectors are used as a protection technique.
Substantiation: The current text is unclear with respect to the suitability of the gas detection equipment and the location in which it is installed. While the use of this technique permits equipment for Division 2 or unclassified locations in a Division 1 or 2 location respectively, the detection equipment itself should be suitable for the actual classified location in which it is installed.
Panel Meeting Action: Accept in Principle
Revise the current text of 500.7(K) to read:
(K) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons service the installation. ~~Gas detection equipment shall be listed for both the location in which it is installed and for detection of the specific gas or vapor to be encountered.~~ Where such a system is installed, equipment specified in 500.7(K)(1), (K)(2), or (K)(3) shall be permitted.
The type of combustible detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented when combustible gas detectors are used as a protection technique.
(1) Inadequate Ventilation. In a Class I, Division 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Division 2 locations shall be permitted. Combustible gas detection equipment shall be listed for Class I, Division 1, the appropriate material group, and for the detection of the specific gas or vapor to be encountered.
(2) Interior of a Building. In a building located in, or with an opening into, a Class I, Division 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted. Combustible gas detection equipment shall be listed for Class I, Division 1 or Class I, Division 2, the appropriate material group, and for the detection of the specific gas or vapor to be encountered.
(3) Interior of a Control Panel. In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases, or vapors, electrical equipment suitable for Class I, Division 2 locations shall be permitted. Combustible gas detection equipment shall be listed for Class I, Division 1, the appropriate material group, and for the detection of the specific gas or vapor to be encountered.
Panel Statement: The panel action accomplishes the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-18 Log #2477 NEC-P14 **Final Action: Accept**
(500.7(K), FPN 1)

TCC Action: The Technical Correlating Committee notes that the reference in FPN No. 1 has been revised by the action on Proposal 14-16.
Submitter: Edward M. Briesch, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
(K) Combustible GAS Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons service the installation. Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment specified in 500.7(K)(1), (K)(2), or (K)(3) shall be permitted. The type of detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented when combustible gas detectors are used as a protection technique.
FPN No. 1: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors ~~.~~ and ANSI/UL2075, GAS and Vapor Detectors and Sensors.
FPN No. 2: For further information, see ANSI/API RP500, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I or Division 2.
FPN No. 3: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.
Substantiation: In addition to requirements for noncombustible gases and vapors, ANSI/UL2075 includes performance requirements for combustible gas detectors to ANSI/ISA-12.13.01.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-18a Log #CP1406 NEC-P14 **Final Action: Accept**
(500.8, 505.9(A), & 506.9(A))

Submitter: Code-Making Panel 14,
Recommendation: Revise 500.8 as follows:
1) Add the following text after existing FPN No. 3 as new 500.8(A):
(A) Suitability. Suitability of identified equipment shall be determined by one of the following:
(1) Equipment listing or labeling
(2) Evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation
(3) Evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment.
FPN: Additional documentation for equipment may include certificates demonstrating compliance with applicable equipment standards, indicating special conditions of use, and other pertinent information.
2) Re-identify existing 500.8(A),(B),(C),(D), and (E) as 500.8(B),(C),(D),(E), and (F)
3) Delete the current text regarding suitability from existing 500.8(A)(1) (located in the second paragraph following the fine print note that reads: Luminaires (lighting fixtures) and other heat-producing apparatus...)
4) Add a new fine print note following 505.9(A)(3) to read:
FPN: Additional documentation for equipment may include certificates demonstrating compliance with applicable equipment standards, indicating special conditions of use, and other pertinent information.
5) Add a new fine print note following 506.9(A)(3) to read:
FPN: Additional documentation for equipment may include certificates demonstrating compliance with applicable equipment standards, indicating special conditions of use, and other pertinent information.
Substantiation: The revision to 500.8 provides consistency with the same requirements in 505.9(A) and 506.9(A). The new fine print note has been added to acknowledge the current practice of providing certificates as part of the required documentation.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-19 Log #654 NEC-P14 **Final Action: Accept**
(500.8(B)(5))

Submitter: William G. Lawrence, Jr., S. Yarmouth, MA
Recommendation: Add new text as follows:
(5) Ambient Temperature Range. For equipment rated for a temperature range other than -25°C to +40°C, the marking shall specify the special range of ambient temperatures in degrees Celsius . The marking shall include either the symbol "Ta" or "Tamb."
FPN: As an example, such a marking might be "-30°C ≤ Ta ≤ +40°C."
Substantiation: Even though the standard ambient range is specified in degrees Celsius, this section does not specify that any special ambient temperature is also to be expressed in degrees Celsius. It is also worth noting that the remainder of the Article, e.g., 501.105(B)(2) Exception 501.115(B)(1)(4), 501.20(B)(3), etc., it specifies temperatures in degrees Celsius. If the ambient temperature range is expressed in degrees Fahrenheit, the potential exists for misapplication of the equipment.
Panel Meeting Action: Accept
Panel Statement: The panel notes that the correct reference is 500.8(B)(5).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-20 Log #607 NEC-P14 **Final Action: Reject**
(500.8(B)(5))

Submitter: Douglas Dura, Rockwell Automation
Recommendation: Revise text to read:
~~For~~ ~~e~~ E quipment rated for a temperature range other than -25°C to +40°C, ~~the marking shall specify~~ shall either be marked with the special range of ambient temperatures or, the special range shall be specified in the literature that accompanies the equipment . When used ~~T~~ t he marking shall include either the symbol "Ta" or "Tamb".
FPN: As an example, such a marking might be "-30°C ≤ Ta ≤ +40°C".
Substantiation: Several ANSI/UL standards dealing with electrical equipment for use in hazardous locations have been reviewed and found to not require the marking of ambient temperature on the equipment. Examples of these are: ANSI/UL 698a, ANSI/UL 913, ANSI/UL 1002, ANSI/UL 1604, ANSI/UL 60079-0, ANSI/UL 60079-1, ANSI/UL 60079-5, ANSI/UL 60079-6, ANSI/UL 60079-7, ANSI/UL 60079-11, ANSI/UL 60079-18.
Panel Meeting Action: Reject
Panel Statement: This information needs to be provided on the product marking, not just in the literature. The substantiation is not correct, because those product standards currently require this marking.

Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-21 Log #2572 NEC-P14 **Final Action: Reject**
(500.8(B)(7))

Submitter: Daniel McKinney, Kingsport, TN
Recommendation: Proposal to add new Subsection/text:
500.8(B)(7) External Conduit Seal(s). Equipment that contains an ignition source as indicated in 501.15(A)(1)(*1*), shall be marked as requiring an external conduit seal. Equipment that does not contain an ignition source during normal operation shall be marked as not requiring an external conduit seal. Marking according to this section shall not be required when the equipment complies with any of the exceptions to 501.15(A)(1)(*1*).
Substantiation: The National Electrical Code requires an external conduit seal for equipment in hazardous locations when the apparatus produces arcs, sparks or high temperatures that are considered to be an ignition source during normal operation (Ref. 501.15(A)(1)(*1*)). In many instances, where the apparatus contained is a simple relay or a circuit breaker, the determination on whether or not an external seal is required is straight forward. In other cases though, where the apparatus is more complex, the determination on the need for an external seal is not quite as obvious. In these cases the assistance by the manufacturer and the information they have received from the Nationally Recognized Testing Laboratory agency would be very helpful to engineers, electricians and inspectors in the field. Marking that indicates whether or not an external conduit seal is required would reduce much confusion and cost, not to mention helping to ensure a safe installation.
Panel Meeting Action: Reject
Panel Statement: Section 500.8 includes general equipment requirements for all types of equipment used for electrical installations related to hazardous (classified) locations. The (B) part of that section includes marking requirements for that equipment. Sealing requirements are addressed in 501.15, 502.15, 503.15, 504.70, 511.9, 513.9, 514.9, and 515.9. The same sealing requirements would not be applicable on a specific piece of equipment located in a different application and therefore are not considered to be equipment marking requirements. In some cases the seals are provided to complete an explosionproof enclosure, while in other cases the seals are provided to minimize the passage of hazardous materials from one location to another. In either application the seal could be external or provided within the equipment (factory sealed).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 501 — CLASS I LOCATIONS

14-22 Log #1525 NEC-P14 **Final Action: Accept in Principle in Part**
(501, 502, 503, 504, 506, 511, and 516)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be sent to the Technical Correlating Committee Grounding and Bonding task group for review and comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 501, 502, 503, 504, 506, 511, and 516 as described in the following, relative to the terms bonding and grounding.
501.10(A)(1)(c): Revise 501.10(A)(1)(c) as follows:
(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate equipment grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application.
501.10(B)(2)(5): Revise 501.10(B)(2)(5) as follows:
(5) Flexible cord listed for extra-hard usage and provided with listed bushed fittings. An additional conductor for use as an equipment grounding conductor shall be included in the flexible cord.
501.15(A)(4) Exception No. 2: Revise 501.15(A)(4) Exception No. 2 as follows:
Exception No. 2: For underground conduit installed in accordance with 300.5 where the boundary is beneath the earth ~~ground~~ , the sealing fitting shall be permitted to be installed after the conduit leaves the earth ~~ground~~ , but there shall be no union, coupling, box, or fitting, other than listed explosionproof reducers at the sealing fitting, in the conduit between the sealing fitting and the point at which the conduit leaves the earth ~~ground~~ .
501.140(B)(2): Revise 501.140(B)(2) as follows:
(2) Contain, in addition to the conductors of the circuit, ~~a~~ an equipment grounding conductor complying with 400.23.
501.145 Receptacles and Attachment Plugs, Class I, Divisions 1 and 2 Receptacles and attachment plugs shall be of the type providing for connection to the equipment grounding conductor of a flexible cord and shall be identified for the location.
502.10(A)(1)(3): Revise 502.10(A)(1)(3) as follows:
(3) In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate equipment grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application, shall be permitted.
502.140(2): Revise 502.140(2) as follows:
(2) Contain, in addition to the conductors of the circuit, ~~a~~ an equipment grounding conductor complying with 400.23.
502.145 (A)Revise 502.145(A) as follows:
(A) Class II, Division 1 In Class II, Division 1 locations, receptacles and attachment plugs shall be of the type providing for connection to the equipment grounding conductor of the flexible cord and shall be identified for Class II locations.
502.145(B): Revise 502.145(B) as follows:
(B) Class II, Division 2 In Class II, Division 2 locations, receptacles and attachment plugs shall be of the type that provides for connection to the equipment grounding conductor of the flexible cord and shall be designed so that connection to the supply circuit cannot be made or broken while live parts are exposed.
503.140: Revise 503.140 as follows:
(2) Contain, in addition to the conductors of the circuit, ~~a~~ an equipment grounding conductor complying with 400.23.
504.50(A): Revise 504.50(A) as follows:
(A) Intrinsically Safe Apparatus, Associated Apparatus, and Raceways Intrinsically safe apparatus, associated apparatus, cable shields, enclosures, and raceways, if of metal, shall be connected to the equipment grounding conductor ~~grounded~~ .
505.15(B)(1)(b): Revise 505.15(B)(1)(b) as follows:
(b) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the cable is not subject to physical damage, Type MC-HL cable listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate equipment grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application.
505.17(2): Revise 505.17(2) as follows:
(2) Contain, in addition to the conductors of the circuit, ~~a~~ an equipment grounding conductor complying with 400.23.
506.15(A)(3): Revise 506.15(A)(3) as follows:
(3) In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC cable, listed for continuous use in Zone 20 locations, with a gas/vaportight continuous corrugated metallic sheath, and overall jacket of suitable polymeric material, separate equipment grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application, shall be permitted.
506.17(2): Revise 506.17(2) as follows:
(2) Contain, in addition to the conductors of the circuit, ~~a~~ an equipment grounding conductor in complying with 400.23.
511.16(B)(2): Revise 511.16(B)(2) as follows:
(2) Approved Means Approved means shall be provided for maintaining continuity of the equipment grounding conductor between the fixed wiring system and the non–current-carrying metal portions of pendant luminaires (fixtures), portable lamps, and portable utilization equipment.
516.10(A)(6): Revise 516.10(A)(6) as follows:
(6) Grounding All electrically conductive objects in the spray area, except those objects required by the process to be at high voltage, shall be ~~adequately~~ grounded. This requirement shall apply to paint containers, wash cans, guards, hose connectors, brackets, and any other electrically conductive objects or devices in the area.
516.10(B)(4): Revise 516.10(B)(4) as follows:
(4) Electrostatic Equipment All electrically conductive objects in the spraying area shall be ~~adequately~~ grounded. This requirement shall apply to paint containers, wash cans, and any other electrical conductive objects or devices in the area. The equipment shall carry a prominent, permanently installed warning regarding the necessity for this grounding feature.
516.10(C)(1): Revise 516.10(C)(1) as follows:
(1) Electric Equipment and Sources of Ignition Electric equipment and other sources of ignition shall comply with the requirements of Article 502. Portable electric lamps and other utilization equipment shall not be used within a Class II location during operation of the finishing processes. Where such lamps or utilization equipment are used during cleaning or repairing operations, they shall be of a type identified for Class II, Division 1 locations, and all exposed metal parts shall be ~~effectively~~ grounded.
516.10(C)(4)(b): Revise 516.10(C)(4)(b) as follows:
(b) All electrically conductive objects within the powder-coating area shall be ~~adequately~~ grounded. The powder-coating equipment shall carry a prominent, permanently installed warning regarding the necessity for grounding these objects.

Substantiation: 501.10(A)(1)(c): Added the word equipment to be more specific about the conductor being described.

501.10(B)(2)(5): Added words to be more specific about the conductor being described.

501.15(A)(4) Exception No. 2: The definition of ground has been revised. The more appropriate word to use in this exception is "earth" since this exception deals with earth or grade levels.

501.140(B)(2): Modified wording to be more specific about the conductor being described.

501.145: Modified wording to be more specific about the conductor being described.

501.10(A)(1)(3): Modified wording to be more specific about the conductor being described.

502.140(2): Modified wording to be more specific about the conductor being described.

502.145(A): Modified wording to be more specific about the conductor being described

502.145(B): Modified wording to be more specific about the conductor being described

503.140: Modified wording to be more specific about the conductor being described

504.50(A): These changes clarify the present requirement in more prescriptive language.

505.15(B)(1)(b): Modified wording to be more specific about the conductor being described.

505.17(2): Modified wording to be more specific about the conductor being described.

506.15(A)(3): Modified wording to be more specific about the conductor being described.

506.17(2): Modified wording to be more specific about the conductor being described.

511.16(B)(2): Modified wording to be more specific about the conductor being described.

516.10(A)(6): There are no definitive parameters for Code users to make a determination on what constitutes "adequately grounded."

516.10(B)(4): There are no definitive parameters for Code users to make a determination on what constitutes "adequately grounded."

516.10(C)(1): There are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded."

516.10(C)(4)(b): There are no definitive parameters for Code users to make a determination on what constitutes "adequately grounded."

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

The panel takes the following actions on the recommended text.

1) Accept the recommended text for 501.10(A) (1) (c) and in addition change "conductors" to "conductor(s)".

2) Revise recommended text of 501.10(B) (2) (5) to read: " Flexible cord listed for extra-hard usage and provided with listed bushed fittings. A ~~n additional~~ conductor for use as an equipment grounding conductor shall be included in the flexible cord. .."

3) Revise the recommendation for 501.15(A) (4), Exception No. 2, by adding "below grade" instead of "earth" in the first occurrence and by adding "emerges from below grade" instead of "earth" in the second two occurrences.

4) Accept recommended change to 501.140(B) (2).

5) Accept recommended change to 501.145.

6) Accept the recommended text for 502.10(A) (1) (c) and in addition change "conductors" to "conductor(s)".

7) Accept the recommended change to 502.140(2).

8) Accept the recommended change to 502.145(A).

9) Accept the recommended change to 502.145(B).

10) Accept the recommended change to 503.140.

11) Reject the recommended change to 504.50(A)

12) Accept the recommended text for 505.15(B) (1) (b) and in addition change "conductors" to "conductor(s)".

13) Accept the recommended change to 505.17(2).

14) Accept the recommended text for 506.15(A)(3) and in addition change "conductors" to "conductor(s)".

15) Accept the recommended change to 506.17(2).

16) Accept the recommended change to 511.16(B)(2).

17) Reject the recommended change to 516.10(A)(6).

18) Reject the recommended change to 516.10(B)(4).

19) Reject the recommended change to 516.10(C)(1).

20) Reject the recommended change to 516.10(C)(4)(b).

Panel Statement: The panel has accepted this proposal in principle in part for the following reasons:

1) The revision to 501.10(A)(1)(c) allows for single or multiple equipment grounding conductors in Type MC-HL cable.

2) The revision to 501.10(B)(2)(5) clarifies that the equipment grounding conductor required by this section is that required by Article 250 and is not in addition to the required equipment grounding conductor.

3) The panel rejects the recommendation to revise 501.15(A)(4), Exeception No. 2, and has added text to clarify that this text relates to below-grade installations.

4) The revision to 502.10(A)(1)(c) allows for single or multiple equipment grounding conductors in Type MC-HL cable.

5) The panel rejects the recommendation to revise 504.50(A) because connection to an equipment grounding conductor is not always the appropriate method to accomplish the requirement of 504.50(A).

6) The revision to 505.15(B)(1)(b) allows for a single or multiple equipment grounding conductors in Type MC-HL cable.

7) The revision to 506.15(A)(3) allows for a single or multiple equipment grounding conductors in Type MC-HL cable.

8) The panel rejects the recommendation for 516.10(A)(6) and 516.10(B)(4) because grounding requirements included in these sections are related to elimination of static electricity. Although "adequately grounded" is not a very specific term, the recommendation to delete "adequately" does not necessarily clarify the necessary effectiveness of the grounding connection. Any paint can, wash can, bracket, etc. that was sitting on a grounded concrete floor would be considered grounded but would not likely be adequately grounded.

9) The panel rejects the recommendation to revise the text in 516.10(C) (1) because this section is describing an equipment grounding path. See the panel action to accept Proposal 14-191 which recommends the text be revised to read: " Where such lamps or utilization equipment are used during cleaning or repairing operations, they shall be of a type identified for Class II, Division 1 locations, and all exposed metal parts shall be ~~effectively~~ connected to an equipment grounding conductor ~~grounded~~ ."

9) The panel rejects the recommendation to revise the text in 516.10(C)(4)(b) because the grounding requirements in 516.10(C) (4) (b) are related to elimination of static electricity. These electrically conductive objects may not be required to have an equipment grounding conductor based on the requirements in Article 250. When these objects are bonded together to eliminate static charges, they also need to be adequately grounded. They could be in contact with ground by sitting on the floor, but not be adequately grounded.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

Comment on Affirmative:

O'MEARA, M.: Although I agree with this proposal in principal in part, I do not agree with all of the panel actions taken. Specifically, in 516.10(A)(6), 516.10(B)(4), and 516.10(C)(4)(b) the task force recommendation to eliminate the term "adequately" from "adequately grounded" should have been accepted. Likewise, the task force recommendation to eliminate the term "effectively" from "effectively grounded" should have been accepted by replacing the text with the phrase "connected to an equipment grounding conductor" similar to the action taken on Proposal 14-191. By not making these changes, CMP 14 has created a correlation issue with the task force recommendations and the actions taken by other code panels.

14-24 Log #3194 NEC-P14 **Final Action: Accept in Principle**
(501.5 and Exception)

Submitter: Donald Cook, Shelby County Development Services

Recommendation: Delete the first paragraph and the exception.

Substantiation: If we believe that use the all of the parties involved in the development of the NEC, users, designers, installers, manufacturers, labor, research & testing, and enforcement are capable of working in hazardous (classified), we should assume they are capable of looking at 90.3 and understanding that the requirements in Chapter 5 modify the general rules in Chapters 1-4. If they are not capable of understanding that, adding the information again in 501.5 will not change their ability to understand the requirements.

This change does not impact the requirements at all.

Panel Meeting Action: Accept in Principle

The panel accepts the recommendation and in addition revises the title of the section from "General" to "Zone Equipment".

Panel Statement: The revised title better captures the remaining requirements of this section now that the first paragraph and exception have been deleted.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-25 Log #2463 NEC-P14 **Final Action: Reject**
(501.10)

Submitter: Eliana Beattie, ISA

Recommendation: 501.10 Wiring Methods

Revise 501.10(B)(3) as follows:

(3) Nonincendive Field Wiring & FNICO . Nonincendive field wiring and FNICO shall be permitted using any of the wiring methods permitted for unclassified locations. Nonincendive field wiring and FNICO systems shall be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field

wiring <u>or FNICO</u> circuit, provided the simple apparatus does not interconnect the nonincendive field wiring <u>or FNICO</u> circuit to any other circuit.
Substantiation: The FISCO (**F** ieldbus **I** ntrinsically **S** afe **CO** ncept) and FNICO (**F** ieldbus **N** on **I** ncendive **CO** ncept) protection concepts take advantage of functional requirements of Fieldbus systems to significantly simplify i.s. installation. These requirements include wire type and quality, supply voltage and current levels, and limitation of stored energy at the terminals of field devices. The objective of these concepts is to simplify the i.s. installation to the point where a safe installation may be effected by simply selecting devices labeled as FISCO (or FNICO) and observing basic wiring type and length restrictions. The NRTL evaluation of all devices ensures that they will be compatible with all other similarly labeled devices without further analysis on the part of the installer.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: The panel rejects the addition of "FNICO" because there are numerous nonincendive field wiring methods that are acceptable and the inclusion of the acronym in this section would imply that "FNICO" is the only method available. If "FNICO" wiring systems are installed in accordance with the control drawings, this practice would not be prohibited by the present NEC. See the panel action and statement on Proposal 14-6.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:

SCHNAARE, T.: Generally speaking, the code serves its primary users base best when it includes information about the various techniques that are allowed for installation. While I agree that the panel does not want to imply that FISCO and FNICO are the only techniques available, I also belive that the code is made stronger and easier to understand and apply when information such as this is included. If there are other deficiencies in the current code (as implied by the panel statement) then these should be addressed as well.

14-23 Log #2333 NEC-P14 **Final Action: Reject**
(501.10(A)(1)(C))

Submitter: Lee Perry, Service Wire Company
Recommendation: Revise existing text to read:

In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous ~~corrugated metallic sheath, an~~ overall jacket of suitable polymeric material, separate grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application.
Substantiation: Requirement of restricting construction to one specific type-corrugated metallic sheath is precluding testing and listing of interlocked metal tape-type MC cable as MC-HL cable to determine compliance with mechanical strength requirements as well as gas/vaportight requirements, interlocked metal tape type cables, such as TECK-90 construction, can pass the required mechanical and gas/vaportight requirements and is allowed in Canadian Electrical Code for use in Class I, Division 1 areas in industrial installations for the last 20 years. The NEC should specify performance requirements instead of mandating one type of construction. US manufacturers are manufacturing and selling TECK cable for the Canadian market, but are precluded from selling in US markets, thereby, restricting their ability to market their product. Replacing prescriptive construction requirements with performance requirements will allow manufactures of interlocked metal tape-type MC cable to request listing agencies to test and list cables as MC-HL if they successfully pass the mechanical and gas vaportight requirements in compliance with the NEC.
Panel Meeting Action: Reject
Panel Statement: In previous NEC revision cycles, action by CMP-14 to accept Type MC-HL cable for use in Class I, Division 1 locations was achieved through considerable discussion. There was great concern related to the gas/vapor tight integrity, to the mechanical strength of the metallic cable sheath, and to the mechanical strength of the polymeric jacket both during the testing and duration of the life of the cable. Under fault conditions, turn to turn arcing cannot be tolerated in an interlocked sheath construction in a Division 1 location. The continuous corrugated metallic sheath provides excellent gas/vapor tight characteristics and an effective ground-fault current return path in accordance with 250.118(10).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14
Comment on Affirmative:

COSPOLICH, J.: We agree with the panel's action to reject Proposal 14-23. The IEEE seeks a performance and not a construction feature to achieve the sealed gas/vapor-tight protection and a metallic armor sheath plus any other performance requirements as appropriate for the listing.

14-26 Log #2474 NEC-P14 **Final Action: Accept in Principle**
(501.10(A)(1)(c) and (d))

TCC Action: The Technical Correlating Committee directs that the panel reconsider the action on this Proposal. The requirement in the main text is for the cable in question to be listed. The FPNs add a reference to the product standard. Annex A of the NEC was specifically added to handle these types of references. The panel should delete the new FPNs and add a reference to UL 2225 into Annex A. This will make the text consistent with how standards for listing are treated elsewhere in the code. This action will be considered by the panel as a public comment.
Submitter: Donald W. Ankele, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:

(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application.

FPN <u>1</u> : See 330.12 for restrictions on use of Type MC cable.

<u>FPN 2: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.</u>

(d) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type ITC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

<u>FPN 1: See 727.4 and 727.5 for restrictions on use of Type ITC cable.</u>

<u>FPN 2: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.</u>
Substantiation: Add FPN 2 to reference the ANSI standard for Type MC-HL cable and Type ITC-HL cables and cable fittings to aid approval of the installation for the location involved.

Add FPN 1 to reference Article 727 for Type ITC cable.
Panel Meeting Action: Accept in Principle
Revise the recommended fine print note to 501.10(A)(1)(d) to read: <u>FPN No. 2: For further information on construction, testing and marking requirements for Type ITC-HL cable and Type ITC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.</u>
Panel Statement: The panel accepts the recommendation and corrects the type of cable covered by the new fine print note to 501.10(A)(1)(d).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-27 Log #1928 NEC-P14 **Final Action: Reject**
(501.10(A)(1) Exception)

TCC Action: The Technical Correlating Committee directs the panel to reconsider the action on this proposal and remove the redundant reference to Article 352 since this is already covered by 90.3. This action will be considered by the panel as a public comment. The Technical Correlating Committee also refers this proposal to Code-Making Panel 8 for comment as it relates to the action taken on Proposal 8-53.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise the first sentence of the exception to 501.10(A)(1) as follows:

Exception: Rigid nonmetallic conduit ~~complying with Article 352~~ shall be permitted where encased in a concrete envelope a minimum of 50 mm (2 in.) thick and provided with not less than 600 mm (24 in.) of cover measured from the top of the conduit to grade.
Substantiation: 4.1.1 of the NEC Style Manual does not permit references to be made to an entire article unless additional conditions are specified. Therefore, the reference to Article 352 should be deleted.
Panel Meeting Action: Reject
Panel Statement: The use of rigid nonmetallic conduit in this section is conditional because this requirement specifies a minimum 2 inches of concrete encasement. Under this condition, the NEC Style Manual permits a reference to an entire article.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:

COOK, D.: Based on the information in 90.3, the text "complying with Article 352" adds nothing to the requirement.

14-28 Log #629 NEC-P14 **Final Action: Reject**
(501.10(A)(3))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(3) Boxes and Fittings. All boxes and fittings shall be listed and identified ~~approved~~ for Class I, Division 1.
Substantiation: It appears that the more appropriate words to use in this section are "listed" and "identified". Approved is defined as "acceptable to the authority having jurisdiction". This proposed revision is an effort to promote consistent use of words and terms in the NEC. The proposal is for clarification purposes.
Panel Meeting Action: Reject
Panel Statement: Some fittings, such as listed conduit couplings, are not identified specifically for use in hazardous locations. In regard to boxes, based on the recommendation there would have to be a listing mark plus some form of identification.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: While I agree that certain items like conduit couplings are not "listed" specifically for use in Class I, Division 1 locations, the use of the term "identified" as described in 500.8 would cover those fittings and any boxes that would be permitted. "Approved" is defined as acceptable to the authority having jurisdiction (AHJ) and the AHJ will need some basis for that approval. My vote for this proposal would be to accept in part.

14-29 Log #630 NEC-P14 **Final Action: Accept**
(501.10(B)(1)(1))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(B) Class I, Division 2
(1) General. In Class I, Division 2 locations, the following wiring methods shall be permitted:
(1) All wiring methods permitted in ~~Article~~ 501.10(A).
Substantiation: This is an editorial change. 501.10(B)(1)(1) should refer to 501.10(A), not Article 501.10(A).
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-30 Log #2707 NEC-P14 **Final Action: Accept in Principle**
(501.10(B)(1)(3) (New))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Under (1) General add: new (3) as follows and renumber the existing items beginning with the current (3) accordingly:
(3) In industrial establishments with restricted public access where the conditions of maintenance and supervision ensure that only qualified persons service the installation and where added corrosion resistance is necessary, rigid nonmetallic conduit with appropriate fittings and seals, identified for use in a Class I, Division 2 location and run with an appropriately sized equipment grounding conductor shall be permitted.
Substantiation: There are industrial establishments having Class I, Division 2 locations where added corrosion resistance is needed. Traditional metal conduit and even metal conduit with coatings, does not offer the needed corrosion protection. Permission within the code for a rigid nonmetallic conduit product would offer a solution to this problem and at the same time better assure protection offered by a conduit system.
Clearly, users with intrinsic safe, nonincendive systems, or areas containing corrosive atmospheres would welcome opportunity to use an identified rigid nonmetallic conduit that could safely be used in a Division 2 location. Often times, if the opportunity door is shut for an application, there is little chance that a product will be developed for that application. In this case, action to support this proposal will enable the development of both the product and the testing standard to proceed, as there definitely is a need for this product.
The panel action should not rule out the use of a rigid nonmetallic conduit application on the basis that it has not been tested or that such a variety could not be manufactured. As an example, Type "Schedule 80" pc rigid nonmetallic already is considered by its product standard as being suitable for use in areas where subject to physical damage. There is no certainty that metallic conduit will not be bent, damaged, corroded, or be otherwise compromised to question its ability to perform as it was originally intended.
Lastly, since this is a Division 2 application, there is no reason that a solvent made connection would be less secure than a threaded connection. Further, while it is common and good practice to use threaded conduit even in Division 2 locations, there is not an NEC requirement that this be done. Additionally, since a separate equipment ground is required with this rigid nonmetallic conduit, the issues associated with continuity afforded by the conduit system would not be an issue. So again, the nonmetallic connection only needs to be secure, and tight for integrity reasons.
In summary, under this proposal, a product standard could be developed to address such additional considerations as bonding of sections of rigid nonmetallic conduit, provision of appropriate seals, and perhaps even interconnection of metallic with nonmetallic conduits.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 14-33a (Log #CP1402).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: The substantiation for this proposal does not resolve all the issues and concerns I have with the installation of Schedule 80 PVC and RTRC in Division 2 locations. The substantiation indicates, in item 1 that poor installations are a general problem which is addressed by limiting the installations to industrial facilities with qualified personnel.
I don't believe that poor installations are a general problem nor do I feel that limiting installations to industrial facilities will automatically translate into better installations. The definition of a "qualified person" in Article 100 is very loose and leaves a lot to the interpretation of the AHJ. Applying the definition does not guarantee that a person who is labeled a "qualified person" completely understands the NEC or how to install electrical equipment. Placing this "qualified person" in an industrial facility does not insure a proper, code-compliant installation. The truth is that poor installations are the product of lack of maintenance as much as they are the problems with the original installation and they can occur just as easily in an industrial facility as they can in a local gasoline station. During my 15 years of conducting electrical inspections for the City of Fort Lauderdale, I had the occasion to issue "not approved notices" on every type of job from small residential to complex commercial and industrial installations.
Item 3 of the substantiation indicates that fitting concerns are addressed by specific reference to Article 352. Nothing in Section 352.10 Uses Permitted indicates that rigid nonmetallic conduit is approved for use in hazardous locations. Furthermore, Section 500.8(A) of the 2005 NEC states that "Equipment shall be identified not only for the class of location, but also for the explosive, combustible, or ignitable properties of the specific gas vapor, dust, fiber, or flyings that will be present." The Article 100 definition of "Equipment" includes "fittings". The FPN under the Article 100 definition of "Identified (applies to equipment)" suggests that "listing and labeling" is a method to identify equipment as being suitable for the use. I am concerned that the proposal would allow the installation of fittings such as male and female adapters, expansion fittings, couplings and other fittings in a hazardous area without investigating their suitability as required by 500.8(A). To my knowledge, RTRC and Schedule 80 PVC have not been evaluated and identified for use in any hazardous location.
The substantiation in item 4 states that "Risk of physical damage has been minimized by use of RTRC or Schedule 80 PVC". I checked RTRC in the UL "white book" (DZKT) and noted the following statement: "Conduit marked "Above Ground" (or "AG") has been investigated for use aboveground, underground and for direct burial with or without encasement in concrete. This conduit has been investigated for concealed or exposed work where not subject to physical damage." The same statement appears in UL 1684. UL 1684A supplements this information by allowing the use of RTRC above ground Type XW in locations subject to physical damage. I couldn't find anything on the UL web page to indicate that this product has been tested.
Furthermore, UL 1684 in its scope states: "This Standard specifies the requirements for halogen-free reinforced thermosetting resin conduit (RTRC), and associated fittings for installation and use in accordance with the Rules of the Canadian Electrical Code, (CEC) Part I, and the National Electrical Code (NEC) for non-hazardous locations."
In researching the Champion Fiberglass catalogue for Fiberglass Conduit (RTRC), I noted that there are four methods for joining the conduit. Two of the methods do not appear to use any cement or epoxy. The other two methods use a two part epoxy which, according to the catalogue takes one hour to cure at the rated temperature. The epoxy is available in three different curing temperatures.
I don't believe, based on the facts presented in the three previous paragraphs that RTRC should be permitted to be installed in a hazardous location without further evaluation and investigation. The substantiation does not show that the product has been investigated for use in hazardous locations. There are too many unanswered questions pertaining to the suitability of the product for use in a hazardous area. Installation details are complex and should be included or referenced in any code rule which would allow its installation.
Item 5 of the substantiation discusses "materials that might attack RTRC or Schedule 80 PVC" and indicates the problem is addressed by Section 110.11. If this is the case, then the same could be said for coated rigid metal conduit

which is approved for use in Division 2 locations. The coating should provide the corrosion protection while the rigid conduit underneath would provide the physical protection. The substantiation for proposal 14-34 indicates that the rigid corrodes under the coating. I question whether the corrosion took place due to the improper installation of the product. I have seen this product used in hazardous locations and have not observed the deterioration of the metal conduit when the product is properly installed and maintained. If the breakdown is due to improper installation and maintenance, then I would refer back to my comment under item 1 concerning industrial locations and "qualified persons".

Item 9 states that "ingress of vapors is assumed as is the case for all other installations and, thus, is not different for RTRC or PVC." The substantiation does not provide any data to support this statement. Does a PVC male adapter or a RTRC connector provide the same connection characteristics as rigid metal conduit threads when connected to an enclosure? Are PVC and RTRC expansion fittings suitable for use in a Division 2 location? I don't have the answers to these questions and I don't feel comfortable with making an assumption that these fittings can be used in the Division 2 location without creating a safety hazard.

The substantiation in item 10 states the "UL 1684 indicates that this material (RTRC) is tested and must be stronger than the equipment it is connected to. Therefore, it is considered acceptable." If the substantiation is addressing physical damage, I would agree but if the substantiation is addressing acceptable for use in Division 2 locations, I don't see the correlation. The substantiation does not provide information that supports the statement.

Item 11 states that "Generation of static electricity is not an issue that is specific to RTRC or PVC conduits, since these materials are used for enclosures, flexible connections, etc. which are already permitted." The substantiation does not provide any facts to substantiate that claim. Looking on the web, I found numerous articles addressing static electricity associated with PVC and other plastics. PVC food grade material handling hoses contain embedded copper grounding wires to prevent the build up of static electricity. While the energy level may not be high enough to cause problems in a hazardous location, that determination should be made based on controlled tests and not conjecture.

In my attempt to give this proposal a fair evaluation, I contacted some friends at Crouse-Hinds who have dealt with hazardous locations for years and asked for some feedback on the proposal.

Note: Supporting material is available for review at NFPA Headquarters.

14-31 Log #2209 NEC-P14 **Final Action: Reject**
(501.10(B)(1)(6))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise as follows:

Type MI, MC, MV, PA or TC cable with termination fittings, or in cable tray system and installed in a manner to avoid tensile stress at the termination fittings. Single Conductor Type MV cables shall be shielded or metallic armored.

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (501.10(B)(1)(6)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This cable is not currently recognized as a Chapter 3 wiring method. CMP-14 notes that CMP-7 rejected a proposal to include this type of cable in Chapter 3.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

Comment on Affirmative:

COOK, D.: I would also add that acceptance of the cable as a Chapter 3 wiring method would not answer all the questions related to use in hazardous (classified) locations.

14-32 Log #2727 NEC-P14 **Final Action: Accept**
(501.10(B)(1)6.)

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:

(6) Type MI, MC, MV, or TC cable with termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings. ~~Single conductor Type MV cables shall be shielded or metallic armored.~~

Substantiation: Action taken under proposal 14-47 Log #2299 NEC-P14 (501.4(B)(1)(6)) in the 2005 Code cycle was to accept the addition of the new sentence "Single conductor Type MV cables must be shielded or metallic armored". However, there is no adverse experience to indicate that Type MV single conductor cables installed within a Class I, Division 2 location are or have been a problem. The original submitter further stated in the substantiation that by providing a metallic armor or shield to provide a ground plane, that an "alleged" external electrical discharge would eliminate the ignition source and preclude any possibility of creating an explosion. Such a statement is not factual.

Panel Meeting Action: Accept

Panel Statement:

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

Comment on Affirmative:

BERNSEN, M.: My vote to accept this proposal is based on the 2005 NEC change to 310.63 that limits the voltage on single conductor non-shielded cable to 2400 volts. The original proposal did not provide substantiation to prove that a metallic armor or shield will eliminate ignition sources associated with these cable.

COOK, D.: My position to delete the 2005 NEC text that requires single conductor Type MV cable to be shielded or armored is based on the 2005 NEC changes in Table 310.63 limiting those cables to 2400 volts. Nothing in the substantiation for proposal 14-32 has convinced me that single conductor, nonshielded cable, operating at 4160 volts is not capable of external discharge that could become an ignition source. I do not agree with the substantiation provided with the proposal.

COSPOLICH, J.: By accepting Proposal 14-32, the 2008 NEC will now allow single conductor non-shielded and non-armored 2400 volt MV cables in Class I, Division 2 locations which was previously not allowed. My position on Proposal 14-32 to accept the deletion of the 2005 NEC text that requires single conductor Type MV cable to be shielded or armored is based on the NEC 2005 changes to 310.6 Exception and Table 310.63 that limit single conductor nonshielded cables to 2400 volts. My position is contingent upon Code Panel 6 not reversing the changes made to 310.6 Exception and Table 310.63 in the NEC 2005 which reduced the voltage allowed from 8000 volts to 2400 volts. Furthermore, it is strongly recommended that the insulation be limited to the thicknesses of the "Wet or Dry Locations" section of NEC 2005 Table 310.63. I do not agree with the submitter's substantiation that there has been no adverse experience to indicate that Type MV single conductor cables installed within a Class I, Division 2 location are or have been a problem or that has convinced me that single conductor, nonshielded cable operating at 4160 volts or 8000 volts is not capable of external discharge that could become an ignition source. I do not agree with the substantiation provided with the proposal.

14-33 Log #3629 NEC-P14 **Final Action: Accept in Principle**
(501.10(B)(1)7.)

Submitter: Goran Haag, Champion Fiberglass, Inc.
Recommendation: Add new item (7) as follows:

(7) Rigid nonmetallic conduit, type RNC, per article 352 installed with an equipment grounding conduction.

Substantiation: Addition of rigid nonmetallic conduit to Class I, Division 2 wiring methods. This proposal provides the option of using a conduit system that is corrosion resistant and safe for Class I, Division 2 locations. Chemical plants, refineries, off shore drilling facilities and other similar processes are highly corrosive and also have classified areas. Nonmetallic conduit provides a critical option on these locations. The NEC requirements for rigid nonmetallic conduit are found in Article 352. Rigid nonmetallic conduit is listed in the UL Information Directory, which describes the types of rigid nonmetallic conduit, and also in UL standard 1684. Rigid nonmetallic conduit is permitted in Class III, Division 1 locations; a s buried raceway in Class I location in commercial Garages, Article 511; in Bulk Storage Plants, Article 515, and in Class I, Division 1 locations when enclosed in concrete. This proposal also requires an equipment grounding conductor with the nonmetallic conduit in Class I, Division 2 locations. Rigid nonmetallic conduit, not other cabling or conduit systems, is not permitted where subject to physical damage unless identified for such use.

A second proposal to permit RNC in Class I, Division 2 locations is being submitted to section 352.12 (A)

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal Proposal 14-33a (Log #CP1402).

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

BERNSEN, M.: See my Explanation of Negative on Proposal 14-30.

14-33a Log #CP1402 NEC-P14 **Final Action: Accept**
(501.10(B)(1)(7))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and remove the redundant references to Articles 352 and 355. Both of these articles already require that RTRC and RNMC be listed wherever they are used in the NEC. The Technical Correlating Committee is concerned that the references specifically to the xxx.6 sections imply that there are other applications where the listing requirement does not apply. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 14,
Recommendation: Add a new 501.10(B)(1)(7) to read: In industrial establishments with restricted public access where the conditions of maintenance and supervision ensure that only qualified persons service the installation and where metallic conduit does not provide sufficient corrosion resistance, Reinforced Thermosetting Resin Conduit (RTRC), factory elbows, and associated fittings in accordance with 355.x, and Schedule 80 PVC Conduit, factory elbows, and associated fittings, in accordance with 352.6, shall be permitted.
Where seals are required for boundary conditions as defined in 501.15 (A) (4), the Division 1 wiring method shall extend into the Division 2 area to the explosionproof seal which shall be located on the Division 2 side of the Division 1 - Division 2 boundary.
Substantiation: Technical issues considered within this proposal include the following:
1) Installation concerns about poor installation are a general problem for installations and these are addressed by limiting the installations to industrial facilities with qualified personnel.
2) Boundary sealing requirements have been addressed by the new text for the Division 1 to Division 2 installation and existing texts already covers Division 2 to unclassified installations.
3) Fittings concerns are addressed by specific reference to Article 352.
4) Risk of physical damage has been minimized by use of RTRC or Schedule 80 PVC.
5) The question about materials that might “attack” RTRC or PVC were considered, but this was considered to be addressed by 110.11 and it was not felt that this was a greater hazard potential than other material currently used.
6) Panel note to CMP8; Article 355 and 352.12 (A) (2) needs to be revised to reflect this permissive installation in 510.10 (B) (1) (7).
7) Rigid nonmetallic has been redefined by actions of CMP-8. Article 352 is now the rigid nonmetallic article and it has been re-titled PVC; addressing schedule 40 and 80. CMP-14 has accepted only schedule 80 for Division 2 installations as provided in the text above. Article 353 is HDPE as Type HDPE Conduit is not a metallic material and there has been no proposal offered for considering this. Types A-PVC and EB-PVC are addressed in UL 651a and are for installations in concrete only.
8) Weather, sunlight, UV exposure, ambient temperatures, etc. are addressed within the product ANSI standards.
9) Ingress of vapors is assumed as is the case for all other installations and thus is not different for RTRC or PVC conduit installations.
10) Fiberglass is addressed in proposed Article 355 as Reinforced Thermosetting Resin Conduit (RTRC). The ANSI RTRC standard (UL-1684) indicates that this material is tested and must be stronger than the equipment it is connected too. Therefore it is considered acceptable.
11) Generation of static electricity is not an issue that is specific to RTRC or PVC conduits, since these materials are used for enclosures, flexible connections, etc. which are already permitted
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: See my Explanation of Negative on Proposal 14-30.
Comment on Affirmative:
BRIESCH, E.: In order to address the Panel’s concern to minimize the risk of physical damage, the requirement for Reinforced Thermosetting Resin Conduit (RTRC) needs to specify RTRC marked with suffix –XW to specify RTRC with the equivalent mechanical strength of Schedule 80 PVC. In addition, since Zone 2 locations as defined in Article 505 and Division 2 locations are technically the same, consideration should be given to adding these wiring methods to 505.15 (C)(1) as well.
WECHSLER, D.: There is a strong need in Industrial applications when corrosion is a problem for having an alternative to metallic conduit. The Panel should continue to support this proposal.

14-34 Log #2626 NEC-P14 **Final Action: Accept in Principle**
(501.10(B)(5) (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add new text to read as follows:
<u>(5) Corrosive Atmospheres. Schedule 80 PVC Rigid Nonmetallic Conduit with an equipment grounding conductor shall be permitted in corrosive atmospheres when installed in accordance with Article 352 and shall be under conditions of continuous maintenance and supervision by only qualified persons that monitor and supervise the systems.</u>
Substantiation: Corrosion is a serious safety problem on offshore drilling rigs and in chemical plants. Metal conduit will corrode away even when it has been galvanized or coated with PVC. When metal conduit corrodes it will no longer maintain its physical ability to protect the conductors or cables nor be able to act as an equipment grounding conductor.
PVC Coated Metal Conduit can corrode underneath the PVC coating. This corrosion can go undetermined for a period of time. There will be a minimum to no protection of electrical conductors in these areas in addition to the loss of grounding.
Schedule 80 PVC Rigid Nonmetallic Conduit is a heavy duty conduit that has been evaluated and listed for areas of physical damage. Schedule 80 PVC RNC when installed in accordance with Article 352 will not bend and provide the physical strength and integrity in areas prone to damage due to corrosive atmospheres. The proposed language adopts text found throughout the code and lists the use of Schedule 80 PVC Conduit to those areas that are monitored by qualified persons (As defined in Article 100.)
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 14-33a (Log #CP1402).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: See my Explanation of Negative on Proposal 14-30.

14-35 Log #2475 NEC-P14 **Final Action: Accept**
(501.15 FPN No. 3 & No. 4)

TCC Action: The Technical Correlating Committee directs the panel to reconsider the action on this proposal and relocate the product standards references to Annex A. The Technical Correlating Committee intends that the use of Annex A be consistent throughout the NEC. This action will be considered by the panel as a public comment.
Submitter: Donald W. Ankele, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
5011.15 Sealing and Drainage. Seals in conduit and cable systems shall comply with 501.15(A) through 501.15(F). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.
FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal and through conductors passing through the seal. See 501.15(E)(2). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See 501.15(C)(2).
FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the stranded conductors larger than 2 AWG. Special conductor constructions, for example, compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.
<u>FPN No. 3: For further information on construction, testing and marking requirements for conduit sealing fittings, see ANSI/UL 1203, Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.</u>
<u>FPN No. 4: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations</u> .
Additionally, revise FPN No. 1 following 501.15(E)(2) as follows:
FPN No. 1: See ~~ANSI/UL 886 1994, Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.~~ <u>ANSI/UL 1203, Explosionproof and Dust-Ingition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.</u>

Substantiation: Add FPN No. 3 and FPN No. 4 to reference the ANSI standards for conduit sealing fittings and cable sealing fittings to aid approval of the installation for the location involved. Replace the reference to UL 886, in 501.15(E)(2), with ANSI/UL 1203 because UL 886 is no longer published.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-36 Log #2802 NEC-P14 **Final Action: Reject**
(501.15(A)(4))

Submitter: Stephen V. Norako, EGS Electrical Group
Recommendation: Delete the following text:
~~...of such location within 3.05 m (10 ft) of the boundary...~~
Substantiation: Conduit (ridgid metal) is available in 20 ft lengths. This will address these longer lengths and allow seals to be installed as far as 20 ft from a boundary.
Panel Meeting Action: Reject
Panel Statement: The panel established this requirement based on the standard length for conduit as specified in the product standard. Non-standard lengths are available; however, the submitter provided no technical substantiation to support moving the seal farther than 10 feet from the boundary.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-37 Log #3559 NEC-P14 **Final Action: Reject**
(501.15(B)(2))

Submitter: Robert Alexander, Laguna Hills, CA
Recommendation: Delete the current 501.15(B)(2) and replace with the following:
501.15(B)(2) Between Class I, Division 2 and Unclassified Locations.
(A) Aboveground. In each aboveground raceway between a Class I, Division 2 location and an unclassified location where, under normal conditions, there is a differential air pressure that may cause fluid flow from the Division 2 location to the unclassified location.
(1) Where a physical barrier, such as a wall or dike, creates the classified location boundary, and the raceway penetrates such barrier,
(A) The sealing fitting shall be permitted on either side of the boundary within 3.05 m (10 ft) of the boundary,
(B) A threaded connection shall be used at the sealing fitting,
(C) Except for listed explosionproof reduces, there shall be no union, coupling, box, or fitting between the conduit seal and the boundary.
(2) Where the classified location boundary is in open air and the raceway continues to an unclassified location and penetrates a physical barrier, such as a wall or dike into the unclassified location.
(A) The sealing fitting shall be within 3.05 m (10 ft) of the physical barrier.
(B) A threaded connection shall be used at the sealing fitting.
(C) Except for listed explosionproof reducers, there shall be no union, coupling, box, or fitting between the conduit seal and the boundary.
(b) At grade. In each raceway where the Class I, Division 2 location boundary is created by grade and the material or materials that create the classified location have a vapor density greater than 0.6.
(1) The sealing fitting shall be aboveground within 3.05 m (10 ft) of grade.
(2) A threaded connection shall be used at the sealing fitting.
(3) Except for listed explosionproof reducers, there shall be no union, coupling, box, or fitting between the conduit seal and grade.
Substantiation: Since the 1990 cycle, there have been several proposals accepted that relax the requirements for seals between Class I, Division 2 and unclassified locations - almost to the point that such seals have become unnecessary. Under most conditions, this is well justified since there is not supposed to be ignitible materials present in Division 2 under normal conditions.
A significant relaxation in the last cycle permits boundary seals to be nonexplosionproof. I have come to the conclusion that they should be explosionproof- that is, if they are needed at all. Unlike the intrinsically safe circuits used to partially justify the relaxation, common circuits still have the ability to ignite flammable materials under abnormal conditions.
I have reduced 501.15(B)(2) to the few conditions I believe seals between Division 2 and unclassified locations ARE necessary and they should be explosionproof.
Notes:
1) 501.15(B)(2)(a)(1) and (2) do not apply unless the main rules applies; i.e., a differential air pressure exists under normal conditions.
2) I have used the term “fluid flow” rather than “gasses” to emphasize the means of migration rather than the material that migrates.
Panel Meeting Action: Reject
Panel Statement: The goal of the NEC is to provide safe electrical installations in both normal and abnormal conditions. The proposed relaxation or modifications have no technical substantiation and provide no equivalency to the existing requirement. The proposed text does not improve the clarity of this section. The differentiation between the condition described in proposed 501.15(B)(2)(A)(1) and 501.15(B)(2)(A)(2) is not clear and would lead to great difficulty in enforcement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-38 Log #100 NEC-P14 **Final Action: Reject**
(501.15(C)(6))

Submitter: Ian Eckstein, March Electric
Recommendation: Add a new last sentence to the section and a new table as follows:
<u>“The cross-sectional area of the conductors shall not exceed the values given in Table 501.15(C)(6).”</u>

Table 501.15(C)(6) Allowable Conductor Fill Permitted for Conduit Seals Installed in Class I Division 1 Locations

Metric Designator	Trade Size	Maximum Cross-Sectional Area mm²	in.²
16	½	51	0.079
21	¾	88	0.137
27	1 ¼	143	0.222
35	1 ½	246	0.328
41	1	333	0.518
53	2	550	0.852
63	2 ½	784	1.217
78	3	1210	1.875
91	3 ½	1615	2.503
103	4	2079	3.221
129	5	3263	5.053
155	6	4705	7.290

Substantiation: Since the number of conductors permitted to be run through a Class I seal (25% fill) is usually less than for the conduit (40% fill), time is lost making calculations in the field where the size of the seal for a particular run is in question. Since the maximum fill is 25% of the cross-sectional area of RMC, a simple fill table in Article 501 would be easy to provide. I saw Proposals 14-38 and 14-39 from the last revision and was disappointed when they were rejected. I copied one of the tables from the proposal and put it in the back of my 2005 NEC. Electricians and inspectors should know about the 25% fill requirement, but the reality is they are often not aware. Such a table would help make this requirement obvious and the sizing of seals faster to determine. If the feeling is that this table is not necessary, then perhaps the 31%, 40%, 53% and 60% columns of Tables 4 should be deleted. As an electrician, I feel adding this new table to Article 501 will definitely make the NEC more user friendly.
Panel Meeting Action: Reject
Panel Statement: Seals are required to be provided with an accompanying table that specifies the allowable fill which may be other than 25%.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-39 Log #2446 NEC-P14 **Final Action: Accept**
(501.15(F)(3))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and to relocate the reference into Annex A to be consistent with other parts of the Code. This action will be considered by the panel as a public comment.
Submitter: Eliana Beattie, ISA
Recommendation: 501.15(F)(3) - 2nd FPN
Change ISA 12.27.01 to ANSI/ISA-12.27.01-2003
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-40 Log #973 NEC-P14 **Final Action: Reject**
(501.30)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Wiring and equipment in Class I Division 1 and 2 locations shall be grounded ~~as specified in Article 250~~ and in accordance with the requirements in 502.30(A) and 501.30(B).
Substantiation: Edit. To comply with Style Manual.
Panel Meeting Action: Reject
Panel Statement: The grounding requirement in this section is conditional because of the additional requirements specified in 501.30. Under this condition, the NEC Style Manual permits a reference to an entire article.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14
Comment on Affirmative:
COOK, D.: While I am not opposed to the panel action, I will offer alternate wording for 510.30 if it is determined the current text does not comply with the NEC Style Manual.
"In addition to the general grounding requirements, wiring and equipment in Class I, Division 1 and 2 locations shall also comply with 501.30 (A) and (B)."

14-41 Log #1452 NEC-P14 **Final Action: Reject**
(501.30(A))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
501.30 Grounding and Bonding. Class, Divisions 1 and 2. Wiring and equipment in Class I, Division 1 and 2 locations shall be grounded <u>and bonded</u> as specified in Article 250 and with the requirements in 501.30(A) and 501.30(B).
(A) Bonding. <u>Bonding in Class I locations shall comply with 250.100.</u> ~~The locknut bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used.~~ Such means of bonding shall apply to all ~~intervening raceways, fittings, boxes enclosures, and so forth~~ <u>equipment</u> between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall be required only to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
~~FPN: See 250.100 for additional bonding requirements in hazardous (classified) locations.~~
(B) Types of Equipment Grounding Conductors. Remain unchanged.
Substantiation: This section is not written in language that is consistent with the rest of the code. For example, what is "so forth"? Also, there is no need to include the sentence that I propose to delete, when it is already found in 250.92, which hazardous (classified) locations are already required to comply with.
Companion proposals are being made to 502.30 and 503.30 for the purposes of correlation.
Panel Meeting Action: Reject
Panel Statement: Because the requirements for grounding and bonding equipment located in, and intervening into, hazardous locations are critical to safe installations, CMP-14 affirms that this requirement should be expressed explicitly in this section and a cross-reference to 250.100 does not improve usability.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: I agree with the submitter's substantiation and agree in principle with the proposed text for 501.30(A) and the proposal to delete the FPN. I will offer the following alternate wording for public comment:
(A) Bonding. Bonding in Class I locations shall comply with 250.100. Such means shall apply to all metal equipment between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
[No change to exception]
[Delete the FPN.]

14-42 Log #2762 NEC-P14 **Final Action: Reject**
(501.30(A))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new last sentence to 501.30(A) to read as follows:
<u>When a bonding jumper is used, it shall be sized in accordance with 250.102(D).</u>
Substantiation: There is no clear statement specifying the minimum size required when a bonding jumper is used for bonding back to the service for a circuit serving a classified hazardous location.
Panel Meeting Action: Reject
Panel Statement: Since 90.3 states the general requirements apply unless modified by the special requirements in Chapters 5, 6, and 7, the requirements in 250.102(D) are applicable without reference. This section does not modify the sizing requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-43 Log #2403 NEC-P14 **Final Action: Reject**
(501.30(A) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
501.30 Grounding and Bonding. Class I, Divisions 1 and 2. Wiring and equipment in Class I, Division 1 and 2 locations shall be grounded as specified in Article 250 and with the requirements in 501.30(A) and 501.30(B).
(A) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, and so forth, between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
~~Exception: The specific bonding means shall be required only to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), provided the branch circuit overcurrent protection is located on the load side of the disconnecting means.~~
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Reject
Panel Statement: The panel rejects this proposal based on the fact that the sole substantiation is acceptance of a companion proposal by CMP-5. Without current knowledge of CMP-5's actions on these companion proposals, CMP-14 has no alternative other than to reject and await any necessary correlating action recommended by the TCC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: I agree with the change being proposed in Proposal 5-119. The use of an equipment grounding conductor in the feeder or branch circuit supplying a separate building should not be optional. The current rule is an exception to the general requirement found in 250.24(A)(5), stating that a "grounding connection shall not be made to the grounded conductor on the load side of the service disconnecting means." It took the code making process a long time to rectify the exception to the rule for ranges and clothes dryers. Proposal 14-43 would remove another unnecessary exception to the rule.
My vote to Reject proposal 14-43 concurs with the substantiation provided by Code-Making Panel 14. My vote, however, would be to Accept this proposal if Code-Making Panel 5 makes a wise decision and votes to Accept Proposal 5-119.

14-44 Log #1504 NEC-P14 **Final Action: Accept in Principle**
(501.30(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete:
"...and is to be relied on to complete a sole equipment grounding path".
Substantiation: Edit. These raceways cannot be used as the sole grounding path. This wording is not used in 502.30(B) or 503.30(B).
Panel Meeting Action: Accept in Principle
Revise 501.30(B) to read:
Flexible metal conduit and liquidtight flexible metal conduit shall not be used as the sole ground-fault current path. Where equipment bonding jumpers are installed, they shall comply with 250.102.
Retain the exisiting exception.
Panel Statement: The panel concurs that flexible metal conduit and liquidtight flexible metal conduit cannot be used in Class I, Division 2 location as the sole ground-fault current path and has revised the current text for clarity.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-45 Log #2600 NEC-P14 **Final Action: Reject**
(501.35 and 502.35)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-349. This action will be considered by the panel as a public comment.
Submitter: Joseph P. DeGregoria, Underwriters Laboratories Inc.
Recommendation: Revise text to read:

501.35 Surge Protection.

(A) Class I, Division 1. Surge arresters, surge protective devices ~~transient voltage surge suppressors (TVSS)~~ , and capacitors shall be installed in enclosures identified for Class I, Division 1 locations. Surge-protective capacitors shall be of a type designed for specific duty.

(B) Class I, Division 2. Surge arresters and surge protective devices ~~TVSS~~ shall be nonarcing, such as metal-oxide varistor (MOV) sealed type, and surge-protective capacitors shall be of a type designed for specific duty. Enclosures shall be permitted to be of the general-purpose type. Surge protection of types other than described in this paragraph shall be installed in enclosures identified for Class I, Division 1 locations.

502.35 Surge Protection — Class II, Divisions 1 and 2. Surge arresters and surge protective devices ~~transient voltage surge suppressors (TVSS)~~ installed in a Class II, Division 1 location shall be in suitable enclosures. Surge-protective capacitors shall be of a type designed for specific duty.

Substantiation: 1) UL intends to combine the categories of Surge Arresters (Article 280) and Transient Voltage Surge Suppressors (Article 285) into one category and Standard, UL 1449, renamed Surge Protective Devices(SPDs).

UL 1449 will include SPD designations Type 1 and Type 2 for permanently connected devices for use on circuits not exceeding 600 V.

The technology of both low voltage Surge Arresters and TVSSs are now basically the same, thereby justifying coverage under one Standard, UL 1449, and one test program with consideration given to the installation location on the line side (Type 1) or load side (Type 2) of the service disconnect overcurrent protection.

2) The Surge Arrester designation will only be retained for devices used in circuits of 1 kV and over and evaluated to IEEE C62.11-1999.

Panel Meeting Action: Reject
Panel Statement: Transient voltage surge suppressors (TVSS) are currently defined in Article 285. Acceptance of this proposal introduces a term (surge protective devices) that is not defined and may result in confusion. The panel understands that there is action on CMP-5's agenda that may clarify this issue and encourages the submitter of this proposal to comment accordingly.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14
Comment on Affirmative:

BRIESCH, E.: I agree with the Panel Action to Reject and the reasons for doing so as documented in the Panel Statement. However it is my understanding that, subsequent to the meeting of Panel 14, Panel 5 accepted these changes in their actions on Proposals 5-335, 5-340 and 5-349.

14-46 Log #550 NEC-P14 **Final Action: Accept**
(501.100(A)(2))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:

(2) Not Containing Liquid That Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with 501.100(A)(1) or be identified ~~approved~~ for Class I locations.

Substantiation: It appears that the more appropriate word to use in this section is "identified." Approved is defined as "acceptable to the authority having jurisdiction." This proposed revision is an effort to promote consistent use of words and terms in the NEC. Also, comparison with 502.100(A)(2) reveals that the word "identified" is used rather than the word "approved" in Class II locations for a requirement that parallels the same requirement in Class I locations for transformers.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-47 Log #622 NEC-P14 **Final Action: Accept**
(501.100(A)(2))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:

(2) Not Containing Liquid That Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with 501.100(A)(1) or be identified ~~approved~~ for Class I locations.

Substantiation: Approved is defined as "acceptable to the authority having jurisdiction". It appears that the more appropriate word to use would be "identified" in this requirement. This would promote more consistency in how the terms "approved", "listed", and "identified" are used in the articles dealing with hazardous (classified) locations. In 502.100(A)(2), the word "identified" is used in a requirement that is similar. This proposal is for clarification purposes.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-48 Log #2801 NEC-P14 **Final Action: Reject**
(501.100(B))

Submitter: Stephen V. Norako, EGS Electrical Group
Recommendation: Add text to read as follows:

Dry type transformer operating temperature shall not exceed the ignition temperature of the specific gas or vapor encountered. Operating temperature is determined by transformer temperature rise, ambient temperature (40°C) and hot spot temperature (30°C).

FPN: Example for a 150°C rise transformer, operating temperature is 220°C (150°C rise and 40°C ambient and 30°C hot spot)

Substantiation: Dry type transformer operating temperature has been overlooked when installed in Class 1, Division 2 locations, and can result in a transformer operating temperature that may exceed the vapor or gas ignition temperature. This can easily be addressed by using the formula in the proposal.
Panel Meeting Action: Reject
Panel Statement: The general requirements for the operating temperature of all equipment in hazardous (classified) locations are specified in 500.8(A)(1).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-49 Log #2482 NEC-P14 **Final Action: Reject**
(501.125, FPN 3)

Submitter: Frederick Bried, Spring, TX
Recommendation: Revise text to read as follows:

For further information on the application of electric motors in Class I, Division 2 hazardous (classified) locations, see IEEE std. 1349-200 6 ~~1~~ , IEEE Guide for the Application of Electric Motors in Class I, Division 2, and Class I, Zone 2 Hazardous (Classified) Locations.

Substantiation: IEEE 1349-2001 is being revised and will be completed in 2006. The standard will include information related to application of electric motors in Class I, Division 2 and Class I, Zone 2 hazardous (classified) locations.
Panel Meeting Action: Reject
Panel Statement: The document referenced in the recommendation has not been approved by the IEEE Standards Board.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-50 Log #297 NEC-P14 **Final Action: Reject**
(501.130(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

~~Physical~~ Damage. Each luminaire (fixture) shall be protected against ~~physical~~ damage by a ~~suitable~~ guard acceptable to the Authority Having Jurisdiction or by location.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. "Suitable" is not clean Code language, so unless someone has specs to suggest I propose substituting the AHJ, who has to be satisfied anyway.

Submitting proposals removing the adjective "physical" may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: CMP-14 disagrees with the submitter's substantiation which indicates that all damage to electrical equipment is physical damage. Electrical equipment can be damaged by overheating. This could occur from ambient, from overload, from the equipment being located in direct sunlight, from lack of adequate ventilation, from proximity to other heat producing equipment, or other situations. The suitable guards required by this section would not protect the electrical equipment from damage in an overheating condition. Other sections of the NEC address that protection. Electrical equipment can be damaged by electrical faults; short circuits, ground faults, etc. The suitable guards required by this section would not protect the electrical equipment from damage in an electrical fault condition. Other sections of the NEC address that protection. Damage to electrical equipment can occur from lightning or other transient voltage sources, under-voltage, misapplication of electrical ratings, and a variety of other sources. The damage addressed by this requirement is physical damage. This requirement will be applied in a variety of different applications, occupancies, and environments, with each having its own unique set of conditions. CMP-14 concedes that "physical damage" has a variety of meanings to a variety of code users, but believes most experienced code users know physical damage when they see it. Panel also believes "suitable" is an accurate description of the guard. A guard that is protecting a luminaire where the lamp that might be broken from vibration and a guard that protecting a luminaire that might be subject to vehicular traffic might both be "suitable", but be very different. Suitability will be determined by the conditions of the installation. It should also be noted that based on 110.2, all equipment required or permitted by this code shall be acceptable only if approved. Including the text "acceptable to the authority having jurisdiction" in this location would only duplicate the requirement in 110.2 and only fatten the document.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-51 Log #2799 NEC-P14 **Final Action: Reject**
(501.130(B)(1))

Submitter: Stephen V. Norako, EGS Electrical Group

Recommendation: Revise text to read as follows:

~~Where lamps are of a size or type that may, under normal operating conditions, reach surface temperatures exceeding a percent of the ignition temperature in degrees Celsius of the gas or vapor involved,~~ fixtures shall comply with 501.130(A)(1) or shall be of a type that has been tested in order to determine the marked operating temperature or temperature class (T code).

Substantiation: This is a point of much confusion causing the unnecessary derating of the temperature class (T code) of identified (UL listed) Class 1, Divison 2 luminaires. The misinterpretation is that tests must be taken at 80 percent instead of 100 percent. Also, in reality it can't be used as intended. Lamp manufacturers do not provide operating surface temperatures of their lamps in open conditions so that this temperature can be derated to 80 percent when lamp is placed in an enclosure (luminaire).

Panel Meeting Action: Reject

Panel Statement: The substantiation shows no basis for the reason for confusion nor does the suggested text make any improvement. For example, in an area with a T1 temperature classification, testing of fluorescent lamps is not necessary because it is evident that they will not exceed 80% of the autoignition temperature.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-52 Log #296 NEC-P14 **Final Action: Reject**
(501.130(B)(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

~~Physical~~ Damage. Luminaire (lighting fixtures) shall be protected from ~~physical~~ damage by ~~suitable~~ guards <u>acceptable to the Authority Having Jurisdiction</u> or by location.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. "Suitable" is not clean Code language, so unless someone has specs to suggest I propose substituting the AHJ, who has to be satisfied anyway.

Submitting proposals removing the adjective "physical" may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-53 Log #2798 NEC-P14 **Final Action: Reject**
(501.140(A)(3))

Submitter: Stephen V. Norako, EGS Electrical Group

Recommendation: Add text to read as follows:

The wireway shall be sealed to minimize the gas or vapor in the well-pit from being communicated to the location of the power source. Such seals shall not be required to be explosion proof.

Substantiation: Typically, the raceway used is ridgid metal conduit or nonmetallic conduit and is directly connected to a switch or disconnect located in an unclassified location. Since the conduit is open at the well-pit, it must be sealed to limit well-pit gases from entering the switch in the unclassified locations in quantity sufficient to ignite.

Panel Meeting Action: Reject

Panel Statement: The requirements for boundary seals are located in 501.15 and vary depending on the area classification of the wet pit and other factors associated with the specific installation.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-54 Log #978 NEC-P14 **Final Action: Reject**
(501.140(B)(3))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

(3) Be connected to terminals in ~~an approved manner~~ <u>accordance with 110.14 and 501.45</u> .

Substantiation: Edit. Proposal is more specific.

Panel Meeting Action: Reject

Panel Statement: The reference to 110.14 is not necessary because it is a general rule that applies throughout the Code and there is not a 501.45.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: I agree with the submitter's substantiation that current text is not specific. The current text requires terminations of supply conductors of a flexible cord to be connected to terminals in an "approved manner". "Approved" is defined as acceptable to the authority having jurisdiction (AHJ). Nothing in the current text or in Chapter 5 of the NEC would provide a basis for the AHJ to accept anything other than a termination that complies with the requirements in 110.14 unless those terminations were permitted to be uninsulated by 501.25. The panel statement indicates the reference to 110.14 is not necessary because it is a general rule. The requirement for supply conductors to be connected to terminals in an approved manner is not necessary either since the general rule in 110.2 requires all conductors and equipment to be approved. I will offer the following alternate wording for public comment:

501.140(B) (3) is connected to terminals in accordance with 110.14 and 501.25.

ARTICLE 502 — CLASS II LOCATIONS

14-54a Log #CP1401 NEC-P14 **Final Action: Accept**
(502.5)

Submitter: Code-Making Panel 14,
Recommendation: Delete the second paragraph and associated fine print note in 502.5 Retitle the remaining paragraph as "Explosionproof Equipment".
Substantiation: The temperature requirements in this paragraph are explicitly covered in 500.8(C)(2).
Panel Meeting Action: Accept
Panel Statement:
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-55 Log #3197 NEC-P14 **Final Action: Accept**
(502.5 and Exception)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete the first paragraph and the exception.
Substantiation: A review of 90.2 (A) and (B), the Article 100 definition of service point, the complete NEC text and specifically the text in Articles 225, and 230 leads one to believe that electrical wiring and equipment located on the load side of the service point is under the scope of the NEC. This FPN, which based on the text in 90.5(C) is not enforceable, provides no value to the NEC user.

If industry believes information in the NESC is necessary for installations on the load side of the service point, that information should included as requirements of the NEC, not as a FPN. As an FPN, it only adds to the confusion of designers, installers, and AHJ's working on installations working on premises wiring.

The FPN also appears to include a requirement, which is not permitted to be located in a FPN.
Panel Meeting Action: Accept
Panel Statement: The panel understands that the same substantiation provided with Proposal 14-24 was intended for this proposal.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-56 Log #2476 NEC-P14 **Final Action: Accept**
(502.10)

TCC Action: The Technical Committee Committee directs the panel to reconsider this proposal and to relocate the reference into Annex A to be consistent with other parts of the Code. This action will be considered by the panel as a public comment.
Submitter: Donald W. Ankele, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:

502.10 Wiring Methods. Wiring methods shall comply with 502.10(A) or 502.10(B).

(A) Class II, Division 1.

(1) General. In Class II, Division 1 locations, the wiring methods in (1) through (4) shall be permitted.

(1) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.

(2) Type MI cable with termination fittings listed for the location. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(3) In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC- HL cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application, shall be permitted.

FPN: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.
Substantiation: Type MC cable listed specifically for hazardous locations carries the HL marking. This is consistent with similar portions of Chapter 5.

Add FPN to reference the ANSI standard for cables and cable fittings to aid approval of the installation for the location involved.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-57 Log #2709 NEC-P14 **Final Action: Reject**
(502.10(B)(1))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Replace the entire existing text with the following:

Revise this section with the underlined and striken portions as shown:

(1) General. In Class II, Division 2 locations, the following wiring methods shall be permitted:

(1) All wiring methods permitted in 502.10(A).

(2) Rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways.

(3) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings.

(4) Type ITC cable as permitted in 727.4.

~~(3) Type MC or MI cable with listed termination fittings.~~

~~(4) Type PLTC in cable trays.~~

~~(5) Type ITC in cable trays.~~

(5) Type MI, MC, MV, or TC cable with listed termination fittings or in cable tray systems, and installed in a manner to avoid tensile stress at the termination fittings. Where ~~Type MC, MI, or TC cable~~ installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, Type MI, MV, or TC cables, or a nonlisted for use Class II, Division 1 Type MC cable shall be in ~~with~~ a space not less than the larger cable diameter between the two adjacent cables, ~~shall be the wiring method employed.~~

Exception to (5): Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the spacings required by (5).
Substantiation: The revised wording aligns the wording and requirements closer to that of 501.10. This will reduce confusion in the field and will aid in more consistent installations.
Panel Meeting Action: Reject
Panel Statement: The proposed revision does not improve the clarity of this section and also introduces technical changes without adequate substantiation.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-58 Log #2464 NEC-P14 **Final Action: Reject**
(502.10(B)(3))

Submitter: Eliana Beattie, ISA
Recommendation: 502.10 Wiring Methods.

Revise 502.10(B)(3) as follows:

(3) Nonincendive Field Wiring & FNICO . Nonincendive field wiring and FNICO shall be permitted using any of the wiring methods permitted for unclassified locations. Nonincendive field wiring and FNICO systems shall be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring or FNICO circuit, provided the simple apparatus does not interconnect the nonincendive field wiring or FNICO circuit to any other circuit.
Substantiation: The FISCO (**F** ieldbus **I** ntrinsically **S** afe **CO** ncept) and FNICO (**F** ieldbus **N** on **I** ncendive **CO** ncept) protection concepts take advantage of functional requirements of Fieldbus systems to significantly simplify i.s. installation. These requirements include wire type and quality, supply voltage and current levels, and limitation of stored energy at the terminals of field devices. The objective of these concepts is to simplify the i.s. installation to the point where a safe installation may be effected by simply selecting devices labeled as FISCO (or FNICO) and observing basic wiring type and length restrictions. The NRTL evaluation of all devices ensures that they will be compatible with all other similarly labeled devices without further analysis on the part of the installer.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel rejects the addition of "FNICO" because there are numerous nonincendive field wiring methods that are acceptable and the inclusion of the acronym in this section would imply that "FNICO" is the only method available. If "FNICO" wiring systems are installed in accordance with the control drawings, this practice would not be prohibited by the current requirements in the NEC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:

SCHNAARE, T.: Generally speaking, the code serves its primary users base best when it includes information about the various techniques that are allowed for installation. While I agree that the panel does not want to imply that FISCO and FNICO are the only techniques available, I also belive that the code is made stronger and easier to understand and apply when information such as this is included. If there are other deficiencies in the current code (as implied by the panel statement) then these should be addressed as well.

14-59 Log #919 NEC-P14 **Final Action: Reject**
(502.30)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence:
Such means of bonding shall apply to intervening raceways, cables , fittings, boxes, enclosures, and so forth between Class II locations and the point of grounding for service equipment or building or structure disconnecting means, or point of grounding of separately derived systems.
Substantiation: Edit. Cables permitted in these locations should be included. If the Class II location is in a building served by overhead conductors, there will be space where there is no intervening equipment to be bonded. It doesn't seem necessary to bond on the line side of a building disconnecting means.
Panel Meeting Action: Reject
Panel Statement: The bonding of a cable wiring method to the boxes, enclosures or equipment occurs through the termination fitting. Fittings are currently included in the list of items required to meet this requirement. The building or structure disconnecting means may, or may not, include a point of grounding (see 250.32). The bonding requirements in this section apply to metal equipment. They apply within a single building or structure, or in installations that involve multiple buildings or structures. If the equipment or the wiring method is nonmetallic, there is nothing to bond. Wiring could include both metal and nonmetallic methods and the metal sections are required to meet the requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-60 Log #1453 NEC-P14 **Final Action: Reject**
(502.30)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
502.30 Grounding and Bonding, Class II, Divisions 1 and 2. Wiring and equipment in Class II, Division 1 and 2 locations shall be grounded and bonded as specified in Article 250 and with the requirements in 502.30(A0 and 502.30(B).
(A) Bonding. Bonding in Class II locations shall comply with 250.100 . ~~The locknut bushing and double locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used.~~ Such means of bonding shall apply to all ~~intervening raceways, fittings, boxes, enclosures, and so forth~~ equipment being Class II locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall be required only to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
(B) Types of Equipment Grounding Conductors. Remain unchanged.
Substantiation: This section is not written in language that is consistent with the rest of the code. For example, what is "so forth"? Also, there is no need to include the sentence that I propose to delete, when it is already found in 250.92, which hazardous (classified) locations are already required to comply with. Companion proposals are being made to 501.30 and 503.30, for the purposes of correlation.
Panel Meeting Action: Reject
Panel Statement: Because the requirements for grounding and bonding equipment located in, and intervening into, hazardous locations are critical to safe installations, CMP-14 affirms that this requirement should be expressed explicitly in this section and a cross-reference to 250.100 does not improve usability.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: I agree with the submitter's substantiation and agree in principle with the proposed text for 502.30(A) and the proposal to delete the FPN. I will offer the following alternate wording for public comment:
(A) Bonding. Bonding in Class I locations shall comply with 250.100. Such means shall apply to all metal equipment between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
[No change to exception]

14-61 Log #2763 NEC-P14 **Final Action: Reject**
(502.30(A))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new last sentence to 502.30(A) to read as follows:
When a bonding jumper is used, it shall be sized in accordance with 250.102(D).
Substantiation: There is no clear statement specifying the minimum size required when a bonding jumper is used for bonding back to the service for a circuit serving a classified hazardous location.
Panel Meeting Action: Reject
Panel Statement: Since 90.3 states the general requirements apply unless modified by the special requirements in Chapters 5, 6, and 7, the requirements in 250.102(D) are applicable without reference. This section does not modify the sizing requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-62 Log #2404 NEC-P14 **Final Action: Reject**
(502.30(A) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
502.30 Grounding and Bonding. Class II, Divisions 1 and 2. Wiring and equipment in Class II, Division 1 and 2 locations shall be grounded as specified in Article 250 and with the requirements in 502.30(A) and 502.30(B).
(A) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, and so forth, between Class II locations and the point of grounding for service equipment or point of grounding of a separately derived system.
~~Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), if the branch circuit overcurrent protection is located on the load side of the disconnecting means.~~
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Reject
Panel Statement: The panel rejects this proposal based on the fact that the sole substantiation is acceptance of a companion proposal by CMP-5. Without current knowledge of CMP-5's actions on these companion proposals, CMP-14 has no alternative other than to reject and await any necessary correlating action recommended by the TCC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: I agree with the change being proposed in Proposal 5-119. The use of an equipment grounding conductor in the feeder or branch circuit supplying a separate building should not be optional. The current rule is an exception to the general requirement found in 250.24(A)(5), stating that a "grounding connection shall not be made to the grounded conductor on the load side of the service disconnecting means." It took the code making process a long time to rectify the exception to the rule for ranges and clothes dryers. Proposal 14-43 would remove another unnecessary exception to the rule.
My vote to Reject proposal 14-43 concurs with the substantiation provided by Code-Making Panel 14. My vote, however, would be to Accept this proposal if Code-Making Panel 5 makes a wise decision and votes to Accept Proposal 5-119.

14-52a Log #CP1404 NEC-P14 **Final Action: Accept**
(502.30(B))

Submitter: Code-Making Panel 14,
Recommendation: Revise 502.30(B) to read:
Liquidtight flexible metal conduit shall not be used as the sole ground-fault current path. Where equipment bonding jumpers are installed, they shall comply with 250.102.
Retain the exisiting exception.
Substantiation: The revised wording clarifies the requirement and is parallel language to the same requirements in Articles 501, 503, 505 and 506.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-63 Log #2501 NEC-P14 **Final Action: Accept**
(502.115(A))

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
502.115 Switches, Circuit Breakers, Motor Controllers, and Fuses.
(A) Class II, Division 1. In Class II, Division 1 locations, switches, circuit breakers, motor controllers, and fuses shall comply with 502.115(A)(1) and ~~through~~ (A)(2 ~~3~~).
(1) Type Required. Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices ~~that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present,~~ shall be provided with identified dust-ignitionproof enclosures.

~~(2) Isolating Switches. Disconnecting and isolating switchescontaining no fuses and not intended to interrupt current and not installed where dusts may be of an electrically conductive nature shall be provided with tight metal enclosures that shall be designed to minimize the entrance of dust and that shall (1) be equipped with telescoping or close-fitting covers or with other effective means to prevent the escape of sparks or burning material and (2) have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which exterior accumulations of dust or adjacent combustible material might be ignited.~~

(2)(~~3~~) Metal Dusts. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fuses, switches, motor controllers, and circuit breakers shall have enclosures identified for such locations.

(B) Class II, Division 2. In Class II, Division 2 locations, enclosures for fuses, switches, circuit breakers, and motor controllers, including pushbuttons, relays, and similar devices, shall be dusttight.

Substantiation: Current requirement permits a construction in Division 1 which would not even be permitted by 502.115(B) in Division 2.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 2

Explanation of Negative:

WECHSLER, D.: The action should have been to Reject due to a lack of technical substantiation.

The current text under (1) is as follows:

(1) Type Required Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present, shall be provided with identified dust-ignitionproof enclosures.

This text addresses two conditions: Condition 1 being that for switches, circuit breakers, etc. installed where combustible dusts of an electrically conductive nature are installed and these shall be provided with an identified dust-ignitionproof enclosures. Condition 2 is for switches, circuit breakers, etc. that are intended to interrupt current during normal operations shall be provided with identified dust-ignitionproof enclosures.

With the proposed change, the requirement loses the valuable requirement dealing with combustible dusts of an electrically conductive nature. Additionally the requirement has been expanded to include both normal operations and abnormal operations requiring dust-ignitionproof enclosures. There is no technical substantiation to support this change or to demonstrate that the current wording has resulted in an unsafe condition.

Striking of the current (2) eliminates the historic permitted installation practice of isolating switches which contain no fuses and are not intended to interrupt current, housed in a tight metal enclosure designed to minimize the entrance of dust. No substantiation has been offered to reflect that this practice is unsafe.

WIRFS, M.: I agree with the comments expressed in Mr. Wechsler's explanation of negative vote.

14-64 Log #2500 NEC-P14 **Final Action: Accept**
(502.120(B)(2))

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Revise text to read as follows:

(B) Class II, Division 2. . In Class II, Division 2 locations, transformers and resistors shall comply with 502.120(B)(1) through (B)(3).

(1) Switching Mechanisms. Switching mechanisms (including overcurrent devices) associated with control transformers, solenoids, impedance coils, and resistors shall be
provided with dusttight enclosures.

(2) Coils and Windings. Where not located in the same enclosure with switching mechanisms, control transformers, solenoids, and impedance coils shall be provided with dusttight enclosures. ~~tight metal housings without ventilating openings.~~

(3) Resistors. Resistors and resistance devices shall have dust-ignitionproof enclosures identified for Class II locations.

Exception: Where the maximum normal operating temperature of the resistor will not exceed 120°C (248°F),nonadjustable resistors or resistors that are part of an automatically timed starting sequence shall be permitted to have enclosures complying with 502.120(B)(2).

Substantiation: 502.10(B)(4) requires all boxes and fittings in a Class II, Division 2 location to be dusttight. It should not require less for a coil or winding.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 3

Explanation of Negative:

GOODMAN, M.: The specific term of "dusttight" is not applicable to the enclosures for this type of equipment and would, in essence, require that a new type of equipment be created and approved which is not necessary to enhance safety.

WECHSLER, D.: Article 502.120 is dealing with a specific installation with Control Transformers and Resistors and within a Class II, Division 2 location has provided that installation of coils and windings (Article 502.120 (B)(2)) follow some different rules when coils and resistors are not located in the same enclosure with switching mechanisms, control transformers, etc. This rule was that they could be installed in tight metal housings without ventilating openings. While a dust-tight enclosure would also be acceptable, there is no basis for excluding a current practice which has not been demonstrated as being unsafe. Justification that something should not require less, when there is no evidence suggested that the current application is unsafe, is not a sufficient justification for eliminating a long existing requirement.

The action by the panel could have been to "Accept in Part" and add to the text permission to locate coils and resistors in a dusttight enclosure, but this is already permitted under 502.10(B)(4).

WIRFS, M.: I agree with the comments expressed in Mr. Wechsler's explanation of negative vote.

14-65 Log #2497 NEC-P14 **Final Action: Reject**
(502.125(B))

TCC Action: Based on the action to "Reject" the Technical Correlating Committee understands there is no change to the existing text.

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Revise text to read as follows:

(B) Class II, Division 2. In Class II, Division 2 locations, motors, generators, and other rotating electrical equipment shall be provided with dusttight enclosures. ~~totally enclosed nonventilated, totally enclosed pipeventilated, totally enclosed water-air-cooled, totally enclosed fan-cooled or dust-ignitionproof for which~~ The maximum full-load external temperature shall be in accordance with 500.8(C)(2) for normal operation when operating in free air (not dust blanketed). ~~and shall have no external openings.~~

~~Exception: If the authority having jurisdiction believes accumulations of nonconductive, nonabrasive dust will be moderate and if machines can be easily reached for routine~~
~~cleaning and maintenance, the following shall be permitted to be installed:~~

~~(1) Standard open-type machines without sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature~~
~~devices), or integral resistance devices~~

~~(2) Standard open-type machines with such contacts, switching mechanisms, or resistance devices enclosed within dusttight housings without ventilating or other openings~~

~~(3) Self-cleaning textile motors of the squirrel-cage type to have enclosures complying with 502.120(B)(2).~~

Substantiation: 502.10(B)(4) requires all boxes and fittings in a Class II, Division 2 location to be dusttight. Motors and other rotating equipment should not be permitted to be less than that.

Panel Meeting Action: Reject

The panel accepts the deletion of the existing exception and rejects the revisions to the current text of 502.125(B).

Panel Statement: The submitter did not convince the panel that the current requirement and exception do not adequately cover rotating equipment in Class II, Division 2 locations.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 3

Explanation of Negative:

BRIESCH, E.: The Panel Action should be to Accept. It makes no sense to require dusttight boxes, fittings and wiring systems and permit dust entrance into a motor or generator. There is a greater likelihood of an ignition source being present in the motor enclosure than in a raceway, conduit fitting or junction box. Furthermore, the Exception is vague, unenforceable and permits a construction in a Class II location that appears to be suitable only for a Class III location. The Panel Statement, fails to address the basic issue of why boxes, fittings and wiring systems need to be capable of excluding dust but motors and generators do not. The ANSI standard for Class II, Division 2 equipment, ANSI/ISA-12.12.01, requires all equipment intended for that location to have a dusttight enclosure. The requirement for dustight enclosures was accepted on other types of equipment by the Panel in the actions taken on Proposals 14-63, -64, -69 and –73.

COOK, D.: This proposal should be accepted. Rejecting this proposal sends a message to users of the NEC that it is acceptable to permit dust into equipment that is obviously ignition capable. If the panel believes the ANSI product standard for dusttight equipment is overly restrictive, we should work to amend the product standard rather than simply permitting the installation of equipment that can not meet the requirements of that standard. The current requirement places the responsibility of evaluating a motor enclosure on the designer, the installer and the AHJ. They are responsible for determining that the motor enclosure will be sufficiently tight to prevent the entrance of appreciable quantities of dust and to determine that the enclosure will prevent the escape of sparks, flame or burning material that might ignite dust accumulations or combustible material in the vicinity. As an AHJ that believes I am relatively competent, I am not sure that I can make that determination in the field.

LAWRENCE, JR., W.: The panel action should have been to "accept in principle". The panel confirmed that junction boxes must be dusttight, but did not confirm that motors are also required to be dusttight. This results in a situation where the terminal box for a motor is required to exclude the entry of dust, but the stator housing of the motor is not. There is a far greater likelihood of an ignition source being present in the stator housing than in the terminal compartment, so the panel's logic appears inverted. The panel's concerns with the prescriptive nature of the definition of "Dusttight" could have been addressed with a revision to that definition.

"Dusttight. Enclosures constructed to provide a degree of protection against the entrance of dust."

Comment on Affirmative:

NEAGLE, J.: The statement "The panel accepts the deletion of the existing exception and rejects the revisions to the current text of 502.125(B)." is incorrect and does not reflect the panel action to reject the proposal.

WECHSLER, D.: 1) The action by the Panel to "Reject" the proposal but accepts deletion of the existing exception does not make sense. The panel action should reflect a complete rejection of this proposal.

2) The panel should continue to reject this proposal. The installation defined under the current 502.125 (B) has existed for many years and no evidence has been provided to the Panel that this installation is unsafe. The current wording does not prohibit the use of dusttight enclosures. There is no technical substantiation to support any change.

14-66 Log #295 NEC-P14 **Final Action: Reject**
(502.128(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

(3) Be protected against ~~physical damage~~ <u>blows or abrasion</u> and against rusting or other corrosive influences.

Substantiation: The proposed rewording is an attempt at precision. Rusting and corrosion technically are physical damage. If you retain "damage," I could argue that the term "physical" should be eliminated.

Submitting proposals removing the adjective "physical" may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-67 Log #294 NEC-P14 **Final Action: Reject**
(502.130(A)(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

~~Physical~~ Damage. Each luminaire (fixture) shall be protected against ~~physical~~ damage by a ~~suitable~~ guard <u>acceptable to the Authority Having Jurisdiction</u> or by location.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. "Suitable" is not clean Code language, so unless someone has specs to suggest I propose substituting the AHJ, who has to be satisfied anyway.

Submitting proposals removing the adjective "physical" may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-68 Log #290 NEC-P14 **Final Action: Reject**
(502.130(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

~~Physical~~ Damage. A luminaire (fixture) that may be exposed to ~~physical~~ damage shall be protected by a suitable guard.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious given the context.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-69 Log #2498 NEC-P14 **Final Action: Accept**
(502.130(B)(2))

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Revise text to read as follows:

(B) Class II, Division 2. In Class II, Division 2 locations, luminaires (lighting fixtures) shall comply with 502.130(B)(1) through (B)(5).

(1) Portable Lighting Equipment. Portable lighting equipment shall be identified for Class II locations. They shall be clearly marked to indicate the maximum wattage of lamps for which they are designed.

(2) Fixed Lighting. Luminaires (lighting fixtures) for fixed lighting, where not of a type identified for Class II locations, shall <u>be</u> provide<u>d with dusttight</u> enclosures <u>.</u> ~~for lamps and lampholders that shall be designed to minimize the deposit of dust on lamps and to prevent the escape of sparks, burning material, or hot metal.~~ Each fixture shall be clearly marked to indicate the maximum wattage of the lamp that shall be permitted without exceeding an exposed surface temperature in accordance with 500.8(C)(2) under normal conditions of use.

Substantiation: 502.10(B)(4) requires all boxes and fittings in a Class II, Division 2 location to be dusttight. Luminaires should not be permitted to merely minimize dust entrance.

Panel Meeting Action: Accept

Panel Statement:

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

GOODMAN, M.: The submitter's substantiation is insufficient to warrant the extent of the changes proposed. The removal of the requirements for the minimization of the deposit of dust on lamps and the escape of sparks, burning material, or hot metal by simply adding "dusttight" minimizes the requirements and reduces safety for this equipment.

14-70 Log #293 NEC-P14 **Final Action: Reject**
(502.130(B)(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

~~Physical~~ Damage. Luminaires (lighting fixtures) for fixed lighting shall be protected against ~~physical~~ damage by ~~suitable~~ guards <u>acceptable to the Authority Having Jurisdiction</u> or by location.

Substantiation: Use of the word "physical" is superfluous– the purpose is obvious. "Suitable" is not clean Code language, so unless someone has specs to suggest I propose substituting the AHJ, who has to be satisfied anyway.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-71 Log #1250 NEC-P14 **Final Action: Reject**
(502.140(3))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise: Be connected to terminals or supply conductors in ~~an approved manner~~ accordance 110.14 except as provided in 502.145.

Substantiation: Edit. Proposal is more specific.

Panel Meeting Action: Reject

Panel Statement: The reference to 110.14 is not necessary because it is a general rule that applies throughout the Code and 502.145 is not applicable to this requirement.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: I agree with the submitter's substantiation that current text is not specific. The current text requires terminations of supply conductors of a flexible cord to be connected to terminals in an "approved manner". "Approved" is defined as acceptable to the authority having jurisdiction (AHJ). Nothing in the current text or in Chapter 5 of the NEC would provide a basis for the AHJ to accept anything other than a termination that complies with the requirements in 110.14 unless those terminations were permitted to be uninsulated by 502.25. The panel statement indicates the reference to 110.14 is not necessary because it is a general rule. The requirement for supply conductors to be connected to terminals in an approved manner is not necessary either since the general rule in 110.2 requires all conductors and equipment to be approved. I will offer the following alternate wording for public comment:

502.140(3) is connected to terminals in accordance with 110.14 and 502.25.

14-72 Log #2493 NEC-P14 **Final Action: Accept**
(502.150(A))

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Revise text to read as follows:

502.150 Signaling, Alarm, Remote-Control, and Communications Systems; and Meters, Instruments, and Relays.

FPN: See Article 800 for rules governing the installation of communications circuits.

(A) Class II, Division 1. In Class II, Division 1 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with 502.150(A)(1) through (A)(56).

~~**(1) Wiring Methods.** The wiring method shall comply with 502.100(A).~~

(1 ~~2~~) Contacts. Switches, circuit breakers, relays, contactors, fuses and current-breaking contacts for bells, horns, howlers, sirens, and other devices in which sparks or arcs maybe produced shall be provided with enclosures identified for a Class II location.

Exception: Where current-breaking contacts are immersed in oil or where the interruption of current occurs within a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.

(2 ~~3~~) Resistors and Similar Equipment. Resistors, transformers, choke coils, rectifiers, thermionic tubes, and other heat-generating equipment shall be provided with enclosures identified for Class II locations.

Exception: Where resistors or similar equipment are immersed in oil or enclosed in a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.

(3 ~~4~~) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with 502.125(A).

(4 ~~5~~) Combustible, Electrically Conductive Dusts. Where dusts are of a combustible, electrically conductive nature, all wiring and equipment shall be identified for Class II locations.

(56) Metal Dusts. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, all apparatus and equipment shall be identified for the specific conditions.

Substantiation: 502.150(A)(1) is redundant as it is already required by 502.10(A.)

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-73 Log #2503 NEC-P14 **Final Action: Accept**
(502.150(B))

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Revise text to read as follows:

(B) Class II, Division 2. In Class II, Division 2 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with 502.150(B)(1) through (B)(5).

(1) Contacts. Contacts shall be provided in dusttight ~~E~~ e nclosures . ~~shall comply with 502.150(A)(2), or contacts shall have tight metal enclosures designed to minimize the entrance of dust and shall have telescoping or tight-fitting covers and no openings through which, after installation, sparks or burning material might escape.~~

Exception: In nonincendive circuits, enclosures shall be permitted to be of the general-purpose type.

(2) Transformers and Similar Equipment. The windings and terminal connections of transformers, choke coils, and similar equipment shall be provided with dust tight ~~metal~~ enclosures . ~~without ventilating openings.~~

(3) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with 502.1 2 ~~3~~ 0(B ~~A~~)(3).

~~Exception: Enclosures for thermionic tubes, nonadjustable resistors, or rectifiers for which maximum operating temperature will not exceed 120°C (248°F) shall be permitted to be of the general-purpose type.~~

(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with 502.125(B).

(5) Wiring Methods. The wiring method shall comply with 502.10(B).

Substantiation: 502.10(B)(4) requires all boxes and fittings in a Class II, Division 2 location to be dusttight. Equipment covered by this section should be required to meet the same requirement.

Also, the reference to 502.130(A)(3) in 502.150(B)(3) should be 502.120(B)(3)

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

GOODMAN, M.: The submitter's substantiation is insufficient to warrant the extent of the changes proposed. The specific term of "dusttight" is not applicable to the enclosures for (2) Transformers and Similar Equipment and would, in essence, require that a new type of equipment be created and approved. There is no substantiation for the removal of the Exception to (3) Resistors and Similar Equipment which presently allows general purpose enclosure types under specific conditions.

14-74 Log #2505 NEC-P14 **Final Action: Accept**
(502.150(B)(5))

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Revise text to read as follows:

(B) Class II, Division 2. In Class II, Division 2 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with 502.150(B)(1) through (B)(4 ~~5~~).

(1) Contacts. Enclosures shall comply with 502.150(A)(2), or contacts shall have tight metal enclosures designed to minimize the entrance of dust and shall have telescoping or tight- fitting covers and no openings through which, after installation, sparks or burning material might escape.

Exception: In nonincendive circuits, enclosures shall be permitted to be of the general-purpose type.

(2) Transformers and Similar Equipment. The windings and terminal connections of transformers, choke coils, and similar equipment shall be provided with tight metal enclosures without ventilating openings.

(3) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with 502.130(A)(3).

Exception: Enclosures for thermionic tubes, nonadjustable resistors, or rectifiers for which maximum operating temperature will not exceed 120°C (248°F) shall be permitted to be of the general-purpose type.

(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with 502.125(B).

~~(5) Wiring Methods. The wiring method shall comply with 502.10(B).~~

Substantiation: 502.150(B)(5) is redundant as it is already required by 502.10(B)

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

ARTICLE 503 — CLASS III LOCATIONS

14-75 Log #3198 NEC-P14 **Final Action: Accept**
(503.5 and Exception)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Delete the first paragraph and the exception.
Substantiation: A review of 90.2 (A) and (B), the Article 100 definition of service point, the complete NEC text and specifically the text in Articles 225, and 230 leads one to believe that electrical wiring and equipment located on the load side of the service point is under the scope of the NEC. This FPN, which based on the text in 90.5(C) is not enforceable, provides no value to the NEC user.

If industry believes information in the NESC is necessary for installations on the load side of the service point, that information should included as requirements of the NEC, not as a FPN. As an FPN, it only adds to the confusion of designers, installers, and AHJ's working on installations working on premises wiring.

The FPN also appears to include a requirement, which is not permitted to be located in a FPN.
Panel Meeting Action: Accept
Panel Statement: The panel understands that the same substantiation provided with Proposal 14-24 was intended for this proposal.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-76 Log #2465 NEC-P14 **Final Action: Reject**
(503.10(A)(3))

Submitter: Eliana Beattie, ISA
Recommendation: 503.10 Wiring Methods.
Revise 503.10(A)(3) as follows:
(3) Nonincendive Field Wiring <u>& FNICO</u> . Nonincendive field wiring <u>and FNICO</u> shall be permitted using any of the wiring methods permitted for unclassified locations. Nonincendive field wiring <u>and FNICO</u> systems shall be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring <u>or FNICO</u> circuit, provided the simple apparatus does not interconnect the nonincendive field wiring <u>or FNICO</u> circuit to any other circuit.
Substantiation: The FISCO (**F** ieldbus **I** ntrinsically **S** afe **CO** ncept) and FNICO (**F** ieldbus **N** on **I** ncendive **CO** ncept) protection concepts take advantage of functional requirements of Fieldbus systems to significantly simplify i.s. installation. These requirements include wire type and quality, supply voltage and current levels, and limitation of stored energy at the terminals of field devices. The objective of these concepts is to simplify the i.s. installation to the point where a safe installation may be effected by simply selecting devices labeled as FISCO (or FNICO) and observing basic wiring type and length restrictions. The NRTL evaluation of all devices ensures that they will be compatible with all other similarly labeled devices without further analysis on the part of the installer.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel rejects the addition of "FNICO" because there are numerous nonincendive field wiring methods that are acceptable and the inclusion of the acronym in this section would imply that "FNICO" is the only method available. If "FNICO" wiring systems are installed in accordance with the control drawings, this practice would not be prohibited by the current requirements in the NEC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:

SCHNAARE, T.: Generally speaking, the code serves its primary users base best when it includes information about the various techniques that are allowed for installation. While I agree that the panel does not want to imply that FISCO and FNICO are the only techniques available, I also belive that the code is made stronger and easier to understand and apply when information such as this is included. If there are other deficiencies in the current code (as implied by the panel statement) then these should be addressed as well.

14-77 Log #292 NEC-P14 **Final Action: Reject**
(503.10(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

"...on condition that protection as required by 320.15(C) be provided where conductors are not run in roof spaces and are well out of reach of sources of ~~physical~~ damage."
Substantiation: Use of the word "physical" is superfluous– the purpose is obvious from the context.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-78 Log #920 NEC-P14 **Final Action: Reject**
(503.30)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence:

Such means of bonding shall apply to intervening raceways, <u>cables</u> , fittings, boxes, enclosures, and so forth between Class II locations and the point of grounding for service equipment <u>or building or structure disconnecting means</u> , or point of grounding of separately derived systems.
Substantiation: Edit. Cables permitted in these locations should be included. If the Class II location is in a building served by overhead conductors there will be space where there is no intervening equipment to be bonded. It doesn't seem necessary to bond on the line side of a building disconnecting means.
Panel Meeting Action: Reject
Panel Statement: The bonding of a cable wiring method to the boxes, enclosures or equipment occurs through the termination fitting. Fittings are currently included in the list of items required to meet this requirement. The building or structure disconnecting means may, or may not, include a point of grounding (see 250.32). The bonding requirements in this section apply to metal equipment. They apply within a single building or structure, or in installations that involve multiple buildings or structures. If the equipment or the wiring method is nonmetallic, there is nothing to bond. Wiring could include both metal and nonmetallic methods and the metal sections are required to meet the requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-79 Log #1454 NEC-P14 **Final Action: Reject**
(503.30)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:

503.30 Grounding and Bonding, Class III, Divisions 1 and 2.

Wiring and equipment in Class II, Division 1 and 2 locations shall be grounded <u>and bonded</u> as specified in Article 250 and with the requirements in 503.30(A) and 502.30(B).

(A) Bonding. <u>Bonding in class III locations shall comply with 250.100.</u> ~~The locknut bushing and double locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used.~~ Such means of bonding shall apply to all ~~intervening raceways, fittings, boxes, enclosures and so forth~~ <u>equipment</u> between Class III locations and the point of grounding for service equipment or point of grounding of a separately derived system.

Exception: The specific bonding means shall be required only to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), provided the branch-circuit ovecurrent protection is located on the load side of the disconnecting means.

(B) Types of Equipment Grounding Conductors. Remain unchanged.
Substantiation: This section is not written in language that is consistent with the rest of the code. For example, what is "so forth"? Also, there is no need to include the sentence that I propose to delete, when it is already found in 250.92, which hazardous (classified) locations are already required to comply with.

Companion proposals are being made to 501.30 and 503.30, for the purposes of correlation.
Panel Meeting Action: Reject
Panel Statement: Because the requirements for grounding and bonding equipment located in, and intervening into, hazardous locations are critical to safe installations, CMP-14 affirms that this requirement should be expressed explicitly in this section and a cross-reference to 250.100 does not improve usability.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-80 Log #2764 NEC-P14 **Final Action: Reject**
(503.30(A))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new last sentence to 503.30(A) to read as follows:
When a bonding jumper is used, it shall be sized in accordance with 250.102(D).
Substantiation: There is no clear statement specifying the minimum size required when a bonding jumper is used for bonding back to the service for a circuit serving a classified hazardous location.
Panel Meeting Action: Reject
Panel Statement: Since 90.3 states the general requirements apply unless modified by the special requirements in Chapters 5, 6, and 7, the requirements in 250.102(D) are applicable without reference. This section does not modify the sizing requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-81 Log #2405 NEC-P14 **Final Action: Reject**
(503.30(A) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
503.30 Grounding and Bonding. Class III, Divisions 1 and 2. Wiring and equipment in Class III, Division 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements in 503.30(A) and 503.30(B).
(A) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, and so forth, between Class III locations and the point of grounding for service equipment or point of grounding of a separately derived system.
~~Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), if the branch circuit overcurrent protection is located on the load side of the disconnecting means.~~
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Reject
Panel Statement: The panel rejects this proposal based on the fact that the sole substantiation is acceptance of a companion proposal by CMP-5. Without current knowledge of CMP-5's actions on these companion proposals, CMP-14 has no alternative other than to reject and await any necessary correlating action recommended by the TCC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: I agree with the change being proposed in Proposal 5-119. The use of an equipment grounding conductor in the feeder or branch circuit supplying a separate building should not be optional. The current rule is an exception to the general requirement found in 250.24(A)(5), stating that a "grounding connection shall not be made to the grounded conductor on the load side of the service disconnecting means." It took the code making process a long time to rectify the exception to the rule for ranges and clothes dryers. Proposal 14-43 would remove another unnecessary exception to the rule.
My vote to Reject proposal 14-43 concurs with the substantiation provided by Code-Making Panel 14. My vote, however, would be to Accept this proposal if Code-Making Panel 5 makes a wise decision and votes to Accept Proposal 5-119.

14-81a Log #CP1405 NEC-P14 **Final Action: Accept**
(503.30(B))

Submitter: Code-Making Panel 14,
Recommendation: Revise 503.30(B) to read:
Liquidtight flexible metal conduit shall not be used as the sole ground-fault current path. Where equipment bonding jumpers are installed, they shall comply with 250.102.
Retain the exisiting exception.
Substantiation: The revised wording clarifies the requirement and is parallel language to the same requirements in Articles 501, 502, 505 and 506.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-82 Log #291 NEC-P14 **Final Action: Reject**
(503.128(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
(3) Be protected against ~~physical damage~~ blows or abrasion and against rusting or other corrosive influences.
Substantiation: The proposed rewording is an attempt at precision. Rusting and corrosion technically are physical damage. If you retain "damage," I could argue that the term "physical" should be eliminated.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, a quarter- to half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?"
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-83 Log #1031 NEC-P14 **Final Action: Reject**
(503.130(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
A luminaire (fixture) ~~that may be~~ is exposed to physical damage shall be protected by a suitable guard.
Substantiation: Edit. "may be" is "iffy" and encompasses conditions that may prevail in the future. Proposal allows assessment to be made with prevailing conditions, including location.
Panel Meeting Action: Reject
Panel Statement: The current text covers luminaires that are subject to damage on an intermittent basis or due to different conditions. A change to "is" would require the damage to be present continuously for the protection to be required. The position of CMP-14 is that suitable guards are required for luminaires that may be exposed to physical damage.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-84 Log #1249 NEC-P14 **Final Action: Reject**
(503.140(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise: Be connected to terminals or supply conductors in ~~an approved manner~~ accordance 110.14 except as provided in 503.145.
Substantiation: Edit. Proposal is more specific.
Panel Meeting Action: Reject
Panel Statement: The reference to 110.14 is not necessary because it is a general rule that applies throughout the Code and 503.145 is not applicable to this requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: I agree with the submitter's substantiation that current text is not specific. The current text requires terminations of supply conductors of a flexible cord to be connected to terminals in an "approved manner". "Approved" is defined as acceptable to the authority having jurisdiction (AHJ). Nothing in the current text or in Chapter 5 of the NEC would provide a basis for the AHJ to accept anything other than a termination that complies with the requirements in 110.14 unless those terminations were permitted to be uninsulated by 503.25. The panel statement indicates the reference to 110.14 is not necessary because it is a general rule. The requirement for supply conductors to be connected to terminals in an approved manner is not necessary either since the general rule in 110.2 requires all conductors and equipment to be approved. I will offer the following alternate wording for public comment:
503.140(3) is connected to terminals in accordance with 110.14 and 503.25.

ARTICLE 504 — INTRINSICALLY SAFE SYSTEMS

14-85 Log #2445 NEC-P14 **Final Action: Accept**
(504.1)

Submitter: Eliana Beattie, ISA
Recommendation: 504.1 - FPN
Change ANSI/ISA RP 12.06.01-2002 to ANSI/ISA-RP12.06.01-2003
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-86 Log #2457 NEC-P14 **Final Action: Accept**
(504.2.Simple Apparatus)

TCC Action: The Technical Correlating Committee directs the panel to reconsider the proposal and revise the Fine Print Note so that it does not contain mandatory text. This action will be considered by the Panel as a Public Comment.
Submitter: Eliana Beattie, ISA
Recommendation: Modify text as follows:
Simple Apparatus. An electrical component or combination of components of simple construction with well-defined electrical parameters that does not generate more than 1.5 volts, 100 milliamps, and 25 milliwatts, or a passive component that does not dissipate more than 1.3 watts and is compatible with the intrinsic safety of the circuit in which it is used.
FPN: The following apparatus are examples of simple apparatus:
(a) Passive components, for example, switches, junction boxes, resistance temperature devices, and simple semiconductor devices such as LEDs
(b) sources of stored energy consisting of single components in simple circuits with well-defined parameters, for example, capacitors or inductors, whose values are be considered when determining the overall safety of the system;
(c) Sources of generated energy, for example, thermocouples and photocells, which do not generate more than 1.5 V, 100 mA, and 25 mW.
Substantiation: The addition of item c) is to permit the user to install items such as filter capacitors without having to submit the system to an NRTL for re-listing as was originally intended by the intrinsic safety standards. Aligns simple apparatus with the definition used in the international arena.
Panel Meeting Action: Accept
Panel Statement: The panel notes that the word “to” after “are” and before “be” is needed.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: In the 1996 NEC, CMP-14 first defined a SIMPLE APPARATUS as a device that will neither generate nor store more than 1.2 volts,.1 ampere, 25 milliwatts or 20 microjoules. At the same time CMP-14 determined that this SIMPLE APPARATUS as defined on a control drawing shall not be required to be approved. Since NEC 110.2 requires all equipment to be approved, I am not sure if SIMPLE APPARATUS were outside the scope of the NEC at that time? A FPN was included with examples of SIMPLE APPARATUS.
In the 2002 NEC, CMP-14 expanded the definition of SIMPLE APPARATUS to: an electrical component or combination of components of simple construction with well defined electrical parameters that does not generate more than 1.5 volts, 100 milliamps, and 25 milliwatts, or a passive component that does not dissipate more than 1.3 watts and is compatible with the intrinsically safety of the circuit in which it is used. CMP-14 also determined at that time that this SIMPLE APPARATUS shall not be required to be listed. I must assume that since the devices shall not be listed, that CMP-14 assumes that installers and AHJ’s all have metering equipment in the field which they can evaluate these products to determine they are within these well defined parameters. A second part was added to the FPN to provide additional examples of qualifying devices.
The proposed text in this proposal is included to permit users to install additional SIMPLE APPARATUS without additional evaluation of certification agencies. The additional text, which the substantiation indicates will accomplish this goal, is being added to a FPN. While I trust that CMP-14 would not include text that would compromise the safety of an installation, I am not certain how a requirement can be expanded by adding text to a FPN. NEC 90.5(C) indicates that a FPN is informational only and not enforceable.

14-87 Log #2973 NEC-P14 **Final Action: Accept in Principle**
(504.10(B), FPN (New))

Submitter: Nicholas P. Ludlam, FM Approvals
Recommendation: Add text to read as follows:
Associated apparatus shall be permitted to be installed in any hazardous (classified) location for which it has been identified or, if protected by other means, permitted by Articles 501 through 503 and Article 505.
FPN: Associated intrinsically safe apparatus with a marked Um of less than 250V may require additional over-voltage protection at the inputs to limit any possible fault voltages to less than the Um marked on the product.
Simple apparatus shall be permitted to be installed in any hazardous (classified) location in which the maximum surface temperature of the simple apparatus does not exceed the ignition temperature of the flammable gases or vapors, flammable liquids, combustible dusts, or ignitible fibers or flyings present.
Substantiation: Changes in the intrinsically safe product standards have led to the removal of the requirement for the Um to be at least 250V. The added FPN is intended to draw attention to users of this fact.
Panel Meeting Action: Accept in Principle
The panel accepts the recommended text as a new fine print note #2 to 504.10(A) with the following revision:
FPN: Associated ~~intrinsically safe~~ apparatus with a marked Um of less than 250V may require additional over-voltage protection at the inputs to limit any possible fault voltages to less than the Um marked on the product.
Panel Statement: The panel has deleted “intrinsically safe” to align with the defined term and believes the information should be associated with 504.10(A).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: While I do not disagree with the technical accuracy of the added FPN, it would seem that this information would be included in the Control Drawings and probably considered in the product evaluation rather than a field installation issue.

14-88 Log #2466 NEC-P14 **Final Action: Accept in Part**
(504.20)

Submitter: Eliana Beattie, ISA
Recommendation: 504.20 Wiring Methods.
Revise as indicated:
Any of the wiring methods suitable for unclassified locations, including Chapter 7 and Chapter 8, shall be permitted for installing intrinsically safe apparatus and FISCO apparatus. ~~Intrinsically safe apparatus and wiring shall be permitted to be installed using any of the wiring methods suitable for unclassified locations, including Chapter 7 and Chapter 8.~~ Sealing shall be as provided in 504.70, and separation shall be as provided in 504.30.
Substantiation: The FISCO (**F** ieldbus **I** ntrinsically **S** afe **CO** ncept) and FNICO (**F** ieldbus **N** on **I** ncendive **CO** ncept) protection concepts take advantage of functional requirements of Fieldbus systems to significantly simplify i.s. installation. These requirements include wire type and quality, supply voltage and current levels, and limitation of stored energy at the terminals of field devices. The objective of these concepts is to simplify the i.s. installation to the point where a safe installation may be effected by simply selecting devices labeled as FISCO (or FNICO) and observing basic wiring type and length restrictions. The NRTL evaluation of all devices ensures that they will be compatible with all other similarly labeled devices without further analysis on the part of the installer.
Panel Meeting Action: Accept in Part
The panel accepts the revised wording of this section but rejects the inclusion of “and FISCO apparatus.”
Panel Statement: The panel rejects the addition of “FISCO” because there are numerous intinsically safe field wiring methods that are acceptable and the inclusion of the acronym in this section would imply that “FISCO” is the only method available. If “FISCO” wiring systems are installed in accordance with the control drawings, this practice would not be prohibited by the present NEC. The panel concurs that the revised wording is grammatically correct and accepts only that part of the recommendation.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
SCHNAARE, T.: Generally speaking, the code serves its primary users base best when it includes information about the various techniques that are allowed for installation. While I agree that the panel does not want to imply that FISCO and FNICO are the only techniques available, I also belive that the code is made stronger and easier to understand and apply when information such as this is included. If there are other deficiencies in the current code (as implied by the panel statement) then these should be addressed as well.

14-88a Log #CP1407 NEC-P14 **Final Action: Accept**
(504.30(A)(1) Exception No. 3 (New))

TCC Action: The Technical Correlating Committee directs the panel to reconsider the proposal relative to the comments expressed in the voting that the Exception, as worded, covers requirements outside the Scope of Article 504. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 14,
Recommendation: Add a new Exception No. 3 to read:
Exception No. 3 : Where equipment in a Division 2 or Zone 2 location is supplied by intrinsically safe circuits or nonincendive field wiring circuits, the circuit conductors shall be permitted to be installed in the same raceway, cable tray or cable in accordance with 504.30(B).

Substantiation: The current wording of the code prevents a user from utilizing nonincendive field wiring in a retrofitted/reclassified plant. In a situation where a user initially classified a location as Division 1 and installed intrinsically safe systems, but where it has now been reclassified as a Division 2 or Zone 2, nonincendive field wiring could only be used if the whole cable was replaced to separate intrinsically safe circuits and nonincendive field wiring circuits. Circuits that were previously acceptable for Division 1 would now be unacceptable for Division 2 or Zone 2 even though the voltage/current combination in the individual cables is non-ignition capable.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 2
Explanation of Negative:
BRIESCH, E.: The Panel Action should be Accept in Part. Article 504 does not cover nonincendive field wiring circuits. The action should be to accept all the text except the words "or nonincendive field wiring circuits".
COOK, D.: This proposal seems to permit a compromise of the separation requirements for IS wiring based on reclassification of an area and the chance that part of the circuit is now located in an area that is Division 2. This exception to the separation could allow a compromise the intrinsic safety of a circuit that is still supplying devices located in Division 1 areas and depend on the intrinsic safety of the circuit to provide protection.
Comment on Affirmative:
LAWRENCE, JR., W.: The proposed Exception No. 3 is not clearly worded. Revised text for Exception 3 is proposed.
Also, the panel action does not fully address the situation of the mixing of circuits. Where an intrinsically safe circuit passes through a Division 2 location in a cable or raceway also containing nonincendive field wiring circuits, but is connected to apparatus in a Division 1 location, separation requirements are also needed. An additional Exception 4 is proposed to address this.
" Exception No. 3 : Intrinsically safe circuits in a Division 2 or Zone 2 location shall be permitted to be installed in a raceway, cable tray or cable along with nonincendive field wiring circuits when installed in accordance with 504.30(B)."
" Exception No. 4: Intrinsically safe circuits passing through a Division 2 or Zone 2 location to supply apparatus which is located in a Division 1, Zone 0, or Zone 1 location, shall be permitted to be installed in a raceway, cable tray or cable along with nonincendive field wiring circuits when installed in accordance with 504.30(B)."
SCHNAARE, T.: The proposed Exception no. 3 should be rewritten as follows to more accurately reflect the intent of the panel.
Exception No. 3: Intrinsically safe circuits located in Division 2 or Zone 2 supplying apparatus located in a Division 2 or Zone 2 location shall be permitted to be installed in a raceway, cable tray or cable along with nonincendive field wiring circuits when installed in accorance with 504.30(B).

14-89 Log #2975 NEC-P14 **Final Action: Accept**
(504.30(A)(2))

TCC Action: The Technical Correlating Committee directs the panel to reconsider the proposal and revise both the new FPN to (1) and the existing FPN No. 1 to item (5) to comply with the NEC Style Manual. Both FPNs contain recommendations and interpretations in the form of a "preferred method" and the text "generally considered acceptable". FPNs shall only contain explanatory information. This action will be considered by the panel as a public comment.
Submitter: Nicholas P. Ludlam, FM Approvals
Recommendation: Revise text to read as follows:
(2) Within Enclosures.
~~(1)~~ Conductors of intrinsically safe circuits shall be separated from conductors of nonintrinsically safe circuits by one of the following means:
(1) ~~Separated~~ Separation by at least 50 mm (2 in.) from conductors of any nonintrinsically safe circuits ~~or as specified in 504.30(A)(2).~~
(2) Separation from conductors of nonintrinsically safe circuits by use of a grounded metal partition.
FPN: 20 gauge sheet metal partitions 0.91 mm (0.0359 in.) or thicker are generally considered acceptable.
(3) Separation from conductors of nonintrinsically safe circuits by use of an approved insulating partition.
(4) Where either (1) all of the intrinsically safe circuit conductors or (2) all of the nonintrinsically safe circuit conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.
FPN: Cables meeting the requirements of Articles 330 and 332 are typical of those considered acceptable.
~~(2)~~ (5) All conductors shall be secured so that any conductor that might come loose from a terminal cannot come in contact with another terminal.
FPN No. 1: The use of separate wiring compartments for the intrinsically safe and nonintrinsically safe terminals is the preferred method of complying with this requirement.
FPN No. 2: Physical barriers such as grounded metal partitions or approved insulating partitions or approved restricted access wiring ducts separated from other such ducts by at least 19 mm (3/4 in.) can be used to help ensure the required separation of the wiring.
Substantiation: Rearrangement of the existing requirements for clarity and to remove the circular reference in the published NEC for 504.30(A)(2).
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-90 Log #238 NEC-P14 **Final Action: Reject**
(504.30(A)(2), FPN 2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
" ~~Physical b~~ B arriers such as...".
Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-91 Log #518 NEC-P14 **Final Action: Accept**
(504.50, FPN)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
FPN: In addition to an equipment grounding conductor connection, a connection to a ~~Supplementary bonding to the~~ grounding electrode may be needed for some associated apparatus, for example, zener diode barriers, if specified in the control drawing. See ANSI/ISA RP 12.06.01-2002, Wiring Methods for Hazardous (Classified) Locations Instrumentation Part 1: Intrinsic Safety.
Substantiation: Supplementary bonding is not a term that is defined in the NEC. This revision is an effort to more clearly indicate what may be required in addition to the equipment grounding conductor of the branch circuit that supplies this equipment. Supplementary grounding electrodes are addressed in 250.54, but generally if a connection to a grounding electrode is required by the control drawing, it is required to be one of those as specified in 504.50(B). These are usually not supplementary electrodes. This proposed revision is intended to provide additional clarity in the FPN.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-92 Log #2444 NEC-P14 **Final Action: Accept**
(504.50(A))

Submitter: Eliana Beattie, ISA
Recommendation: 504.50(A) - FPN
Change ANSI/ISA RP 12.06.01-2002 to ANSI/ISA-RP12.06.01-2003
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-93 Log #623 NEC-P14 **Final Action: Accept in Principle**
(504.50(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(B) Connection to Grounding Electrodes. Where connection to a grounding electrode is required, the grounding electrode shall be as specified in 250.52(A)(1), (A)(2), (A)(3), and (A)(4) and shall comply with 250.30(A)(7). 250.52(A)(5), (A)(6), and (A)(7) shall not be used if any of the electrodes specified in 250.52(A)(1), (A)(2), (A)(3), or (A)(4) are present for use ~~available~~ .

Substantiation: The word “available” is identified by the NEC Style Manual as a word to avoid in Code rules. It is vague and unenforceable. This proposed revision is an effort to provide a correlation with the language in 250.50. Similar revisions were made to 250.50 during the 2005 NEC development process to replace the word “available” with the concept of the electrodes being used where present. This revision should provide improved consistency.
Panel Meeting Action: Accept in Principle
Revise the recommended text as follows: (B) Connection to Grounding Electrodes. Where connection to a grounding electrode is required, the grounding electrode shall be as specified in 250.52(A)(1), (A)(2), (A)(3), and (A)(4) and shall comply with 250.30(A)(7). Section 250.52(A)(5), (A)(6), and (A)(7) shall not be used if any of the electrodes specified in 250.52(A)(1), (A)(2), (A)(3), or (A)(4) are present ~~for use available.~~
Panel Statement: The words “for use” were removed because “are present” clearly describes the requirement and aligns with 250.50. The panel notes that the word “Section” needs to be inserted at the beginning of the second sentence in the recommendation.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: This proposal should be accepted as submitted. By changing “present for use” to “present”, concrete encased electrodes would be required to be exposed in retrofit applications. By using “present for use” the concrete encased electrode would only be required to be connected in applications where it is present for use.

14-94 Log #2576 NEC-P14 **Final Action: Accept**
(504.60(B))

Submitter: Nicholas P. Ludlam, FM Approvals
Recommendation: Revise text to read as follows:
(B) Unclassified. In unclassified ~~or nonhazardous~~ locations, where metal raceways are used for intrinsically safe system wiring in hazardous (classified) locations, associated apparatus shall be bonded in accordance with 501.30(A), 502.30(A), 503.30(A), or 505.25, as applicable.
Substantiation: The term nonhazardous was replaced by unclassified in the rest of the Code, but was left here.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-95 Log #2765 NEC-P14 **Final Action: Accept**
(504.60(B))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add 506.25 to the list at the end of the paragraph as follows:
(B) Unclassified. In unclassified or nonhazardous locations, where metal raceways are used for intrinsically safe system wiring in hazardous (classified) locations, associated apparatus shall be bonded in accordance with 501.30(A), 502.30(A), 503.30(A), ~~or~~ 505.25, or 506.25, as applicable.
Substantiation: The same bonding requirement should apply to Zone 20, 21, and 22 locations.
Panel Meeting Action: Accept
Panel Statement: The panel notes the recommended action is only to add the reference to 506.25.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-97 Log #2504 NEC-P14 **Final Action: Accept in Principle**
(504.70)

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
504.70 Sealing. Conduits and cables that are required to be sealed by 501.15, 502.15, and 505.16 shall be sealed to minimize the passage of gases, vapors, or dusts. Such seals shall not be required to be explosionproof or flameproof but shall be identified for the purpose of minimizing passage of gases under normal operating conditions and shall be accessible.
Exception: Seals shall not be required for enclosures that contain only intrinsically safe apparatus, except as required by 501.15(F)(3).
Substantiation: Current text is not consistent with the same sealing requirement found in 501.15(B)(2) which addresses the same issue.
Panel Meeting Action: Accept in Principle
Revise the recommended text to include a reference to 506.16 and by adding “vapors or dusts” in the second sentence. With this action the section reads:
504.70 Sealing. Conduits and cables that are required to be sealed by 501.15, 502.15, ~~and~~ 505.16 , and 506.16 shall be sealed to minimize the passage of gases, vapors, or dusts. Such seals shall not be required to be explosionproof or flameproof but shall be identified for the purpose of minimizing passage of gases, vapors, or dusts under normal operating conditions and shall be accessible.
Exception: Seals shall not be required for enclosures that contain only intrinsically safe apparatus, except as required by 501.15(F)(3).
Panel Statement: The panel has added the reference to 506.16 to include the sealing requirements from that article and has added “vapors or dusts” in the second sentence to align with the requirement expressed in the first sentence.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-98 Log #90 NEC-P14 **Final Action: Reject**
(504.70 Exception)

Submitter: David Bredhold, Eaton Corp./Cutler-Hammer Products
Recommendation: Delete the following:
~~Exception: Seals shall not be required for enclosures that contain only intrinsicaly safe apparatus, except as required by 501.15(F)(3).~~
Substantiation: Quoting from NEC 2005, Section 501.15 Sealing and Drainage. FPN No. 1: “Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit.”
An enclosure containing intrinsically safe apparatus can allow the intrusion of hazardous gases and vapors as well as can any other enclosure. The conduit connecting that enclosure to a safe area can allow the passage of the gases or vapors to the safe area where they could be ignited by arc- or spark-producing components. The flame front could then pass back through the conduit to the hazardous area igniting the atmosphere.
Panel Meeting Action: Reject
Panel Statement: The concern expressed in the substantiation is already addressed by the requirements in 501.15(A)(4) and 505.16(A)(1). In addition, it is necessary to retain the reference to the process seal required by 501.15(F)(3).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 505 — CLASS I, ZONE 0, 1 AND 2 LOCATIONS

14-99 Log #3136 NEC-P14 **Final Action: Reject**
(505)

Submitter: Eric Stromberg, Stromberg Engineering, Inc.
Recommendation: Delete “Class I” throughout article 505.
Substantiation: Zone 0, Zone 1, and Zone 2 are already defined as liquid or gas, thereby making the “Class I” designation redundant. Article 506 is titled “Zone 20, 21, and 22 Locations for Combustible Dusts, Fibers, and Flyings.” Deleting “Class I” from article 505 would bring it in alignment with both IEC standards and with article 506.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided specific guidance on where to remove “Class I” in Article 505. There is concern on the part of CMP-14 that a global removal of “Class I” is not necessarily the right approach and may result in confusion to the user.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-100 Log #3524 NEC-P14 **Final Action: Accept in Principle**
(505.2)

Submitter: Sandra McCloskey, Newark, DE
Recommendation: Revise as follows:
Purged and Pressurized. ~~Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.~~ The process of (1) purging, supplying an enclosure with a protective gas at a sufficient flow and positive pressure to reduce the concentration of the flammable gas or vapor initially present to an acceptable level; and (2) pressurization, supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of a flammable gas or vapor, a combustible dust, or an ignitable fiber. [2005 NFPA 70, 500.2]
Substantiation: As currently written, the definition of pressurized is provided without defining purged.
Panel Meeting Action: Accept in Principle
The panel accepts the recommendation in principle with the following revisions:
1) Revise the exisiting 505.2 definition to read:
Pressurization “p”. Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.
2) Delete the existing FPN No. 1
3) Revise the second fine print note to read:
FPN: See ANSI/ISA 60079-2 (12.04.01)-2004 Electrical Apparatus for Explosive Gas Atmospheres -Part 2 Pressurized Enclosures “p” and IEC 60079-13-1982, Electrical Apparatus for Explosive Gas Atmospheres — Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization.

Panel Statement: The panel has addressed the concern of the submitter by revising the title of this section. Pressurization "p" always requires pressurizing, but does not require purging under all circumstances. The requirements in Article 500 are more comprehensive in scope and are different from those in Article 505.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14
Comment on Affirmative:
COOK, D.: I agree with all of the panel action except the inclusion of the reference to IEC 60079-13-1982. That is not an ANSI Standard. It was not developed through a consensus process. I have not seen the document.

14-101 Log #211 NEC-P14 **Final Action: Accept in Principle**
(505.2. Encapsulation "m")

NOTE: The following proposal consists of Comment 14-70 on Proposal 14-73 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 14-73 was:

Revise text as follows:

505.2 Definitions. For purposes of this article, the following definitions apply.

Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments.

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with, an electrical installation.

FPN: Portable or transportable equipment having self-contained power supplies, such as battery-operated equipment, could potentially become an ignition source in hazardous (classified) locations.

Encapsulation "m". Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

FPN: See ISA 12.23.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection - Encapsulation "m";* IEC 60079-18-1992, *Electrical Apparatus for Explosive Gas Atmospheres - Part 18: Encapsulation "m";* and ANSI/UL 2279-1997 (Part 18), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* <u>ANSI/UL 60079-18, *Electrical apparatus for explosive gas atmospheres - Part 18: Encapsulation "m".*</u>

Flameproof "d". Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition through any joints or structural openings in the enclosure, of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed.

FPN: See ISA 12.22.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection - Flameproof "d";* IEC 60079-1-2000, *Electrical Apparatus for Explosive Gas Atmospheres, Part 1 - Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus;* ANSI/UL 2279-1997, (Part 1), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* <u>ANSI/UL 60079-1, *Electrical apparatus for explosive gas atmospheres - Part 1: Flameproof enclosures "d".*</u>

Increased Safety "e". Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.

FPN: See ISA - 12.16.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection - Increased Safety "e",* IEC 60079-7-1990, *Electrical Apparatus for Explosive Gas Atmospheres, Part 7: - Increased Safety "e",* Amendment No. 1 (1991) and Amendment No. 2 (1993); and ANSI/UL 2279-1997 (Part 7), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* <u>ANSI/UL 60079-7, *Electrical apparatus for explosive gas atmospheres - Part 7: Increased Safety "e".*</u>

Intrinsic Safety "i". Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.

FPN No. 1: See ANSI/UL 913-1997, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations;* ISA- 12.02.01-1999, *Electrical Apparatus for Use in Class I, Zones 0, 1 and 2 Hazardous (Classified) Locations - Intrinsic Safety "i";* IEC 60079-11-1999, *Electrical Apparatus for Explosive Gas Atmospheres - Part II; Intrinsic Safety "i"'* and ANSI/UL 2279-1997 (Part II). *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* <u>ANSI/UL 60079-11, *Electrical apparatus for explosive gas atmospheres - Part II: Intrinsic safety "i".*</u>

FPN No. 2: Intrinsic safety is designated type of protection "ia" for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" for use in Zone 1 locations.

FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe apparatus ("ia" or "ib," respectively) but is located outside the hazardous (classified) locations unless also protected by another type of protection (such as flameproof).

Oil Immersion "o". Type of protection where electrical equipment is immersed in a protective liquid in such as way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: See ISA 12.26.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection - Oil-Immersion "o";* IEC 60079-6-1995, *Electrical Apparatus for Explosive Gas Atmospheres, Part 6 - Oil-Immersion "o";* and ANSI/UL 2279-1997 (Part 6), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* <u>ANSI/UL 60079-6, *Electrical apparatus for explosive gas atmospheres - Part 6: Oil-immersion "o".*</u>

Powder Filling "q". Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.

FPN: See ISA-12.25.01-1996, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Powder Filling "q";* IEC 60079-5-1996, *Electrical Apparatus for Explosive Gas Atmospheres - Part 5: Powder Filling, Type of Protection "q";* and ANSI/UL 2279-1997 (Part 5), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* <u>ANSI/UL 60079-5, *Electrical apparatus for explosive gas atmospheres - Part 5: Powder filling "q".*</u>

Purged and Pressurized. Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.

FPN No. 1: See NFPA 496-1998, *Standard for Purged and Pressurized Enclosures for Electrical Equipment.*

FPN No. 2: See IEC 60079-2-2000, *Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p";* and IEC 60079-13-1982, *Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization.*

Type of Protection "n". Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

FPN: See IEC 60079-15-2000, *Electrical Apparatus for Explosive Gas Atmospheres, Part 15 - Electrical Apparatus with Type of Protection "n";* and ANSI/UL 2279-1997 (Part 15), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* <u>ANSI/UL 60079-15, *Electrical apparatus for explosive gas atmospheres- Part 15: Type of protection "n".*</u>

Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2: Class I, Zone 0; Class I, Zone 1; Class 1, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.

Submitter: Jeremy Neagle, Intertek ETL SEMKO
Recommendation: Revise text as follows:

Encapsulation "m". Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

FPN <u>No. 1:</u> See ANSI/ISA 12.23.01-2002, Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection - Encapsulation "m", IEC 60079-18-1992, Electrical Apparatus for Explosive Gas Atmospheres - Part 18: Encapsulation "m"; and ANSI/UL 60079-18, Electrical apparatus for explosive gas atmospheres - Part 18: Encapsulation "m".

<u>FPN No. 2: Type of protection "m" may be further subdivided into ma or mb.</u>

Substantiation: Standards are currently in preparation which include two levels of protection, 'ma' and 'mb' which are suitable for Zone 0 and Zone 1 locations respectively. IEC 60079-18, 2nd edition is in the final stages of publication, and adoption of this standard as ISA 12.23.01, 2nd edition is currently in process with publication expected in 2005. The necessary measures are not yet in place to allow for use of 'ma' in Zone 0 locations. However, it provides a greater level of safety than the current practice, while 'mb' provides an equivalent level of safety as the current practice. Adding this FPN clarifies the fact that both levels of protection 'ma' and 'mb' are both suitable for use in Class I Zone 1 locations. US standards will likely be published, and listed equipment available throughout the life span of this code edition, this FPN clarifies that apparatus marked 'm' as required, which is additionally marked to indicate level of protection 'a' or 'b' is still suitable for use in Class I, Zone 1 locations.

Panel Meeting Action: Accept in Principle

Revise the text of the recommended fine print note #2 to read:

FPN No. 2: Encapsulation is designated type of protection "ma" for use in Zone 0 locations. Encapsulation is designated type of protection "m" or "mb" for use in Zone 1 locations.

Panel Statement: The revision of the new fine print note correlates with the action taken on Proposal 14-116.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-102 Log #2443 NEC-P14 **Final Action: Accept in Principle**
(505.2.Various)

Submitter: Eliana Beattie, ISA
Recommendation: 505.2 - Encapsulation - FPN
Change ANSI/ISA 12.23.01-2002 to ANSI/ISA-60079-18 (12.23.01)-2005
505.2 - Flameproof - FPN
Change ANSI/ISA 12.22.01-2002 to ANSI/ISA-60079-1 (12.22.01)-2005
505.2 - Increased Safety - FPN
Change ANSI/ISA 12.16.01-2002 to ANSI/ISA-60079-7 (12.16.01)-2002
505.2 - Intrinsic Safety - FPN 1
Change ISA 12.02.01-1999 to ANSI/ISA-60079-11 (12.02.01)-2002
505.2 - Oil Immersion - FPN
Change ISA 12.26.01-1998 to ANSI/ISA-60079-6 (12.26.01)-1998
505.2 - Powder Filling - FPN
Change ANSI/ISA 12.25.01-2002 to ANSI/ISA-60079-5 (12.25.01)-1998
505-2 - Type of Protection n - FPN
Change ANSI/ISA 12.25.02-2003 to ANSI/ISA-60079-15 (12.12.02)-2003
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept in Principle
Revise the recommended text (last referenced standard) to read:
ANSI/ISA 12.12.02-2003 to ANSI/ISA-60079-15 (12.12.02)-2003
Panel Statement: The panel action corrects the number of the referenced standard.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-103 Log #2460 NEC-P14 **Final Action: Reject**
(505.2.Various)

Submitter: Eliana Beattie, ISA
Recommendation: Modify text as follows:
Type of Protection "n." Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.
FPN: See ANSI/UL 60079-15-2002, Electrical apparatus for explosive gas atmospheres — Part 15: Type of protection "n"; and ANSI/ISA -60079-15 (12.12.02)-2003, Electrical apparatus for use in Class I, Zone 2 Hazardous (Classified) Locations: Type of protection "n."
Type of protection "n" is further subdivided as follows:
non-sparking "nA"
equipment constructed to minimize the risk of occurrence of arcs or sparks capable of creating an ignition hazard during conditions of normal operation.
encapsulated "nC"
equipment, which may or may not contain voids, which is so constructed that it is totally immersed in an encapsulating compound so that it is sealed to prevent entry of an external atmosphere.
enclosed-break "nC"
equipment incorporating electrical contacts that are made and broken and that will withstand an internal explosion of the flammable gas or vapor which may enter it without suffering damage and without communicating the internal explosion to the external flammable gas or vapor.
hermetically-sealed "nC"
equipment which is so constructed that the external atmosphere cannot gain access to the interior and in which the seal is made by fusion, for example, by soldering, brazing, welding or the fusion of glass to metal.
non-incendive component "nC"
components having contacts for making or breaking a specified ignition capable circuit but in which the contacting mechanism is constructed so that the component is not capable of causing ignition of the specified explosive gas atmosphere.
FPN The enclosure of the non-incendive component is not intended to either exclude the explosive gas atmosphere or contain an explosion.
sealed "nC"
equipment which is so constructed that it cannot be opened during normal service and is sealed effectively to prevent entry of an external atmosphere.
energy-limited apparatus "nL"
electrical apparatus in which the circuits and components are constructed according to the concept of energy limitation
FPN: energy-limited apparatus "nL" may sometimes be referred to as intrinsically safe apparatus level of protection "ic".
associated energy-limited apparatus "[nL]" or "[AEx nL]"
electrical apparatus which contains both energy-limited and non-energy-limited circuits and is constructed so that the non-energy-limited circuits cannot adversely affect the energy-limited circuits. Associated energy-limited apparatus may be either:
a) electrical apparatus which has an alternative method of protection included in this standard for use in the appropriate explosive gas atmosphere [nL];
b) electrical apparatus which has an alternative type of protection listed in 505.8 for use in the appropriate explosive gas atmosphere [nL];
c) electrical apparatus not so protected and which therefore shall not be used within an explosive gas atmosphere, for example, a recorder which is not of itself in an explosive gas atmosphere but is connected to a thermocouple situated within an explosive gas atmosphere where only the recorder input circuit is energy-limited [AEx nL].
self protected energy-limited apparatus "nA nL"
apparatus which contains energy-limited sparking contacts, the circuits supplying energy-limited power to these contacts, as well as the non-energy limited source of supply to the circuit.
restricted-breathing enclosure "nR"
enclosure that is designed to restrict the entry of gases, vapors and mists.

Substantiation: Type of protection "n" is subdivided into a number of categories which are determined by the method of protection of the electrical apparatus. This is only partially covered by Table 505.9(C)(2)(4) – Types of protection designation, and complicated in the product standard by the use of two terms for one of the concepts, self-protected energy-limited apparatus.
Panel Meeting Action: Reject
Panel Statement: The standard covering the protection technique specified in the recommendation is not currently published.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-104 Log #1136 NEC-P14 **Final Action: Reject**
(505.3)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "rules" to "provisions" or alternatively, delete this section.
Substantiation: Edit. Some code provisions are not requirements. Per 90.5(B) some rules are permissive. 430.5 uses the term "applicable provisions". This section is already covered by 90.3.
Panel Meeting Action: Reject
Panel Statement: Section 90.5 covers the use of the term "rules" in regard to mandatory and permissive requirements in this Code.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-105 Log #2442 NEC-P14 **Final Action: Accept**
(505.4(A))

Submitter: Eliana Beattie, ISA
Recommendation: 505.4(A) - FPN
Change ISA-RP12.24.01-1998 to ANSI/ISA-TR12.24.01-1998 (IEC 60079-10 Mod)
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-106 Log #2454 NEC-P14 **Final Action: Reject**
(505.4(A) & 505.9(C)(2))

Submitter: Eliana Beattie, ISA
Recommendation: 1) Revise 505.4(A) with the underlined as follows:
505.4 General.
(A) Documentation for Industrial Occupancies.
(1) Area Classification. All areas in industrial occupancies designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.
FPN: For examples of area classification drawings, see ANSI/API RP 505-1997, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2; ANSI/ ISA -TR ~~RP~~ 12.24.01-1998 (IEC 60079-10 Mod) , Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2; IEC 60079-10-1995, Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.
(2) Certificate of Conformity. The documentation for electrical equipment marked in accordance with 505.9(C)(2) shall be permitted to include a Certificate of Conformity showing compliance with the applicable standards.
(a) Where the Certificate number includes an "X" suffix, the electrical equipment Listing includes Special Condition for Safe Use which shall be observed.
(b) Where the Certificate number includes a "U" suffix, the equipment is an incomplete component and is not suitable for installation without further evaluation.
2) Provide a new marking 505.9(C)(2) on "Marking" with the following underlined additional text:
(2) Zone Equipment.
Equipment shall be permitted to be marked with a certificate reference, see 505.4(A).
Equipment meeting one or more of the protection techniques described in 505.8 shall be marked with all of the following in the order shown:

Substantiation: While listing and labeling are marks to indicate equipment meets specific standards, Certificates offer an extremely important long term benefit of providing documentation that will enable users to understand the Models certified, the applicable standards, the effective date and any special conditions for safe use, long after the normal life of most other product literature. Certificates are this important documentation that provides vital information to users to better assure that equipment will be properly installed within a hazardous (classified) location.

Examples of certificates, selected at random from public sources, are provided for improved understanding.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This proposal would add permission to permit a certificate that is not prohibited by the current requirements. The additional text serves no purpose. The panel rejection of the proposal in no way prohibits the manufacturer and/or the certification body from providing a certificate if it is needed or desired for other reasons.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-107 Log #2441 NEC-P14 **Final Action: Accept**

(505.4(B))

Submitter: Eliana Beattie, ISA

Recommendation: 505.4(B) - FPN 2

Change ISA-RP12.24.01-1998 to ANSI/ISA-TR12.24.01-1998 (IEC 60079-10 Mod)

505.4(B) - FPN 7

Change ANSI/ISA 12.00.01-2002 to ANSI/ISA-60079-0 (12.00.01)-2005

Change ANSI/ISA 12.01.01-1999 to ANSI/ISA-12.01.01-1999

Substantiation: Change format to match actual ISA standards numbering.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-108 Log #2440 NEC-P14 **Final Action: Accept**

(505.5(B)(2))

Submitter: Eliana Beattie, ISA

Recommendation: 505.5(B)(2) FPN 1

Change ISA 12.24.01-1998 to ANSI/ISA-TR12.24.01-1998 (IEC 60079-10 Mod)

Substantiation: Change format to match actual ISA standards numbering.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-109 Log #2714 NEC-P14 **Final Action: Accept**

(505.7(A))

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Replace the entire existing text with the following:

~~(A) Supervision of Work. Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.~~

(A) Implementation of Zone Classification System. Classification of areas, engineering and design, selection of equipment and wiring methods, installation, and inspection shall be performed by qualified persons.

Substantiation: Since the introduction of the zone methodology into the NEC, there has been the issue of the qualified registered professional engineer as the "gatekeeper" to the zone implementation. Code Panel 14 in considering action for combustible dusts (Article 506), examined this problem text and arrived at a preferred wording to address this need. The text proposed follows this lead.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 4

Explanation of Negative:

BERNSEN, M.: The substantiation for this proposal does not provide any documentation to show why the requirement for having a professional engineer supervise zone installations should be removed. Discussion in the ROP meeting stated that the zone system had been around for a while now and that the electrical community should have a better understanding of installation requirements of Articles 505 and 506 of the NEC. Neither the ROP discussion nor the substantiation provided any idea of how many installations in the United States have been made using the requirements of the two code articles or how our familiarity with the zone system had increased.

The mere fact that the articles have been in the NEC for several code cycles does not mean that the electrical community has a better understanding of either article. It seems we are removing a rule without a clear understanding of the implications of doing so. The requirement to have a professional engineer supervise the installation of equipment in a hazardous area insures the safety of the installation where knowledge of the electrical code is not the only factor involved. In order to provide a safe installation, knowledge of the hazardous products that will be encountered and the fire/explosion hazards associated with the products is necessary.

The proposed change would allow a "qualified person" to classify the hazardous areas, engineer and design the installation, select equipment and wiring methods, install the equipment and inspect the installation. The Article 100 definition of a "qualified person" does not, in my opinion enable the AHJ to make educated or consistent decisions as to who is qualified to "classify" hazardous areas and to "engineer and design" the installation. Installation and inspection of the installations is in most areas of the country covered by local or state licensing requirements.

My vote to reject this proposal is based on a lack of substantiation and my concern that the proposed change will adversely affect the safety of zone installations.

COOK, D.: I agree and support strengthening the implementation of the Zone System by requiring installation and inspection of these systems by qualified persons. I do not believe anything has changed that substantiates removal of the requirement for area classification, selection of equipment and wiring methods to be under the supervision of a qualified Registered Professional Engineer. The safety of every electrical project, and certainly those involving "special occupancies", especially those special occupancies that implement the "Zone System", should be a team effort that includes the most qualified persons in every aspect of the project. Since the implementation of Article 505 in 1996, and Article 506 in 2005, CMP-14 has been made aware of one project that was based completely on Article 505. We are not aware of a single project that utilized Article 506. That limited use of these systems by the majority of the persons using the NEC is one reason to require additional oversight by the most qualified persons that we can involve in the implementation of the Zone System. Rather than deleting the requirement for this new technology, we should be expanding the requirement to all hazardous location projects.

While engineers, contractors, electricians, inspectors and operators typically have minimum education and training opportunities and requirements, the registration laws and requirements for engineers normally impose a higher level of responsibility on the PE for understanding and limiting the individual to practicing engineering services within their specific discipline. Unlike general electrical installations, the safety of electrical installations in hazardous locations requires significant, nonelectrical analysis of the property to determine the likelihood that the electrical system could become an ignition source. That might include a contribution from chemical engineers, process engineers, mechanical engineers, and fire protection engineers prior to any of the electrical design taking place. I believe the most qualified individual to supervise that activity would be a "Qualified, Registered, PE". I do not believe that makes any of the other parties less qualified to make their contribution or any less important to the overall safety of the installation. I believe the elimination of any of individuals involved in the safety of these installations is a bad decision. Without the NEC requirement, the decision to eliminate the supervision component of the safety team could become financially driven.

O'MEARA, M.: Although I agree that all individuals involved with Zone concepts need to be trained and qualified for the portion of the work being performed, I feel that relaxing the requirement for a qualified registered engineer leaves these areas vulnerable to misapplication of equipment and a false sense of security in an environment that will not tolerate mistakes in design or installation. The panel statement on Proposal 14-148 states that the installation and design "should not rely exclusively on the qualifications or certification of a single individual or entity." I fear that the wording proposed in Proposal 14-109 not only allows the installation to rely on a single person or entity, but it relaxes the requirement without providing any methods of assuring the person designing and implementing the Zone system really is qualified. The term "qualified" is too generic and would allow anyone that has attended a class to claim that they are now "qualified". I feel that the requirement for the person designing the system to be a registered engineer provides the necessary added level of assurance that the design and installation was not taken lightly, and that all proper precautions have been taken. In addition, maintaining engineering oversight does not remove the requirement for qualified persons to participate in all aspects of the design, installation and inspection of the Zone system. The requirement for a "qualified" individual is understood and applies equally throughout the NEC.

WIRFS, M.: The substantiation that similar language was fully considered for Article 506 is insufficient. I personally feel that it was NOT properly or fully addressed during the previous code cycle when Article 506 was introduced and the panel was inconsistent in not including similar language. A companion proposal for the 2008 NEC (14-148) has addressed this oversight. During panel discussion, it was suggested that some compromise had been struck within the panel to include this provision in return for consideration of passage of the new Article 505 when it was first introduced and that some "time limit" applied. Again, I believe that principles have no time limit and I am disappointed that any panel member would compromise those opinions or principles based on this premise. There is no "time limit" on my opinion or my original voting on this subject and I still maintain that this provision has the same validity that it did when it was first introduced with Article 505. This is a step forward to a higher standard of responsibility and certification of the most important issue with the application of this article. The submitter did not provide any technical or convincing argument to remove or modify this provision.

Comment on Affirmative:

WECHSLER, D.: After much discussion this Panel has finally been able to accept that the complete implementation of hazardous classified locational aspects includes more than just the assessment of the area, but selection of equipment, wiring methods, an appropriate installation, and inspection. Each must be done by persons that a qualified for the tasks. The text proposed, is the same text agreed upon for 506, also a zone methodology. For these reasons, this proposal should continued to be supported.

14-110 Log #2962 NEC-P14 **Final Action: Accept in Principle**
(505.7(A))

Submitter: Robert L. Seitz, Artech Engineering

Recommendation: Revise text to read as follows:

~~Supervision of Work~~ Implementation of Zone Classification System.

Classification of areas, engineering and design , selection of equipment and wiring methods , installation and inspection shall be ~~under the supervision of a qualified Registered Professional Engineer~~ performed by qualified persons .

Substantiation: ● Paragraph as currently written is not consistent with 506.6(A).

● No other Section requires specifically a Registered Professional Engineer.

● Presence of this paragraph actually hinders the application of Zone Classified areas as there may be qualified personnel who are not registered professional engineers, but who are qualified to perform some or all of the tasks listed.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 14-109.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 4

Explanation of Negative:

BERNSEN, M.: See my Explanation of Negative on Proposal 14-109.

COOK, D.: See my explanation of negative vote on Proposal 14-109.

O'MEARA, M.: See my Explanation of Negative Vote on Proposal 14-109.

WIRFS, M.: See my explanation of negative vote on Proposal 14-109.

14-111 Log #3547 NEC-P14 **Final Action: Accept in Principle**
(505.7(A))

Submitter: Kevin Taylor, Lyondell Chemical Company

Recommendation: Delete the following text ~~:~~

~~Supervision of Work Classification of areas and selection of equipment and wiring methods shall b under the supervision of a qualified Registered Professional Engineer.~~

Substantiation: Deletion of this text will remove a restriction on use of the NEC Zone System that does not exist for the traditional Division System, thereby allowing users greater access to the benefits of adopting harmonized protection and installation methods described in Article 505.

Panel Meeting Action: Accept in Principle

Panel Statement: See the panel action on Proposal 14-109, which has revised the requirement for supervision.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 4

Explanation of Negative:

BERNSEN, M.: See my Explanation of Negative on Proposal 14-109.

COOK, D.: See my explanation of negative vote on Proposal 14-109.

O'MEARA, M.: See my Explanation of Negative Vote on Proposal 14-109.

WIRFS, M.: See my explanation of negative vote on Proposal 14-109.

14-112 Log #2439 NEC-P14 **Final Action: Accept**
(505.8)

Submitter: Eliana Beattie, ISA

Recommendation: 505.8 FPN

Change ANSI/ISA-12.00.01-2002 to ANSI/ISA-60079-0 (12.00.01)-2005.

Change ANSI/ISA 12.01.01-2002 to ANSI/ISA-12.01.01-1999.

Substantiation: Change format to match actual ISA standards numbering.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-113 Log #2459 NEC-P14 **Final Action: Reject**
(505.8, 505.9 and 505.15)

Submitter: Eliana Beattie, ISA

Recommendation: ***Article 505***

505.8 Protection Techniques.

Rewrite sections (C) and (D) as shown:

(C) Intrinsic Safety & FISCO . ~~This~~ These protection technique s shall be permitted for apparatus and associated apparatus in Class I, Zone 0, Zone 1, or Zone 2 locations for which it is listed.

(D) Type of Protection "n" & FNICO . ~~This~~ These protection technique s shall be permitted for equipment in Class I, Zone 2 locations. Type of protection "n" is further subdivided into nA, nC, and nR.

FPN: See Table 505.9(C)(2)(4) for the descriptions of subdivisions for type of protection "n".

505.9 (C)

Add exception Nos. 3 and 4 to end of section:

(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in 505.8 shall be marked with all of the following in the order shown:

(1) Class
(2) Zone
(3) Symbol "AEx"
(4) Protection technique(s) in accordance with Table 505.9(C)(2)(4)
(5) Applicable gas classification group(s) in accordance with Table 505.9(C)
(6) Temperature classification in accordance with 505.9(D)(1)

Exception No. 1: Associated apparatus NOT suitable for installation in a hazardous (classified) locations shall be required to be marked only with (3), (4), and (5), but BOTH the symbol AEx (3) and the symbol for the type of protection (4) shall be enclosed within the same square brackets, for example, [AEx ia] IIC.

Exception No. 2: Simple apparatus as defined in 504.2 shall not be required to have a marked operating temperature or temperature class.

Exception No. 3: FISCO apparatus shall be marked as above and shall also include the term "FISCO" followed by an indication of its function, i.e. power supply, field device or terminator. This marking shall precede the markings shown above in (1) through (6).

Exception No. 4: FNICO apparatus shall be marked as above and shall also include the term "FNICO" followed by an indication of its function, i.e. power supply, field device or terminator. This marking shall precede the markings shown above in (1) through (6).

505.15 Wiring Methods.

Revise (A) as follows:

(A) Class I, Zone 0 . In Class I, Zone 0 locations, only intrinsically safe and FISCO wiring methods in accordance with Article 504 shall be permitted.

Revise (C)(1)(g) as follows:

(g) Nonincendive field wiring and FNICO shall be permitted using any of the wiring methods permitted for unclassified locations. Nonincendive field wiring and FNICO systems shall be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring or FNICO circuit, provided the simple apparatus does not interconnect the nonincendive field wiring or FNICO circuit to any other circuit.

Substantiation: The FISCO (Fieldbus Intrinsically Safe COncept) and FNICO (Fieldbus NonIncendive COncept) protection concepts take advantage of functional requirements of Fieldbus systems to significantly simplify i.s. installation. These requirements include wire type and quality, supply voltage and current levels, and limitation of stored energy at the terminals of field devices. The objective of these concepts is to simplify the i.s. installation to the point where a safe installation may be effected by simply selecting devices labeled as FISCO (or FNICO) and observing basic wiring type and length restrictions. The NRTL evaluation of all devices ensures that they will be compatible with all other similarly labeled devices without further analysis on the part of the installer.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel rejects the addition of "FISCO" and "FNICO" because there are numerous intrinsically safe and nonincendive field wiring methods that are acceptable and the inclusion of these acronyms in this section would imply that "FISCO" and "FNICO" are the only methods available.
If "FISCO" and "FNICO" wiring systems are installed in accordance with the control drawings, this practice would not be prohibited by the current requirements of the NEC.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

SCHNAARE, T.: Generally speaking, the code serves its primary users base best when it includes information about the various techniques that are allowed for installation. While I agree that the panel does not want to imply that FISCO and FNICO are the only techniques available, I also belive that the code is made stronger and easier to understand and apply when information such as this is included. If there are other deficiencies in the current code (as implied by the panel statement) then these should be addressed as well.

14-114 Log #2451 NEC-P14 **Final Action: Reject**
(505.8(D))

Submitter: Eliana Beattie, ISA

Recommendation: Revise text to read as follows:

(D) Type of protection "n". This protection technique shall be permitted for equipment to be used in Class I, Zone 2 locations. Type of protection "n" is further subdivided into nA, nC, nL and nR.

FPN...".

Substantiation: Add protection type "nL" to align with 505.2.

Panel Meeting Action: Reject

Panel Statement: The standard covering the protection technique specified in the recommendation is not currently published.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-115 Log #212 NEC-P14 **Final Action: Accept in Principle**
(505.8(G))

NOTE: The following proposal consists of Comment 14-77 on Proposal 14-80 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 14-80 was:
Revise text as follows:
505.8 Protection Techniques. Acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations shall be as described in 505.8(A) through (I).
FPN: For additional information, see ISA 12.00.01-1999, *Electrical Apparatus for Use in Class I, Zones 0 and 1 Hazardous (Classified) Locations, General Requirements;* ISA 12.01.01-1999, *Definitions and Information Pertaining to Electrical Apparatus in Hazardous (Classified) Locations;* ~~ANSI/UL 2279, 1997, *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations*~~ ANSI/UL 60079-0, *Electrical apparatus for explosive gas atmospheres - Part 0: General requirements;* and IEC 60079-0-1998, *Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements.*
Submitter: Jeremy Neagle, Intertek ETL SEMKO
Recommendation: Add text as follows:
(G) Encapsulation “m”. This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.
FPN: Type of protection “m” may be further subdivided into ma or mb.
Substantiation: Standards are currently in preparation which include two levels of protection, ‘ma’ and ‘mb’ which are suitable for Zone 0 and Zone 1 locations respectively. IEC 60079-18, 2nd edition is in the final stages of publication, and adoption of this standard as ISA 12.23.01, 2nd edition is currently in process with publication expected in 2005. The necessary measures are not yet in place to allow for use of ‘ma’ in Zone 0 locations. However, it provides a greater level of safety than the current practice, while ‘mb’ provides an equivalent level of safety as the current practice. Adding this FPN clarifies the fact that both levels of protection ‘ma’ and ‘mb’ are both suitable for use in Class I Zone 1 locations. US standards will likely be published, and listed equipment available throughout the life span of this code edition, this FPN clarifies that apparatus marked ‘m’ as required, which is additionally marked to indicate level of protection ‘a’ or ‘b’ is still suitable for use in Class I, Zone 1 locations.
Panel Meeting Action: Accept in Principle
Panel Statement: The recommended action is accomplished through the panel action on Proposal 14-116.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-116 Log #2456 NEC-P14 **Final Action: Accept**
(505.8(G))

Submitter: Eliana Beattie, ISA
Recommendation: Add text as follows:
(G) Encapsulation “m.” This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.
(H) Encapsulation “ma.” This protection technique shall be permitted for equipment in Class I, Zone 0, Zone 1, or Zone 2 locations.
(I) Encapsulation “mb.” This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.
(J) Powder Filling “q”…”
(K) Combustible Gas Detection System…
Substantiation: Items (H) and (I) are inserted; subsequent items are re-lettered. This clarifies that there are now multiple levels of protection for encapsulated equipment. The current edition of ANSI/ISA 60079-18 includes requirements for two levels of protection for encapsulated equipment, “ma” which is suitable for Class I, Zone 0 locations, and “mb” which is suitable for Class I, Zone 1 locations. As the NEC currently does not permit the use of “ma” or “mb” encapsulated equipment, ANSI/ISA 60079-18 currently requires both levels of protection to be marked “m” (suitable for Class I, Zone 1 locations only). Once the NEC has adopted levels of protection “ma” and “mb”, ANSI/ISA 60079-18 will be revised to permit marking of the individual levels of protection.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-117 Log #1295 NEC-P14 **Final Action: Reject**
(505.8(I))

Submitter: Jon Miller, Detector Electronics Corp.
Recommendation: Revise text to read:
505.8 Protection Techniques. Acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations shall be as described in 505.8(A) through 505.8(I) .
FPN: For additional information, see ANSI/ISA 12.00.01-2002, Electrical Apparatus for Use in Class I, Zones 0 and 1 Hazardous (Classified) locations, General Requirements; ANSI/ISA 12.01.01-2002, Definitions and Information Pertaining to Electrical Apparatus in Hazardous (Classified) Locations; and ANSI/UL 60079-0, Electrical apparatus for explosive gas atmospheres—Part 0: General Requirements.
(A)...
(I) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons service the installation. Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment specified in 505.8(I)(1), I(2), or I(3) shall be permitted. The type of detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented and in conformance with ISA-TR12.13.03, Guide for Combustible Gas Detection as a Method of Protection, when combustible gas detectors are used as a protection technique.
FPN No. 1: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors.
FPN No. 2: For further information, see ANSI/API RP 505, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2.
FPN No. 3: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.
(1) Inadequate Ventilation. In a Class I, Zone 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Zone 2 locations shall be permitted.
(2) Interior of a Building. In a building located in, or with an opening into, a Class I, Zone 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.
(3) Interior of a Control Panel. In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases, or vapors, electrical equipment suitable for Class I, Zone 2 locations shall be permitted.
Substantiation: There is currently no guidance on recommended practices for the use of combustible gas detection equipment as a method of protection. It is recommended that a reference to ISA-TR12.13.03 be provided within the text for such recommended practice. The ISA-TR12.13.03 is directly based upon API practices that have been applied for 30+ years in the petroleum industry.
Panel Meeting Action: Reject
Panel Statement: The proposed text cannot be included as a mandatory requirement for the application of combustible gas detectors because mandatory references to other standards are not permitted by the NEC Style Manual. Acceptance of information regarding the referenced standard in a fine print note is premature because the document is not currently available. The panel is seeking information on the availability date of the referenced standard.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-118 Log #2437 NEC-P14 **Final Action: Accept**
(505.8(I))

Submitter: Eliana Beattie, ISA
Recommendation: 505.8(I) - FPN 1
Change ANSI/ISA-12.13.01 to ANSI/ISA-12.13.01-2003 (IEC 61779-1 through -5 Mod)
505.8(I) - FPN 3
Change ISA-RP12.13.02 to ISA-RP12.13.02-2003 (IEC 61779-6 Mod)
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-119 Log #2492 NEC-P14 **Final Action: Accept**
(505.8(I))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and to relocate the reference into Annex A to be consistent with other parts of the Code. This action will be considered by the panel as a public comment.
Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
(I) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and

supervision ensure that only qualified persons service the installation. Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment specified in 505.8(I)(1), I(2), or I(3) shall be permitted. The type of detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented when combustible gas detectors are used as a protection technique.

FPN No. 1: For further information, see ANSI/ISA-12.13.01, *Performance Requirements, Combustible Gas Detectors* ~~.~~ and ANSI/UL2075, Gas and Vapor Detectors and Sensors.

Substantiation: ANSI/UL2075 includes performance requirements for combustible gas detectors to ANSI/ISA-12.13.01 in addition to requirements for non-combustible gases and vapors.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-120 Log #2494 NEC-P14 **Final Action: Accept in Principle (505.8(I))**

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.

Recommendation: Revise text to read as follows:

(I) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons service the installation. Gas detection equipment shall be listed for both the location in which it is installed and for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment, other than the gas detection equipment, specified in 505.8(I)(1), I(2), or I(3) shall be permitted. The type of detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented when combustible gas detectors are used as a protection technique.

Substantiation: The current text is unclear with respect to the suitability of the gas detection equipment and the location in which it is installed. While the use of this technique permits equipment for Zone 2 or unclassified locations in a Zone 1 or 2 location respectively, the detection equipment itself should be suitable for the actual classified location in which it is installed.

Panel Meeting Action: Accept in Principle

Revise current text of 505.8(I) to read:

(I) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons service the installation. ~~Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered.~~ Where such a system is installed, equipment specified in 505.8(I)(1), I(2), or I(3) shall be permitted. The type of detection equipment, its listing, installation location(s), alarm and shutdown criteria, and calibration frequency shall be documented when combustible gas detectors are used as a protection technique.

(1) Inadequate Ventilation. In a Class I, Zone 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Zone 2 locations shall be permitted. Combustible gas detection equipment shall be listed for Class I, Zone 1, the appropriate material group, and for the detection of the specific gas or vapor to be encountered.

(2) Interior of a Building. In a building located in, or with an opening into, a Class I, Zone 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted. Combustible gas detection equipment shall be listed for Class I, Zone 1 or Class I, Zone 2, the appropriate material group, and for the detection of the specific gas or vapor to be encountered.

(3) Interior of a Control Panel. In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases, or vapors, electrical equipment suitable for Class I, Zone 2 locations shall be permitted. Combustible gas detection equipment shall be listed for Class I, Zone 1, the appropriate material group, and for the detection of the specific gas or vapor to be encountered.

Panel Statement: The panel action accomplishes the intent of the submitter.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-122 Log #1629 NEC-P14 **Final Action: Accept (Table 505.9(C))**

Submitter: Tom Henry, Code Electrical Classes, Inc.

Recommendation: Add the following text:

Gas Group Comment
II C See 505.6 (A)
II B See 505.6 (B)
II A See 505.6 (C)

Substantiation: Remove text (1) (2) (3) as there is no (1) (2) (3). Replace with (A) (B) (C) as shown above.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-123 Log #213 NEC-P14 **Final Action: Accept in Principle (505.9(C)(2))**

NOTE: The following proposal consists of Comment 14-79 on Proposal 14-89 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 14-89 was:

Revise text to read as follows:

(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in 505.8 shall be marked with the following in the order shown:

(1) Class
(2) Zone
(3) Symbol "AEx"
(4) Protection technique(s) in accordance with Table 505.9(C)(2)(4)
(5) Applicable gas classification group(s) in accordance with Table 505.9(C)
(6) Temperature classification in accordance with 505.9(D)(1)

Exception No. 1 : Intrinsically safe associated apparatus shall be required to be marked only with (4), (5), and (6)

Exception No. 2: Simple Apparatus as defined in 504.2 shall not be required to have a marked operating temperature or temperature class.

Submitter: Jeremy Neagle, Intertek ETL SEMKO

Recommendation: Revise text to read as follows:

FPN No. 1: An example of such a required marking is "Class 1 Zone 0, AEx is IIC T6." An explanation of the marking that is required is shown in FPN Figure 505.9(C)(2).

FPN No. 2: Type of protection "m" may be further subdivided into ma or mb.

Substantiation: Standards are currently in preparation which include two levels of protection, 'ma' and 'mb' which are suitable for Zone 0 and Zone 1 locations respectively. IEC 60079-18, 2nd edition is in the final stages of publication, and adoption of this standard as ISA 12.23.01, 2nd edition is currently in process with publication expected in 2005. The necessary measures are not yet in place to allow for use of 'ma' in Zone 0 locations. However, it provides a greater level of safety than the current practice, while 'mb' provides an equivalent level of safety as the current practice. Adding this FPN clarifies the fact that both levels of protection 'ma' and 'mb' are both suitable for use in Class I Zone 1 locations. US standards will likely be published, and listed equipment available throughout the life span of this code edition, this FPN clarifies that apparatus marked 'm' as required, which is additionally marked to indicate level of protection 'a' or 'b' is still suitable for use in Class I, Zone 1 locations.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 14-124.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-124 Log #2455 NEC-P14 **Final Action: Accept in Principle in Part (505.9(C)(2))**

Submitter: Eliana Beattie, ISA

Recommendation: Modify text as follows:

(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in 505.8 shall be marked with all of the following in the order shown:

(1) Class
(2) Zone
(3) Symbol "AEx"
(4) Protection technique(s) in accordance with Table 505.9(C)(2)(4)

FPN: Where apparatus is protected by more than one protection technique, the designation will appear in alphabetical order, except in the case where the apparatus includes type of protection "n" in which case the type of protection "n" marking will appear first.

(5) Applicable gas classification group(s) in accordance with Table 505.9(C)
(6) Temperature classification in accordance with 505.9(D)(1)

Exception No. 1: Associated apparatus NOT suitable for installation in a hazardous (classified) locations shall be required to be marked only with (3), (4), and (5), but BOTH the symbol AEx (3) and the symbol for the type of protection (4) shall be enclosed within the same square brackets, for example, [AEx ia] IIC.

Exception No. 2: Simple apparatus as defined in 504.2 shall not be required to have a marked operating temperature or temperature class.

Electrical equipment of types of protection "e," "m," "p," or "q" shall be marked Group II. Electrical equipment of types of protection "d," "ia," "ib," "[ia]," or "[ib]" shall be marked Group IIA, IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN No. 1: An example of the required marking for intrinsically safe apparatus for installation in Class I, Zone 0 is “Class I, Zone 0, AEx ia IIC T6.” An explanation of the marking that is required is shown in FPN Figure 505.9(C)(2).

FPN No. 2: An example of the required marking for intrinsically safe associated apparatus mounted in a flameproof enclosure for installation in Class I, Zone 1 is “Class I, Zone 1 AEx d[ia] IIC T4.”

FPN No. 3: An example of the required marking for intrinsically safe associated apparatus NOT for installation in a hazardous (classified) location is “[AEx ia] IIC.”

FPN Figure 505.9(C)(2) Zone Equipment Marking.

Table 505.9(C)(2)(4) Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Associated apparatus	Unclassified**
[ib]	Associated apparatus	Unclassified**
m	Encapsulation	1
ma	Encapsulation	0
mb	Encapsulation	1
nA	Nonsparking ~~equipment~~	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure	2
nL	Energy-limited apparatus	2
nAnL	Self-protected energy-limited apparatus	2
[nL]	Associated Energy-limited apparatus	Unclassified**
nR	Restricted breathing enclosure	2
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

*Does not address use where a combination of techniques is used

**Associated intrinsically safe and associated energy-limited apparatus may be installed in a hazardous (Classified) location if suitably protected using another technique.

Substantiation: Table 505.9(C)(2)(4) modified to include the additional protection concepts in the Type “n” standard ANSI/ISA-60079-15 and ANSI/UL 60079-15 and types of protection “ma” and “mb” as defined in ANSI/ISA-60079-18 and ANSI/UL 60079-18.

Table modified to include the possibility of installing associated apparatus in a hazardous (classified) location if it is suitably protected by another means such as Flameproof or Purged.

New FPN added to align with the current edition of ANSI/ISA-60079-0 and ANSI/UL 60079-0.

Panel Meeting Action: Accept in Principle in Part

Accept the recommendation in principle in part with the following actions:

1) Revise Table 505.9(C)(2)(4) to read as shown:

Table 505.9(C)(2)(4) Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Associated apparatus	Unclassified**
[ib]	Associated apparatus	Unclassified **
m	Encapsulation	1
ma	Encapsulation	0
mb	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure	2
nR	Restricted breathing enclosure	2
o	Oil immersion	1
px	Pressurization	1
py	Pressurization	1
pz	Pressurization	2
q	Powder filled	1

*Does not address use where a combination of techniques is used.

** Associated apparatus is permitted to be installed in a hazardous (Classified) location if suitably protected using another type of protection.

2) Revise first sentence of the second paragraph (following Exception No. 2) in existing code text to read:

Electrical equipment of types of protection “e,” “m,” “ma”, “mb”, ~~“p”~~ “px”, “py”, “pz”, or “q” shall be marked Group II.

3) Reject inclusion of the recommended fine print note.

Panel Statement: The panel rejects the recommended fine print note because it does not provide information that is necessary in an installation document. The panel revised the existing text of the second paragraph in the NEC to include all of the encapsulation (“ma” and “mb” added) and pressurization (“p” replaced with “px”, “py” and “pz” methods.

In the recommended changes to Table 505.9(C)(2)(4), the panel deleted “nL”, “nAnL”, and [nL] because the standard covering those methods is not currently published. The panel also replaced pressurization “p” with “px”, “py”, and “pz” for correlation with the revisions in the Code text. The recommended new note to the table (indicated with **) was revised for clarity and to align with terminology used in the NEC.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-125 Log #653 NEC-P14 **Final Action: Accept**
(505.9(D)(1))

TCC Action: The Technical Correlating Committee directs the panel to reconsider the proposal and place the example text of the recommendation into a Fine Print Note. This action will be considered by the Panel as a Public Comment.

Submitter: William G. Lawrence, Jr., S. Yarmouth, MA

Recommendation: Add new text as follows:

Electrical equipment that is designed for use in a range of ambient temperatures other than -20°C to +40°C is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol “Ta” or “Tamb” together with the special range of ambient temperatures, in degrees Celsius . As an example, such a marking might be “-30°C ≤ Ta ≤ +40°C.”

Substantiation: Even though the standard ambient range is specified in degrees Celsius, this section does not specify that any special ambient temperature is also to be expressed in degrees Celsius. If the ambient temperature range is expressed in degrees Fahrenheit, the potential exists for misapplication of the equipment.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-126 Log #2565 NEC-P14 **Final Action: Accept in Principle**
(505.9(F))

Submitter: Peter Schimmoeller, CSA International

Recommendation: Add new text as follows:

505.9(F) Fiber Optic Cable Assembly. Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Article 505, as applicable.

Substantiation: Current Code does not address fiber optical cables with electrical conductors used in Zone 0, 1, or 2 classified locations. This proposal adds wording similar to that found in Division classified locations.

Panel Meeting Action: Accept in Principle

The panel accepts the recommendation in principle with the following revision:

505.9(F) Fiber Optic Cable Assembly. Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with 505.15 and 505.16, as applicable.

Panel Statement: The panel has revised the recommendation to specifically require compliance with the applicable wiring method and sealing rules.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-121 Log #2472 NEC-P14 **Final Action: Accept in Principle**
(505.15(B)(1) and (c))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and to relocate the reference in the FPNs into Annex A to be consistent with other parts of the Code. This action will be considered by the panel as a public comment.

Submitter: Donald W. Ankele, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

(b) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application.

FPN 1 : See 330.12 for restrictions on use of Type MC cable.
FPN 2: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.

(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type ITC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

FPN 1: See 727.4 and 727.5 for restrictions on use of Type ITC cable.
FPN 2: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-ML cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.

Substantiation: Add FPN 2 to reference the ANSI standard for Type MC-HL cable and Type ITC-HL cables and cable fittings to aid approval of the installation for the location involved.

Add FPN 1 to reference Article 727 for Type ITC cable.

Panel Meeting Action: Accept in Principle

Revise the recommended fine print note to 505.15(B)(1)(c) to read: FPN No. 2: For further information on construction, testing and marking requirements for Type ITC-HL cable and Type ITC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.

Panel Statement: The panel notes that this proposal is to 505.15(B)(1)(b) & (c). The panel accepts the recommendation and corrects the type of cable covered by the new fine print note to 505.15(B)(1)(c).

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-128 Log #1929 NEC-P14 **Final Action: Reject**
(505.15(B)(1)(f))

TCC Action: The Technical Correlating Committee directs the panel to reconsider the action on this proposal and remove the redundant reference to Article 352 since this is already covered by 90.3. This action will be considered by the panel as a public comment. The Technical Correlating Committee also directs that this proposal be sent to Code-Making Panel 8 for comment.

Submitter: William Wagner, Certification Solutions

Recommendation: Revise the first sentence of item (f) of 505.15(B)(1) as follows:

(f) Rigid nonmetallic conduit ~~complying with Article 352~~ shall be permitted where encased in a concrete envelope a minimum of 50 mm (2 in.) thick and provided with not less than 600 mm (24 in.) of cover measured from the top of the conduit to grade.

Substantiation: 4.1.1 of the NEC Style Manual does not permit references to be made to an entire article unless additional conditions are specified. Therefore, the reference to Article 352 should be deleted.

Panel Meeting Action: Reject

Panel Statement: The use of rigid nonmetallic conduit in this section is conditional because this requirement specifies a minimum 2 inches of concrete encasement. Under this condition, the NEC Style Manual permits a reference to an entire article.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: Based on the information in 90.3, the text “complying with Article 352” adds nothing to the requirement.

14-129 Log #2961 NEC-P14 **Final Action: Reject**
(505.15(B)(1)(g))

Submitter: Robert L. Seitz, Artech Engineering

Recommendation: Add text to read as follows:

(g) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installations, and where the cable is not subject to physical damage, listed Marine Shipboard Cable, with overall jacket of suitable material, separate grounding conductors in accordance with 250.122 and provided with termination fittings listed for the application. Marine Shipboard cable shall be permitted to be installed in the same manner as permitted for TC-ER cable as described in 336. Where conditions warrant additional protection Marine Shipboard cable with basket weave armor may be installed. Minimum bending radius for non-armored cable shall be 6X diameter, and for armored cable 8X diameter. Instrumentation and control cables with shielded components are permitted. Conduit sleeves may be used to cross high risk areas.

Substantiation: MC-HL cable does not permit proper installation of all listed and marked Zone 1 devices because of size and stiffness of the cable and the bulk and rigidness of the connector. Other less functional devices are often selected for installations to avoid difficulties with these installations. Marine Shipboard cable listed under UL 1309 and complaint with IEEE 1580 provides a reasonable means to provide a safe installation in a Zone 1 area without the corrugated armor. Where additional protection might be required there are a variety of basket weave armors that can be selected, while retaining necessary flexibility.

MC-HL cable is often damaged during installation, and when equipment and devices are removed for maintenance or replacement by crimping of the metallic sheath when the cable is bent to move it out of the way.

Where flexible connections to instruments or control devices is required, necessary configurations of extra hard usage cord are not available Only power cords seem to be available as extra hard usage cord or cable.

Cable tray, both ladder type and wire basket tray afford adequate protection of cable installed. The small wire basket tray can be run to close proximity of devices and equipment to provide protection of the cable. Marine Shipboard cable is required to have the crush and impact required for MC-HL cable. Much of the Marine Shipboard cable available exceeds the requirement by 5 times.

Where cable tray cannot be run or there is elevated risk of damage to a cable MC-HL cable would be selected. By 505.15, the MC-HL cable installations are to be “not subject to physical damage”, but conditions during overhauls and reconfiguration can present a risk even for MC-HL cable. Installation of Marine Shipboard cable in cable tray (wire basket type) can afford more protection than the armor of MC-Hl cable by allowing different routing allowed by a smaller bending radius of the Marine Shipboard cable. Some basket tray configurations have partial coverage on the top that would prevent objects from being placed on the cable.

Marine Shipboard cable is a proven cable for harsh environments, is better for use in high vibration areas than MC-HL cable, and is available with low temperature ratings, flame retardant, resistant to oil, abrasion, chemicals and sunlight.

The introduction of the wire basket tray in the US provides the means to provide protection of the cable while retaining the flexibility the Marine Shipboard cable affords.

A companion proposal for article 310 is also submitted to add Marine Shipboard cable to Table 310.13.

Where the higher risk environments exist, the basket weave armor can be specified during design. Where the environment is harsh enough MC-HL cable can be specified. If there is great risk from falling objects, conduit sleeves may be employed or covers on the cable tray. The flexibility and smaller bending radius of the Marine Shipboard cable can allow installations that are more safe than those with MC-HL cable just by being able to route out of the way better.

This cable will allow Zone 1 approved products to be used more effectively than is possible with the MC-HL cable.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated that a marine shipboard cable is suitable for use in a Class I, Zone 1 premises wiring system and will offer equivalent performance to the wiring methods currently permitted in these locations. The NEC does not currently recognize the use of this cable in Chapter 3. The recommendation equates installation requirements with those for Type TC-ER, however the panel notes that Type TC-ER is not permitted in a Class I, Zone 1 location. As recommended, this particular product is not required to be armored and CMP-14 considers armor to be an essential protection feature for cables installed in Class I, Zone 1 locations.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-127 Log #2481 NEC-P14 **Final Action: Accept in Principle**
(505.15(B)(1)(b) and (c))

TCC Action: See Technical Correlating Committee Note on Proposal 14-121.

Submitter: Donald W. Ankele, Underwriters Laboratories Inc.

Recommendation: Revise as follows:

(b) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application.

FPN 1: See 330.12 for restrictions on use of Type MC cable.
FPN 2: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations .

(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type ITC-HL cable, listed for use in Class I, Zone I or Division I locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

FPN 1: See 727.4 and 727.5 for restrictions on use of Type ITC cable.
FPN 2: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable sealing fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations .

Substantiation: Add FPN 2 to reference the ANSI standard for Type MC-HL cable and Type ITC-HL cables and cable fittings to aid approval of the installation for the location involved.

Add FPN 1 to reference Article 727 for type ITC cable.

Panel Meeting Action: Accept in Principle

Panel Statement: The recommended action is accomplished through the panel action on Proposal 14-121.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-130 Log #2479 NEC-P14 **Final Action: Accept**

(505.16, FPN 3 (New))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and to relocate the reference in the FPNs into Annex A to be consistent with other parts of the Code. This action will be considered by the panel as a public comment.

Submitter: Donald W. Ankele, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

505.16 Sealing and Drainage. Seals in conduit and cable systems shall comply with 501.15(A) through 501.15(E).

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal and through conductors passing through the seal. See 505.16(C)(2)(b). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See 505.16(D)(2).

FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than 2 AWG. Special conductor constructions, for example, compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

FPN No. 3: For further information, see ANSI/UL 2225, Cable and Cable Fittings for Use in Hazardous (Classified) Locations. Also see ANSI/UL 1203, Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.

Substantiation: Add FPN 3 to reference the ANSI standard for cable fittings to aid approval of the installation for the location involved.

Panel Meeting Action: Accept

Panel Statement: The panel notes that the referenced standard in FPN No.3 is 2225.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-131 Log #2478 NEC-P14 **Final Action: Accept**

(505.16(B)(2), FPN 1)

Submitter: Donald W. Ankele, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in 505.16(C)(2)(a). The minimum length of such cable run shall not be less than the length that limits gas or vapor flow through the cable core to the rate permitted for seal fitting [200 cm 3 /hr (0.007 ft 3 /hr) of air at a pressure of 1500 pascals (6 in. of water)]

FPN No. 1: ~~See ANSI/UL 886 1994, Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.~~ For further information on construction, testing and marking requirements for conduit sealing fittings, see ANSI/UL 1203, Explosionproof and Dust-Ingition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

Substantiation: Delete the reference to UL 886, which has been replaced by UL 1203. Add FPN to reference the ANSI standard for conduit sealing fittings to aid approval of the installation for the location involved.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-132 Log #2438 NEC-P14 **Final Action: Accept**

(505.16(E)(3))

Submitter: Eliana Beattie, ISA

Recommendation: 505.16(E)(3) - 2nd FPN

Change ISA 12.27.01 to ANSI/ISA-12.27.01-2003.

Substantiation: Change format to match actual ISA standards numbering.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-133 Log #2480 NEC-P14 **Final Action: Accept**

(505.17)

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and to relocate the reference in FPN No. 2 into Annex A to be consistent with other parts of the Code. This action will be considered by the panel as a public comment.

Submitter: Donald W. Ankele, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

505.17 Flexible Cords, Class I, Zones 1 and 2. A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of 505.15(B) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall comply with ~~all of~~ the following:

(1) Be of a type listed for extra-hard usage

(2) Contain, in addition to the conductors of the circuit, a grounding conductor complying with 400.23

(3) Be connected to terminals or to supply conductors in an approved manner

(4) Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections

(5) Be provided with listed seals where the flexible cord enters boxes, fittings, or enclosures that are required to be explosionproof or flameproof

(6) Cord entering a increased safety "e" enclosure shall be terminated with a listed increased safety "e" cord connector.

Exception: As provided in 505.16.

FPN 1: See Article 400.7 for permitted uses of flexible cords.

FPN 2: For further information on construction, testing and marking requirements for increased safety "e" and flameproof "d" cord connectors, see ANSI/UL 2225, *Cable and Cable Fittings for Use in Hazardous (Classified) Locations.*

Substantiation: 505.17 lacks clear statements regarding the requirements for cord connectors entering type of protection "e" enclosures. Add FPN's to reference the ANSI standard for "d" and "e" cord connectors to aid approval of the installation of the required fittings.

Panel Meeting Action: Accept

Panel Statement: The panel notes that in the recommendation for FPN No.1, the word "Article" should be removed from preceding 400.7.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-134 Log #1248 NEC-P14 **Final Action: Reject**

(505.17(3))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise: Be connected to terminals or supply conductors in ~~an approved manner~~ accordance with 110.14.

Substantiation: Edit. Proposal is more specific.

Panel Meeting Action: Reject

Panel Statement: The reference to 110.14 is not necessary because it is a general rule that applies throughout the Code.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: I agree with the submitter's substantiation that current text is not specific. The current text requires terminations of supply conductors of a flexible cord to be connected to terminals in an "approved manner". "Approved" is defined as acceptable to the authority having jurisdiction (AHJ). Nothing in the current text or in Chapter 5 of the NEC would provide a basis for the AHJ to accept anything other than a termination that complies with the requirements in 110.14 unless those terminations were permitted to be uninsulated by 505.19. The panel statement indicates the reference to 110.14 is not necessary because it is a general rule. The requirement for supply conductors to be connected to terminals in an approved manner is not necessary either since the general rule in 110.2 requires all conductors and equipment to be approved. I will offer the following alternate wording for public comment:

505.17(3) Be connected to terminals or supply conductors in accordance with 110.14 and 505.19.

14-135 Log #2483 NEC-P14 **Final Action: Reject**
(505.20(C) Exception No. 4, FPN 3 (New))

Submitter: Frederick Bried, Spring, TX
Recommendation: New FPN No. 3: For further information on the application of electric motors in Class I, Division 2 hazardous (classified) locations, see IEEE Std. 1349-2006, IEEE Guide for the Application of Electric Motors in Class I, Division 2, and Class I, Zone 2 Hazardous (Classified) Locations.
Substantiation: IEEE 1349-2001 is being revised and will be completed in 2006. The standard will include information related to application of electric motors in Class I, Division 2 and Class I, Zone 2 hazardous (classified) locations.
Panel Meeting Action: Reject
Panel Statement: The document referenced in the recommendation has not been approved by the IEEE Standards Board.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-136 Log #2766 NEC-P14 **Final Action: Reject**
(505.25(A))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new last sentence to 505.25(A) to read as follows:
When a bonding jumper is used, it shall be sized in accordance with 250.102(D).
Substantiation: There is no clear statement specifying the minimum size required when a bonding jumper is used for bonding back to the service for a circuit serving a classified hazardous location.
Panel Meeting Action: Reject
Panel Statement: Since 90.3 states the general requirements apply unless modified by the special requirements in Chapters 5, 6, and 7, the requirements in 250.102(D) are applicable without reference. This section does not modify the sizing requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-137 Log #2406 NEC-P14 **Final Action: Reject**
(505.25(A) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
505.25 Grounding and Bonding. Grounding and bonding shall comply with Article 250 and the requirements in 505.25(A) and 505.25(B).
(A) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, and so forth, between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
~~Exception: The specific bonding means shall be required only to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), provided the branch circuit overcurrent protection is located on the load side of the disconnecting means.~~
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Reject
Panel Statement: The panel rejects this proposal based on the fact that the sole substantiation is acceptance of a companion proposal by CMP-5. Without current knowledge of CMP-5's actions on these companion proposals, CMP-14 has no alternative other than to reject and await any necessary correlating action recommended by the TCC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: I agree with the change being proposed in Proposal 5-119. The use of an equipment grounding conductor in the feeder or branch circuit supplying a separate building should not be optional. The current rule is an exception to the general requirement found in 250.24(A)(5), stating that a "grounding connection shall not be made to the grounded conductor on the load side of the service disconnecting means." It took the code making process a long time to rectify the exception to the rule for ranges and clothes dryers. Proposal 14-43 would remove another unnecessary exception to the rule.
My vote to Reject proposal 14-43 concurs with the substantiation provided by Code-Making Panel 14. My vote, however, would be to Accept this proposal if Code-Making Panel 5 makes a wise decision and votes to Accept Proposal 5-119.

14-138 Log #1505 NEC-P14 **Final Action: Accept in Principle**
(505.25(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete:
"...and is to be relied on to complete a sole equipment grounding path".
Substantiation: Edit. These raceways cannot be used as the sole grounding path. This wording is not used in 502.30(B) or 503.30(B).
Panel Meeting Action: Accept in Principle
Revise 505.25(B) to read:
Flexible metal conduit and liquidtight flexible metal conduit shall not be used as the sole ground-fault current path. Where equipment bonding jumpers are installed, they shall comply with 250.102.
Retain the exisiting exception.
Panel Statement: The panel concurs that flexible metal conduit and liquidtight flexible metal conduit cannot be used in Class I, Zone 2 location as the sole ground-fault current path and has revised the current text for clarity.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-139 Log #2436 NEC-P14 **Final Action: Accept**
(506.1)

Submitter: Eliana Beattie, ISA
Recommendation: 506.1 - FPN 2
Change ISA 12.10.05 to ANSI/ISA-61241-10 (12.10.05)-2004.
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 506 — ZONE 20, 21, AND 22 LOCATIONS FOR COMBUSTIBLE DUSTS, FIBERS, AND FLYINGS

14-139a Log #CP1409 NEC-P14 **Final Action: Accept**
(506.2)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 14,
Recommendation: Add the following new definitions to 506.2:
Protection by pressurization 'pD'. Type of protection that guards against the ingress of a mixture of combustible dust, fibers, or flyings in air into an enclosure containing electrical equipment by providing and maintaining a protective gas atmosphere inside the enclosure at a pressure above that of the external atmosphere.
FPN: For additional information see, ISA 61241-2 (12.10.04), Electrical Apparatus for use in Zone 21 and Zone 22 Hazardous (Classified) Locations-Protection by Pressurization "pD".
Protection by Intrinsic Safety 'iD'. Type of protection where any spark or thermal effect is incapable of causing ingition of a mixture of combustible dust, fibers, or flyings in air under prescribed test conditions.
FPN: For additional information see ISA 61241-11 (12.10.06), Electrical Apparatus for use in Zone 20, Zone 21 and Zone 22 Hazardous (Classified) Locations- Protection by Intrinsic Safety "iD".
Substantiation: These definitions are added to agree with ISA standards ISA 61241-2 and 61241-11 for the recognized types of protection.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 3
Explanation of Negative:
BRIESCH, E.: The Panel Action should be Reject. The referenced standards for the protection techniques "pD" and "iD" are not currently published.
COOK, D.: Panel should reject this proposal based on the fact that applicable product standards are not published.
LAWRENCE, JR., W.: The panel action should have been to "reject" as the reference standards ISA 61241-2 and 61241-11are not yet published.

14-140 Log #1416 NEC-P14 **Final Action: Reject**
(506.2)

Submitter: Al Engler, Det Norske Veritas
Recommendation: Add text as follows:
Protection by Enclosure "tD". Type of protection for explosive dust atmospheres where electrical apparatus is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures.
FPN: For additional information see ISA 61241-0 (12.10.02) Electrical Apparatus for Use in Zone 20, Zone 21 and Zone 22 Hazardous (Classified) Locations–General requirements (IEC 61241-0 Mod), and ISA 61241-1 (12.10.03) Electrical Apparatus for Use in Zone 21 and Zone 22 Hazardous (Classified) Locations–Protection by Enclosure "tD" (IEC 61241-1 Mod).

Substantiation: ISA 61241-0 and ISA 6124-1 define the requirements for the type of protection “tD”, which is suitable for Zone 21 and Zone 22 locations.
Panel Meeting Action: Reject
Panel Statement: The standard covering the protection technique specified in the recommendation is not currently published.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-141 Log #2435 NEC-P14 **Final Action: Accept**
(506.2)

Submitter: Eliana Beattie, ISA
Recommendation: 506.2 - Dusttight - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000.
506.2 - Nonincendive Circuit - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000.
506.2 - Nonincendive Equipment - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000.
506.2 - Nonincendive Field Wiring Apparatus - FPN
Change ANSI/ISA 12.12.01-2000 to ANSI/ISA-12.12.01-2000.
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-142 Log #2496 NEC-P14 **Final Action: Accept**
(506.2)

Submitter: Edward M. Briesch, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
Dusttight. Enclosures constructed so that dust will not enter under specified test conditions.
FPN: See ANSI/ISA 12.12.01-2000, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* . ~~;~~
~~and UL 1604-1994, *Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations*~~ .
Substantiation: UL1604 has been withdrawn.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-143 Log #2670 NEC-P14 **Final Action: Reject**
(506.2)

Submitter: Eliana Beattie, ISA
Recommendation: Add text as follows:
Protection by encapsulation “mD”. Type of protection where electrical parts that could cause ignition of a mixture of combustible dust, fibers, or flyings in air are protected by enclosing them in a compound in such a way the explosive atmosphere cannot be ignited.
FPN No. 1: For additional information see ISA-61241-18 (12.10.07)-2006 Electrical Apparatus for Use in Zone 20, Zone 21 and Zone 22 Hazardous (Classified) Locations-Protection by Encapsulation “mD”.
FPN No. 2: Encapsulation is designated level of protection “maD” for use in Zone 20 locations. Encapsulation is designated level of protection “mbD” for use in Zone 21 locations.
Substantiation: ISA-61241-18 includes two levels of protection, “maD” and “mbD” which are suitable for Zone 20 and Zone 21 locations, respectively.
Panel Meeting Action: Reject
Panel Statement: The standard covering the protection technique specified in the recommendation is not currently published.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-144 Log #2452 NEC-P14 **Final Action: Reject**
(506.4(A) & 506.9(C))

Submitter: Eliana Beattie, ISA
Recommendation: 1) Revise 506.4(A) as follows:
506.4 General.
(A) Documentation for Industrial Occupancies.
(1) Area Classification. All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.
(2) Certificates of Conformity. The documentation, for electrical equipment marked in accordance with 506.9(C) shall include a Certificate of Conformity showing compliance with the applicable standards.
(a) Where the Certificate number includes an “X” suffix, the electrical equipment Listing includes Special Condition for Safe Use which shall be observed.
(b) Where the Certificate number includes a “U” suffix, the equipment is an incomplete component and is not suitable for installation without further evaluation.
2) Provide a new marking 506.9(C) on “Marking” with the following underlined additional text:
C) Marking.
Equipment shall be permitted to be marked with a certificate reference, see 506.4(A).
Equipment identified for Class II, Division 1 or Class II, Division 2 shall, in addition to being marked in accordance with 500.8(B), be permitted to be marked with both of the following:
(1) Zone 20, 21, or 22 (as applicable)
(2) Temperature classification in accordance with 506.9(D)
Substantiation: While listing and labeling are marks to indicate equipment meets specific standards, Certificates offer an extremely important long term benefit of providing documentation that will enable users to understand the Models certified, the applicable standards, the effective date and any special conditions for safe use, long after the normal life of most other product literature. Certificates are this important documentation that provides vital information to users to better assure that equipment will be properly installed within a hazardous (classified) location.
Examples of certificates, selected at random from public sources, are provided for improved understanding.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: This proposal would add permission to permit a certificate that is not prohibited by the current requirements. The additional text serves no purpose. The panel rejection of the proposal in no way prohibits the manufacturer and/or the certification body from providing a certificate if it is needed or desired for other reasons.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-145 Log #2434 NEC-P14 **Final Action: Accept**
(506.5(B)(1))

Submitter: Eliana Beattie, ISA
Recommendation: 506.5(B)(1) - FPN 1
Change ISA 12.10.05 to ANSI/ISA-61241-10 (12.10.05)-2004.
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-146 Log #2433 NEC-P14 **Final Action: Accept**
(506.5(B)(2)(d))

Submitter: Eliana Beattie, ISA
Recommendation: 506.5(B)(2)(d) - FPN 1
Change ISA 12.10.05 to ANSI/ISA-61241-10 (12.10.05)-2004.
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-147 Log #2461 NEC-P14 **Final Action: Accept**
(506.5(B)(3)(c))

Submitter: Eliana Beattie, ISA
Recommendation: 506.5(B)(3)(c) – FPN 1
Change ISA 12.10.05 to ANSI/ISA-61241-10 (12.10.05)-2004.
Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-148 Log #363 NEC-P14 **Final Action: Reject**
(506.6(A) (New))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Add a new 506.6(A) as follows:
(A) Supervision of Work. Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.
Renumber the balance of this section accordingly.
Substantiation: Hazardous (classified) locations under the Zone System of classification are currently few and far between in North America. 505.7(A) continues to require areas classified under the Zone System of classifying hazardous (classified) locations in the 2005 NEC. There was activity to remove this requirement in the 2005 NEC cycle that was rejected by the CMP and the Technical Correlating Committee as a result of ballot votes and not receiving the necessary 2/3. (Note: See action on Proposal 14-78 and Comment 14-74). Since Article 506 is new to the NEC and the methods of area classification provided in the article use the Zone System (20, 21, and 22) for classifying hazardous locations, the requirement for engineering supervision should be consistent. The proposed wording provided is identical to that already used in 505.7(A).

Panel Meeting Action: Reject
Panel Statement: The elements involved in installation, design, and inspection all require qualified individuals and should not rely exclusively on the qualifications or certification of a single individual or entity.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 3
Explanation of Negative:
COOK, D.: See my explanation of negative vote on Proposal 14-109.
O'MEARA, M.: See my Explanation of Negative Vote on Proposal 14-109.
WIRFS, M.: I personally believe that the submitter's substantiation is correct and self-explanatory.
For additional comment see my Comment on Proposal 14-109 negative vote.
Comment on Affirmative:
BERNSEN, M.: My vote to accept this item is based on my opinion that proposals 14-109, 14-110 and 14-111 should be rejected. If they are, I agree with the substantiation for this proposal and it should be accepted for clarity.

14-149 Log #2453 NEC-P14 **Final Action: Reject**
(506.8)

Submitter: Eliana Beattie, ISA
Recommendation: Add text as follows:
(G) Encapsulation "maD". This protection technique shall be permitted for equipment in Zone 20, Zone 21 and Zone 22 locations for which it is identified.
(H) Encapsulation "mbD". This protection technique shall be permitted for equipment in Zone 21 and Zone 22 locations for which it is identified.
FPN: For additional information see ISA-61241-18 (12.10.07)-2006, Electrical Apparatus for Use in Zone 20, Zone 21 and Zone 22 Hazardous (Classified) Locations-Protection by Encapsulation "mD".
Substantiation: ISA-1241-18 includes two levels of protection, "maD" and "mbD" which are suitable for Zone 20 and Zone 21 locations respectively.
Panel Meeting Action: Reject
Panel Statement: The standard covering the protection techniques specified in the recommendation is not currently published.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-150 Log #1417 NEC-P14 **Final Action: Reject**
(506.8(G))

Submitter: Al Engler, Det Norske Veritas
Recommendation: Add text as follows:
(G) Protection by Enclosure "tD". This protection technique shall be permitted for equipment in Zone 21 and Zone 22 locations for which it is identified.
Substantiation: ISA 6124-1 and ISA 6124-1 define the requirements for the type of protection "tD", which is suitable for Zone 21 and Zone 22 locations.
Panel Meeting Action: Reject
Panel Statement: The standard covering the protection technique specified in the recommendation is not currently published.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-150a Log #CP1408 NEC-P14 **Final Action: Accept**
(506.8(J) & (K))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 14,
Recommendation: Add the following text to 506.8:
(J)Protection by pressurization 'pD'. This protection technique shall be permitted for equipment in Zone 21 and Zone 22 locations for which it is identified.
(K)Protection by intrinsic safety 'iD'. This protection technique shall be permitted for equipment in Zone 20, Zone 21 and Zone 22 locations for which it is listed.
Substantiation: These protection methods are added to agree with ISA standards ISA 61241-2 and 61241-11 for the recognized types of protection.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 10 Negative: 4
Explanation of Negative:
BRIESCH, E.: The Panel Action should be Reject. The referenced standards for the protection techniques "pD" and "iD" are not currently published.
COOK, D.: Panel should reject this proposal based on the fact that applicable product standards are not published.
LAWRENCE, JR., W.: The panel action should have been to "reject" as the reference standards ISA 61241-2 and 61241-11are not yet published.
NEAGLE, J.: The standards referenced in the substantiation, covering the types of protection listed in the recommendation, have not yet been published. The panel action should be to reject this proposal.

14-150b Log #CP1410 NEC-P14 **Final Action: Accept**
(506.9(C)(1) & (2) (New))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 14,
Recommendation: Revise as indicated and add the following all new text following tD and renumber as indicated:
(1) Division Equipment. Equipment identified for Class II, Division 1 or Class II, Division 2 shall, in addition to being marked in accordance with 500.8(B), be permitted to be marked with both of the following:
(1) Zone 20, 21, or 22 (as applicable)
(2) Temperature classification in accordance with 506.9(D)
(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in 506.8 shall be marked with the following in the order shown:
(1) Symbol "AEx"
(2)Protection technique(s) in accordance with Table 506.20 (F) (1);
(3) Zone
(4) Temperature classification, marked as a temperature value, in degrees C, preceded by T;
(5) Ambient temperature marking in accordance with 506.9(D).
Substantiation: The recommendation provides marking requirements for zone equipment.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 2
Explanation of Negative:
COOK, D.: Panel should reject this proposal based on the fact that applicable product standards are not published.
LAWRENCE, JR., W.: The panel action should have been to "reject" as Table 506-20(F)(1) should not have been added (14-153a)as the types of protection referred to in the Table have not yet been added to Article 506.

14-151 Log #2566 NEC-P14 **Final Action: Accept in Principle**
(506.9(F))

Submitter: Peter Schimmoeller, CSA International
Recommendation: Add new text as follows:
506.9(F) Fiber Optic Cable Assembly. Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Article 506, as applicable.
Substantiation: Current Code does not address fiber optical cables with electrical conductors used in Zone 20, 21, or 22 classified locations. This proposal adds wording similar to that found in Division classified locations.
Panel Meeting Action: Accept in Principle
The panel accepts the recommendation in principle with the following revision:
506.9(F) Fiber Optic Cable Assembly. Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with 506.15 and 506.16, as applicable.
Panel Statement: The panel has revised the recommendation to specifically require compliance with the applicable wiring method and sealing rules.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-152 Log #2473 NEC-P14 **Final Action: Accept**
(506.15(A)(3))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and to relocate the reference in the FPNs into Annex A to be consistent with other parts of the Code. This action will be considered by the panel as a public comment.
Submitter: Donald W. Ankele, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
(3) In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type MC- HL cable, listed for use in Zone 20 locations, with a gas/vaportight continuous corrugated metallic sheath, and overall jacket of suitable polymeric material, separate grounding conductors in accordance with 250.122, and provided with termination fittings listed for the application, shall be permitted.
Exception: Type MC- HL cable and fittings listed for Class II, Division 1 locaitons are permitted to be used.
FPN 1: See 330.12 for restrictions on use of Type MC cable.
FPN 2: For further information on construction, testing and marking requirements for Type MC-HL cable and Type MC-HL cable fittings, see ANSI/UL 2225, Cables and Cable Fittings for Use in Hazardous (Classified) Locations.

Substantiation: Type MC cable listed specifically for hazardous locations carries the HL marking. This is consistent with similar portions of Chapter 5. Add FPN 1 to refer to Article 330. Add FPN 2 to reference the ANSI standard for Type MC-HL cable and Type ITC-HL cables and cable fittings to aid approval of the installation for the location involved.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-153 Log #2210 NEC-P14 **Final Action: Reject**
(506.15(C)(6))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise as follows:
Type MC, MI, PA , MV in TC cable installed in ladder, ventilated trough..
Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.
Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (506.15(C)(6)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: This cable is not currently recognized as a Chapter 3 wiring method. CMP-14 notes that CMP-7 rejected a proposal to include this type of cable in Chapter 3.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-153a Log #CP1411 NEC-P14 **Final Action: Accept**
(506.20 & Table 506.20(F) (New))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 14,
Recommendation: Add the following new text following tD and renumber as indicated:
(F) Types of Protection Allowed. The types of protection allowed in Zones, 20, 21 and 22 are shown in Table 506.20 (F).

Table 506.20(F) Types of Protection Designation

Protection Type	Zone 20	Zone 21	Zone 22
Protection by enclosures 'tD'	Not allowed	tD	tD
Protection by pressurization "pD"	Not allowed	pD	pD
Protection by intrinsic safety "iD"	iaD	iaD ibD	iaD ibD
Protection by encapsulation "mD"	maD	maD mbD	maD mbD

Substantiation: This table is provided as a means of reflecting the correct zone of application for the defined type of protection.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 10 Negative: 4
Explanation of Negative:
BRIESCH, E.: The Panel Action should be Reject. The standards defining the protection techniques tabulated in Table 506.20(F) are not currently published. The Table therefore serves no purpose.
COOK, D.: Panel should reject this proposal based on the fact that applicable product standards are not published.
LAWRENCE, JR., W.: The panel action should have been to "reject" as the types of protection referred to in the Table have not yet been added to Article 506.
NEAGLE, J.: The standards covering the types of protection listed in the table have not yet been published. The panel action should be to reject this proposal.

14-154 Log #2767 NEC-P14 **Final Action: Reject**
(506.25(A))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new last sentence to 506.25(A) to read as follows:
When a bonding jumper is used, it shall be sized in accordance with 250.102(D).
Substantiation: There is no clear statement specifying the minimum size required when a bonding jumper is used for bonding back to the service for a circuit serving a classified hazardous location.
Panel Meeting Action: Reject
Panel Statement: Since 90.3 states the general requirements apply unless modified by the special requirements in Chapters 5, 6, and 7, the requirements in 250.102(D) are applicable without reference. This section does not modify the sizing requirement.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-155 Log #2407 NEC-P14 **Final Action: Reject**
(506.25(A) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be reconsidered and correlated with the action on Proposal 5-119. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
506.25 Grounding and Bonding. Grounding and bonding shall compu with Article 250 and the requirements in 506.25(A) and 506.25(B).
(A) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, and so forth, between Zone 20, Zone 21, and Zone 22 locations and the point of grounding for service equipment or point of grounding of a separately derived system.
~~Exception: The specific bonding means shall be required only to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in 250.32(A), (B), and (C), if the branch circuit overcurrent protection is located on the load side of the disconnecting means.~~
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Reject
Panel Statement: The panel rejects this proposal based on the fact that the sole substantiation is acceptance of a companion proposal by CMP-5. Without current knowledge of CMP-5's actions on these companion proposals, CMP-14 has no alternative other than to reject and await any necessary correlating action recommended by the TCC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
BERNSEN, M.: I agree with the change being proposed in Proposal 5-119. The use of an equipment grounding conductor in the feeder or branch circuit supplying a separate building should not be optional. The current rule is an exception to the general requirement found in 250.24(A)(5), stating that a "grounding connection shall not be made to the grounded conductor on the load side of the service disconnecting means." It took the code making process a long time to rectify the exception to the rule for ranges and clothes dryers. Proposal 14-43 would remove another unnecessary exception to the rule.
My vote to Reject proposal 14-43 concurs with the substantiation provided by Code-Making Panel 14. My vote, however, would be to Accept this proposal if Code-Making Panel 5 makes a wise decision and votes to Accept Proposal 5-119.

14-155a Log #CP1403 NEC-P14 **Final Action: Accept**
(506.25(B))

Submitter: Code-Making Panel 14,
Recommendation: Revise 506.25(B) to read:
Liquidtight flexible metal conduit shall not be used as the sole ground-fault current path. Where equipment bonding jumpers are installed, they shall comply with 250.102.
Retain the exisiting exception.
Substantiation: The revised wording clarifies the requirement and is parallel language to the same requirements in Articles 501, 502, 503, and 505
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 511 — COMMERCIAL GARAGES, REPAIR AND STORAGE

14-156 Log #3412 NEC-P14 **Final Action: Reject**
(511.2 (New) and 511.3)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Add a new 511.2 and Revise 511.3 to read as follows:
511.2 Definitions.
Major Repair Garage. A building or portions of a building where major repairs, such as engine overhauls, painting, body and fender work, and repairs that require draining of the motor vehicle fuel tank are performed on motor vehicles, including associated floor space used for offices, parking, or showrooms. [NFPA 30A-2003, 3.3.12.1]
Minor Repair Garage. A building or portions of a building used for lubrication, inspection, and minor automotive maintenance work, such as engine tune-ups, replacement of parts, fluid changes (e.g., oil, antifreeze, transmission fluid, brake fluid, air conditioning refrigerants, etc.), brake system repairs, tire rotation, and similar routine maintenance work, including associated floor space used for offices, parking, or showrooms. [NFPA 30A-2003, 3.3.12.2]
511.3 Area Classification, General. Where Class I liquids or gaseous fuels are stored, handled, or transferred, electrical wiring and electrical utilization equipment shall be designed in accordance with the requirements for Class I, Division 1 or 2 hazardous (classified) locations as classified in accordance with 500.5 and 500.6, and this article. A Class I location shall not extend beyond an unpierced wall, roof, or other solid partition that has no openings. [NFPA 30A-2003, 8.3.5, 8.3.2]
(A) Parking Garages. Parking garages used for parking or storage shall be unclassified.
FPN: For further information, see NFPA 88A-2002, Standard for Parking Structures, and NFPA 30A-2003, Code for Motor Fuel Dispensing Facilities and Repair Garages.
(B) Repair Garages, With Dispensing. Major and minor repair garages that dispense motor fuels into the fuel tanks of vehicles, including flammable liquids having a flash point below 38°C (100°F), such as gasoline, or gaseous fuels, such as natural gas, hydrogen, or LPG, shall have the dispensing functions and components classified in accordance with Table 514.3(B)(1) in addition to any classification required by this section. Where Class I liquids, other than fuels, are dispensed, the area within 900 mm (3 ft) of any fill or dispensing point, extending in all directions, shall be a Class I, Division 2 location.
(C) Major Repair Garages. Where flammable liquids having a flash point below 38°C (100°F), such as gasoline, or gaseous fuels, such as natural gas, hydrogen, or LPG, will not be dispensed, but repair activities that involve the transfer of such fluids or gases are performed, the classification rules in (1), (2) and (3) shall apply.
(1) Floor Areas.
(a) Ventilation Provided. The floor area shall be unclassified where there is mechanical ventilation providing a minimum of four air changes per hour or one cubic foot per minute of exchanged air for each square foot of floor area. Ventilation shall provide for air exchange across the entire floor area and exhaust air shall be taken at a point within 0.3 m (12 in.) of the floor.
(b) Ventilation Not Provided. The entire floor area up to a level of 450 mm (18 in.) above the floor shall be classified as Class I Division 2 if the ventilation does not comply with 511.3(B)(1)(a).
(2) Ceiling Areas. Where lighter-than-air gaseous fueled vehicles, such as vehicles fueled by natural gas or hydrogen, are repaired or stored, the area within 450 mm (18 in.) of the ceiling shall be considered for classification in accordance with (a) and (b).
(a) Ventilation Provided. The ceiling area shall be unclassified where ventilation is provided, from a point not less than 450 mm (18 in.) from the highest point in the ceiling, to exhaust the ceiling area at a rate of not less than 0.3 $m^3/min/m^2$ (1 cfm/ft^2) of ceiling area at all times that the building is occupied or when vehicles using lighter-than-air gaseous fuels are parked below this area.
(b) Ventilation Not Provided. Ceiling areas that are not ventilated in accordance with 511.3(C)(2)(a) shall be classified as Class I, Division 2.
(3) Pit Areas in Lubrication or Service Room. Any pit, belowgrade work area, or subfloor work area shall be classified as provided in (a) or (b).
(a) Ventilation Provided. The pit area shall be a Class I Division 2 location where there is mechanical ventilation providing a minimum of six air changes per hour.
{Where ventilation is provided to exhaust the pit area at a rate of not less than 0.3 $m^3/min/m^2$ (1 cfm/ft^2) of floor area at all times that the building is occupied or when vehicles are parked in or over this area and where exhaust air is taken from a point within 300 mm (12 in.) of the floor of the pit, belowgrade work area, or subfloor work area, the pit shall be unclassified. [NFPA 30A-2003, 7.4.5.4 & Table 8.3.1]}
(b) Ventilation Not Provided. Where ventilation is not provided in accordance with 511.3(C)(3)(a), any pit or depression below floor level shall be a Class I, Division 1 location that extends up to the floor level.
(D) Minor Repair Garages. Where flammable liquids having a flash point below 38°C (100°F), such as gasoline, or gaseous fuels, such as natural gas or hydrogen, will not be dispensed or transferred, the classification rules in (1), (2) and (3) shall apply to the lubrication and service rooms.
(1) Floor Areas. Floor areas in minor repair garages without pits, belowgrade work areas, or subfloor work areas shall be unclassified. Where floor areas include pits, belowgrade work areas or subfloor work areas in lubrication or service rooms, the classification rules in (a) or (b) shall apply.
(a) Ventilation Provided. The entire floor area shall be unclassified where there is mechanical ventilation providing a minimum of four air changes per hour or one cubic foot per minute of exchanged air for each square foot of floor area. Ventilation shall provide for air exchange across the entire floor area and exhaust air shall be taken at a point within 0.3 m (12 in.) of the floor.
(b) Ventilation Not Provided. The floor area up to a level of 450 mm (18 in.) above any unventilated pit, belowgrade work area, or subfloor work area and extending a distance of 900 mm (3 ft) horizontally from the edge of any such pit, belowgrade work area, or subfloor work area shall be classified as Class I Division 2.
(2) Ceiling Areas. Where lighter-than-air gaseous fuels (such as natural gas or hydrogen) will not be transferred, such locations shall be unclassified.
(3) Pit Areas in Lubrication or Service Room. Any pit, belowgrade work area, or subfloor work area shall be classified as provided in (a) or (b).
(a) Ventilation Provided. Where ventilation is provided to exhaust the pit area at a rate of not less than 0.3 $m^3/min/m^2$ (1 cfm/ft^2) of floor area at all times that the building is occupied or when vehicles are parked in or over this area and where exhaust air is taken from a point within 300 mm (12 in.) of the floor of the pit, belowgrade work area, or subfloor work area, the pit shall be unclassified. [NFPA 30A-2003, 7.4.5.4 & Table 8.3.1]
(b) Ventilation Not Provided. Where ventilation is not provided in accordance with 511.3(D)(3)(a), any pit or depression below floor level shall be a Class I, Division 2 location that extends up to the floor level.
(E) Modifications to Classification.
(1) Specific Areas Adjacent to Classified Locations. Areas adjacent to classified locations in which flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, shall be unclassified where mechanically ventilated at a rate of four or more air changes per hour, or designed with positive air pressure, or where effectively cut off by walls or partitions.
(2) Alcohol-Based Windshield Washer Fluid. The area used for storage, handling, or dispensing into motor vehicles of alcohol-based windshield washer fluid in repair garages shall be unclassified unless otherwise classified by a provision of 511.3. [NFPA 30A-2003. 8.3.5, Exception]
Substantiation: This proposal generally preserves the technical content of 511.3, but presents the information in a much more user-friendly manner. There are two editorial difficulties with the organization of the panel action on the proposal. First, by presenting the user with two disconnected laundry lists of areas that either are or are not classified, it makes finding the requirements for a given area under consideration difficult. For example, in garages where flammable liquids will not be transferred, one finds these locations on two lists; the one in (A)(6) saying they are not classified, and the one in (B)(2) saying they are in some locations. Although there is a cross reference, the organization is confusing at best. Second, the layout fails to take full advantage of the crucial distinctions in NFPA 30A between major and minor repair garages. This is particularly problematic in that 511.3(B)(4) specifically uses the termonology "major repair garages."
Therefore, and since the distinctions between major and minor repair garages, particularly the potential "transfer" of flammable materials inform most of the technical provisions in the current NEC text, the submitter opens this proposal with those two definitions extracted from NFPA 30 and placed in 511-2, the appropriate section for definitions. The comment then organizes the requirements based on specific locations, as follows:
511.3: This adds appropriate parent language for area classification for this section, including additional language extracted from 30A. The lettered subsections following all cover area classifications within their scope.
511.3(A): This is the parking garage material, unamended.
511.3(B): This is the language that brings in Article 514 when actual fuel dispensing is part of the operation. This is 511.3(B)(1) and 511.3(B)(3)(5) in the NEC.
511.3(C): This is where major repair garages land. They have three areas requiring consideration for classification, and the numbered subsections proceed accordingly. The parent language effectively calls attention to the provision in the definition regarding fuel tanks, thereby reiterating the distinction for clarity.
511.3(C)(1)(a): This is 511.3(A)(5) in the NEC.
511.3(C)(1)(b): This is 511.3(B)(3)(1) and (4) in the NEC
511.3(C)(2)(a) and (b): These are 511.3(A)(7) and 511.3(B)(4) in the NEC
511.3(C)(3)(a) and (b): These are 511.3(B)(3)(2), and 511.3(B)(3)(3) in the NEC. Note that the ventilated pit rules in the NEC arguably conflict with NFPA 30A allowances for an unclassified location with adequate ventilation; this allowance in NFPA 30A appears to apply to both major and minor repair garages. CMP 14 should decide whether the extract policy will affect the outcome of this classification rule. If it does, the correlated text appears within {curly braces}.
511.3(D)(1): This is 511.3(A)(6) in the proposal incorporated into the floor area requirement, and correlation of the floor area requirements for above "pits" that are in 511.3(A)(4) and 511.3(B)(2) in the NEC. If a minor repair garage has an unventilated pit, it could be argued the NEC classifies the floor

area around the pit as Div. 2, even if the general shop floor met the ventilation requirements for a major repair garage, even though the pit itself is only Class I Div. 2. The structure in this proposal provides overall consistent technical content to that of the NEC: The entire floor area is unclassified if ventilated, and even if not, only the floor area over or to the edge (within 3 ft) of an unventilated pit is classified.

511.3(D)(2): The submitter understands that the issue of ceiling classifications for minor repair garages has been discussed within the 30A Committee, and the conclusion reached that potential gas releases were too minor to warrant classification, which is why 30A only imposes the ceiling classification requirement on major repair garages. This does need to be addressed, however, in this part of the requirements in order to avoid obvious questions.

511.3(D)(3): This is 511.3(A)(4) and 511.3(B)(2)(1) of the NEC. Note that 511.3(B)(2)(2) of the NEC is included in 511.3(D)(1)(b) of this proposal, assuming no general floor ventilation.

511.3(E): This is 511.3(A)(2) and 511.3(A)(3) in the proposal, editorially modified to make a positive declaration of classification. Since these topics are of comparatively minor interest and application, it made more sense to place them at the end of the section.

The reformatted layout includes all provisions contained in the NEC, but reformatted by location. This proposal is offered as a constructive suggestion for a far more user-friendly presentation of this material, and the submitter requests CMP 14 consider it accordingly. The submitter wishes to thank Marshall Klein of the 30A Committee, who graciously took time to review this material on several occasions.

Panel Meeting Action: Reject

Panel Statement: The panel concludes that the recommended text does not improve the usability of this section. The panel notes that the recommendation includes a change that creates mandatory language considering the classification of parking garages, which is different from the permissive language in the 2005 NEC.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-157 Log #1628 NEC-P14 **Final Action: Accept**

(511.3(A)(6))

Submitter: Tom Henry, Code Electrical Classes, Inc.

Recommendation: Revise text to read as follows:

Such location shall be considered to be unclassified ~~.~~ <u>,</u> unless the location is required to be classified in accordance with 511.3(B)(2) or (B)(4).

Substantiation: Remove period and replace with comma as shown above.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-158 Log #998 NEC-P14 **Final Action: Accept**

(511.3(B)(1))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Change "Article 514" to "514.3".

Substantiation: Edit. To conform to Style Manual requirements.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-159 Log #3414 NEC-P14 **Final Action: Reject**

(511.4(A))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Insert a second paragraph as follows:

Raceways buried beneath the floor of a classified location covered in 511.3 shall not be considered to be in a classified location, but shall be sealed within 3.05 m (10 ft) of the point of emergence above grade in accordance with 501.15(A)(4).

Substantiation: CMP 14 removed the classification requirements for these raceways in the 2005 cycle based on the premise that there was insufficient oxygen available to create an explosive fuel-air mixture. Although this is presumably true, the concentration of flammable materials below grade in these areas is well known. As these chemicals infiltrate the underground conduit system, they will migrate through the conduit to a point where air is plentiful. Remember that the current NEC does require a boundary seal, but with the underground area no longer classified, that boundary seal could be placed at a point before the conduit system enters the floor from the repair garage area. This proposal restores a sealing requirement (need not be explosionproof) at the point where a hazardous fuel-air mixture could form. Note that 514.8 retains a similar requirement. Note also that a short underground run accomplished with an unbroken length of conduit qualifies under this wording for treatment under 501.15(A)(4) Exception No.1, and only one seal at either end of the raceway is allowable.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its action for the 2005 NEC, and the submitter has not provided technical substantiation that convinces the panel it is necessary to require an explosionproof seal at the point of emergence. Additionally, based on the reference to 501.15(A)(4) in the recommended text, the panel does not concur with the submitter's substantiation that the seal does not have to be explosionproof. Seals installed to meet the requirements of 501.15(A)(4) are required to be explosionproof.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-160 Log #2211 NEC-P14 **Final Action: Reject**

(511.7(A)(1))

Submitter: Kyle Cope, Prysmian Cables and Systems

Recommendation: Revise as follows:

"... or liquidtight flexible nonmetallic conduit, or shall be Type MC, AC, MI, <u>PA</u> manufactured wiring systems...".

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (511.7(A)(1)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This cable is not currently recognized as a Chapter 3 wiring method. CMP-14 notes that CMP-7 rejected a proposal to include this type of cable in Chapter 3.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-161 Log #237 NEC-P14 **Final Action: Reject**

(511.7(B)(1)(b))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

"Fixed Lighting. Lamps and lampholders for fixed lighting that is located over lanes through which vehicles are commonly driven or that may otherwise be exposed to ~~physical~~ damage shall be located not less than...".

Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-162 Log #236 NEC-P14 **Final Action: Reject**

(511.10(B)(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

Where an automatic arrangement is provided to pull both cord and plug beyond the range of ~~physical~~ damage, no additional connector shall be required in the cable or at the outlet.

Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the

Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See the panel statement on Proposal 14-50 which provides a thorough explanation for the rejection of this proposal and others recommending the elimination of "physical".
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-163 Log #514 NEC-P14 **Final Action: Accept in Part**
(511.16(A) & (B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
511.16 ~~Grounded and~~ Grounding and Bonding Requirements.
(A) General Grounding and Bonding Requirements. All metal raceways, the metal armor or metallic sheath on cables, and all normally non-current-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded and bonded as provided in Article 250.
(B) Supplying Circuits with Grounded and Grounding Conductors in Class I Locations. Grounding in Class I location shall comply the grounding and bonding ~~with~~ requirements in 501.30.
Substantiation: 501.30 includes both grounding and bonding requirements for Class I locations. Both grounding and bonding requirements should be referenced here since 501.30 includes both grounding and bonding rules and is referenced from this section.
Panel Meeting Action: Accept in Part
Panel Statement: The panel accepts only the recommendation to revise the title of this section. The panel rejects the revisions to (A) and (B) because the submitter has not provided technical substantiation to support the recommendation.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: The proposed change and substantiation is correct.

14-164 Log #1255 NEC-P14 **Final Action: Reject**
(511.16(A))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting in accordance with 4.1.1 of the NEC Style Manual. This action will be considered by the panel as a public comment.
Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete: "as provided in Article 250".
Substantiation: Edit. To comply with the Style Manual. Article 250 already applies per 90.3.
Panel Meeting Action: Reject
Panel Statement: The grounding requirement in this section is unique in that it applies regardless of the voltage. Where the reference to an entire article is conditional based on specific requirements in a particular article, the NEC Style Manual permits the reference to an entire article.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13 Negative: 1
Explanation of Negative:
COOK, D.: Submitter is correct that compliance with Article 250 is required by 90.3. Deleting that text will not change the requirement.

14-165 Log #1754 NEC-P14 **Final Action: Accept**
(511.16(B)(2))

Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Replace the term "portable lamp" with the term " portable luminaire ". Revise text as follows:
511.16 Grounded and Grounding Requirements
(B) Supplying Circuits with Grounding and Grounding Conductors in Class I Locations
(2) Approved Means. Approved means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the non-current-carrying metal portions of pendant luminaires (fixtures), portable ~~lamps~~ luminaires , and portable utilization equipment.
Substantiation: The term "luminaire" has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms "fixture" or "lighting fixture", which were terms for fixed lighting systems.
The term "portable luminaire" has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled "Portable Electric Lamps" and is now titled "Portable Electric Luminaires".
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 513 — AIRCRAFT HANGARS

14-165a Log #CP1413 NEC-P14 **Final Action: Accept**
(513.2)

Submitter: Code-Making Panel 14,
Recommendation: Add a new definition to read:
Aircraft Painting Hangar. An aircraft hangar constructed for the express purpose of spray/coating/dipping applications and provided with dedicated ventilation supply and exhaust.
Substantiation: Aircraft paint hangars have not been previously defined and with the acceptance of proposal Log# CP1412 this is a necessary definition.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-165b Log #CP1412 NEC-P14 **Final Action: Accept**
(513.3(C))

Submitter: Code-Making Panel 14,
Recommendation: Revise current text and add new text as follows:
(C) Vicinity of Aircraft.
(1) Aircraft Maintenance and Storage Hangars. [retain current text of 513.3(C)]
(2) Aircraft Painting Hangars. The area within 3m (10ft) horizontally from aircraft surfaces from the floor to 3m (10ft) above the aircraft shall be classified as Class I, Division 1 or Class I, Zone 1. The area horizontally from aircraft surfaces between 3.0m (10ft) and 9.0m (30) from the floor to 9.0m (30ft) above the aircraft surface shall be classified as Class I, Division 2 or Class I, Zone 2.
FPN: See NFPA 33-2003, Standard for Spray Application Using Flammable or Combustible Materials for information on ventilation and grounding for static protection in spray painting areas.
Substantiation: NFPA 409-2005 has been revised to specifically separate the hazardous locations near aircraft for aircraft paint hangars from those of general maintenance. Aircraft paint hangars while constructed like huge paint booths do not have the same dimensional clearances found in traditional paint booths. The shape of the aircraft creates clearances far greater than that found in any other painting system. This creates a level of safety not found in traditional paint booths and supports hazardous location classification that is less than the entire hangar.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14
Comment on Affirmative:
COOK, D.: While I understand the need and use for the proposed new item (C)(2), it should be clarified that the classified area described in (C)(2) is in addition to the described in (C)(1) not a replacement of the classified area from (C)(1).

14-166 Log #2180 NEC-P14 **Final Action: Accept**
(513.3(D))

Submitter: Dann Strube, Strube Consulting
Recommendation: Revise text to read as follows:
"...electrical control rooms, and other similar locations, ~~shall not be classified~~ shall be unclassified where...".
Substantiation: 500.2 defines areas that have not been classified as "Unclassified Locations". This change will put the language of this section into agreement with the 500.2 definition.
4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-167 Log #2212 NEC-P14 **Final Action: Reject**
(513.7(A))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise as follows:
"... shall be installed in metal raceways or shall be Type MI, TC, PA or MC cable.
Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials.

The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (513.7(A)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This cable is not currently recognized as a Chapter 3 wiring method. CMP-14 notes that CMP-7 rejected a proposal to include this type of cable in Chapter 3.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-168 Log #1755 NEC-P14 **Final Action: Accept**

(513.10(E)(1), 513.16(B)(2))

Submitter: David Belt, Underwriters Laboratores Inc.

Recommendation: Replace the term “portable lamp” with the term “ portable luminaire “. Revise text as follows:

513.10 Special Equipment

(1) Portable Lighting Equipment. Portable lighting equipment that is used within a hangar shall be identified for the location in which they are used. For portable ~~lamps~~ luminaires , flexible cord suitable for the type of service and identified for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

513.16 Grounding and Grounding Requirements

(B) Supplying Circuits with Grounded and Grounding Conductors in Class I Locations

(2) Approved Means. Approved means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the non-current-carrying metal portions of pendant luminaires (fixtures), portable ~~lamps~~ luminaires , and portable utilization equipment.

Substantiation: The term “luminaire” has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms “fixture” or “lighting fixture”, which were terms for fixed lighting systems.

The term “portable luminaire” has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled “Portable Electric Lamps” and is now titled “Portable Electric Luminaires”.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-169 Log #513 NEC-P14 **Final Action: Accept in Part**

(513.16(A))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read:

513.16 ~~Grounded and~~ Grounding and Bonding Requirements.

(A) General Grounding and Bonding Requirements. All metal raceways, the metal armor or metallic sheath on cables, and all normally non-current-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded and bonded as provided in Article 250. Grounding and bonding in Class I locations shall comply with 501.30 for Class I, Division 1 and 2 locations and 505.25 for Class I, Zone 0, 1, and 2 locations.

Substantiation: 501.30 and 505.25 include both grounding and bonding requirements for Class I locations. This proposed change is an effort to clarify what is actually covered by this section.

Panel Meeting Action: Accept in Part

Panel Statement: The panel accepts only the recommendation to revise the title of this section. The panel rejects the revisions to (A) because the submitter has not provided technical substantiation to support the recommendation.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: The proposed change and substantiation is correct.

14-170 Log #1500 NEC-P14 **Final Action: Reject**

(513.16(A))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting in accordance with 4.1.1 of the NEC Style Manual. This action will be considered by the panel as a public comment.

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete:

“... in accordance with Article 250”.

Substantiation: Edit. 250.1 indicates Article 250 covers (1) required grounding; (2) permitted grounding: (3) not permitted grounding; and (4) substitution for grounding. Apparent intent is to apply (1) required grounding, which is clarified by the proposal. Some sections requiring grounding do not refer to Article 250, e.g. 490.36. Article 250 already applies, per 90.3.

Panel Meeting Action: Reject

Panel Statement: The grounding requirement in this section is unique in that it applies regardless of the voltage. Where the reference to an entire article is conditional based on specific requirements in a particular article, the NEC Style Manual permits the reference to an entire article.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: Submitter is correct that compliance with Article 250 is required by 90.3. Deleting that text will not change the requirement.

ARTICLE 514 — MOTOR FUEL DISPENSING FACILITIES

14-171 Log #2912 NEC-P14 **Final Action: Reject**

(514.1)

TCC Action: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

Submitter: Marcus Sampson, Lysistrata Electric

Recommendation: Revise as follows:

514.1 Scope. This article shall apply to motor fuel dispensing facilities, marine/motor fuel dispensing facilities, motor fuel dispensing facilities located inside buildings, and fleet vehicle motor fuel dispensing facilities. The requirements of this article do not apply to dispensing facilities used exclusively for diesel motor fuel.

Substantiation: Although 514.3(A) makes it clear that areas where flammable liquids with a flash point above 38°C (100°F) shall not be required to be classified, diesel fuel dispensing facilities are often required to conform to the criteria of this article. This statement in the scope of Article 514 would assist installers and inspectors in their understanding and enforcement of the requirements.

Panel Meeting Action: Reject

Panel Statement: The assessment of whether diesel fuel should fall within the requirement of Article 514 is dependent on ambient temperature, how the fuel is stored, and the range of diesel fuels that are available. There are some diesel fuels that have flashpoints below 100 degrees F. The scope of the article does not preclude the application of requirements that are in addition to the area classification rules. Some of the requirements apply to all motor fuel dispensing facilities.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-172 Log #1667 NEC-P14 **Final Action: Reject**

(Table 514.3(B)(1))

Submitter: Wayne H. Robinson, Prince George County Government

Recommendation: Revise text to read as follows:

Dispensing Device 2, 5, 1

(except overhead type)

Dispensing Device 5, 1

(Overhead type 3)

Substantiation: The 2005 Code added marine fuel dispensing facilities to Article 514, note 1 was added on page 70-396 but wasn’t applied to the table.

Panel Meeting Action: Reject

Panel Statement: The application of the notes within the table are adequately expressed in the current text. Table note 1 is found at the top of the column “Extent of Classified Location 1 .”

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-173 Log #1627 NEC-P14 **Final Action: Reject**

(514.4)

Submitter: Tom Henry, Code Electrical Classes, Inc.

Recommendation: Add new text as follows:

5 14.4 Wiring and equipment installed in Class I locations.

Substantiation: Add the 5 to 14.4, the 5 is missing.

Panel Meeting Action: Reject

Panel Statement: The recommended action has been accomplished through a correction to the first printing to the 2005 NEC and NECH.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-174 Log #3066 NEC-P14 **Final Action: Reject**

(514.11(B))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read as follows:

514.11(B) Attended Self-Service Motor Fuel Dispensing Facilities. An attended self-service facility is one where an employee is assigned exclusively to monitor the activity of self-service customers at the dispenser location.

Emergency controls as specified in 514.11(A) shall be installed at a location ~~acceptable to the authority having jurisdiction~~ within sight of the dispensers , ~~but controls~~ and shall not be more than 30 m (100 ft) from the fuel dispensers.

Substantiation: The problem is that there is no definition of "attended". This rewrite will clarify and make it possible to comply with rules of safety.

Panel Meeting Action: Reject

Panel Statement: The recommended text is inconsistent with the use of the term in NFPA 30A and does not improve the usability and application of these requirements. The operational requirements for "attended self-service motor fuel dispensing facilities" are covered in NFPA 30A.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-175 Log #3067 NEC-P14 **Final Action: Reject**
(514.11(C))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read as follows:

514.11(C) Unattended Self-Service Motor Fuel Dispensing Facilities. An unattended self-service facility is one where all employees are assigned exclusively to conduct business indoors and remote from the fuel dispensers. Emergency controls as specified in 514.11(A) shall be installed at a location ~~acceptable to the authority having jurisdiction~~ within sight of the dispensers , ~~but the control~~ and shall be more than 6 m (20 ft) but less than 30 m (100 ft) from the fuel dispensers. Additional...".

Substantiation: The problem is that there is no definition of "unattended". This rewrite will clarify and make it possible to comply with rules of safety. The phrase "acceptable to the authority having jurisdiction" is not necessary here.

Panel Meeting Action: Reject

Panel Statement: The recommended text is inconsistent with the use of the term in NFPA 30A and does not improve the usability and application of these requirements. The term "unattended self-service motor fuel dispensing facilities" is clear, and operational requirements for these facilities are covered in NFPA 30A.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-176 Log #354 NEC-P14 **Final Action: Reject**
(514.13)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

514.13 Each dispensing device shall be provided with a means to remove all external voltage sources, including feedback, during periods of maintenance and service of the dispensing equipment. The location of this means shall be permitted to be other than inside or adjacent to the dispensing device. The means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker and shall remain in place with or without the lock installed.

Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.

Panel Meeting Action: Reject

Panel Statement: The panel is concerned that the recommended text would preclude the use of some forms of locking (other than portable) devices for disconnecting means, and because of the complexity of some dispensing equipment, the recommended text may not be practical for this application.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: The proposed text is consistent with 430.102(B) Exception that addresses the method to lock a motor off from a remote location. The hazard to workers is the same.

Comment on Affirmative:

BERNSEN, M.: The proposal to require locking devices to remain in place whether or not a lock is installed provides added safety for electricians working on electrical systems in energized buildings. In an era where we are more aware of the arc fault dangers of energized circuits, we should make every attempt to provide permanent methods for assuring that a circuit which is turned off for maintenance or repair can be made to remain off until the work is complete.

The means to comply with the requirements of this proposal are currently available and are currently required by other articles of the Code. The proposal does not make the requirement retroactive; it would only be applied to new installations. The proposal would enhance the safety of the future installations with little effect on the economics of the installation. The changes make sense and should be approved.

14-177 Log #2040 NEC-P14 **Final Action: Reject**
(514.13)

Submitter: James T. Dollard, Jr., IBEW Local 98

Recommendation: Revise text to read as follows:

514.13 Provisions for Maintenance and Service of Dispensing Equipment Each dispensing device shall be provided with a means to remove all external voltage sources, including feedback, during periods of maintenance and service of the dispensing equipment. The location of this means shall be permitted to be other than inside or adjacent to the dispensing device. The means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

Substantiation: The problem with the present wording of this section is that the disconnect for some motor fuel dispensing equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where motor fuel dispensing equipment is involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for motor fuel dispensing equipment.

Panel Meeting Action: Reject

Panel Statement: The panel is concerned that the recommended text would preclude the use of some forms of locking (other than portable) devices for disconnecting means and because of the complexity of some dispensing equipment, the recommended text may not be practical for this application.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13 Negative: 1

Explanation of Negative:

COOK, D.: The proposed text is consistent with 430.102(B) Exception that addresses the method to lock a motor off from a remote location. The hazard to workers is the same.

Comment on Affirmative:

BERNSEN, M.: See my Comment on Affirmative on Proposal 14-176.

14-178 Log #501 NEC-P14 **Final Action: Accept**
(514.16)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise as follows:

514.16 Grounding and Bonding. All metal raceways, the metal armor or metallic sheath on cables, and all non-current-carrying metal parts of fixed portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding and bonding in Class 1 locations shall comply with 501.130.

Substantiation: 501.130 includes both grounding and bonding requirements for Class I locations. This proposed change is an effort to clarify what is actually covered by this section.

Panel Meeting Action: Accept

Panel Statement: The panel notes that the correct reference is 501.30.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 14

14-179 Log #504 NEC-P14 **Final Action: Accept**
(514.16)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise as follows:

514.16 Grounding and Bonding . All metal raceways, the metal armor or metallic sheath on cables, and all non-current-carrying metal parts of fixed portable electrical equipment, regardless of voltage,shall be grounded as

provided in Article 250. Grounding and bonding in Class I locations shall comply with 501.130.
Substantiation: 501.30 includes both grounding and bonding requirements for Class I locations. This proposed change is an effort to clarify what is actually covered by this section.
Panel Meeting Action: Accept
Panel Statement: The panel notes that the correct reference is 501.30.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-180 Log #521 NEC-P14 **Final Action: Accept**
(514.16)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
514.16 Grounding and Bonding . All metal raceways, the metal armor or metallic sheath on cables, and all non-current-carrying metal parts of fixed portable electrical equipment, regardless of voltage, shall be grounded and bonded as provided in Article 250. Grounding and bonding in Class I locations shall comply with 501. ~~1~~ 30.
Substantiation: 501.30 includes both grounding and bonding requirements for Class I locations. This proposed change is an effort to clarify what is actually covered by this section. The reference to 510.130 in the last sentence should be to 501.30. 501.130 provides the rules for luminaries (light fixtures) in Class I locations.
Panel Meeting Action: Accept
Panel Statement: The panel notes that the correct reference is 501.30.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-181 Log #1038 NEC-P14 **Final Action: Reject**
(514.16)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to 4.1.1 of the NEC Style Manual. This action will be considered by the panel as a public comment.
Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete “as provided in Article 250.”
Substantiation: Edit. Article 250 already applies per 90.3. References should not be made to entire articles.
Panel Meeting Action: Reject
Panel Statement: The grounding requirement in this section is unique in that it applies regardless of the voltage. Where the reference to an entire article is conditional based on specific requirements in a particular article, the NEC Style Manual permits the reference to an entire article.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-182 Log #1626 NEC-P14 **Final Action: Reject**
(514.16)

Submitter: Tom Henry, Code Electrical Classes, Inc.
Recommendation: Revise text to read as follows:
Grounding in Class I locations shall comply with 501. ~~130~~ 30 .
Substantiation: Remove 501.130 and the text should read 501.30.
Panel Meeting Action: Reject
Panel Statement: The recommended action has been accomplished through a correction to the first printing to the 2005 NEC and NECH.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 515 — BULK STORAGE PLANTS

14-183 Log #2186 NEC-P14 **Final Action: Accept**
(Table 515.3)

Submitter: Dann Strube, Strube Consulting
Recommendation: On the table, in four places, change the word “ordinary” to “unclassified”.
Substantiation: 500.2 defines areas that have not been classified as “Unclassified Locations”. This change will put the language of this section into agreement with the 500.2 definition.
4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-184 Log #1930 NEC-P14 **Final Action: Accept in Principle**
(515.7(A))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 8 for comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise the first sentence of 515.7(A) as follows:
(A) Fixed Wiring. All fixed wiring above Class I locations shall be in metal raceways or ~~PVC~~ Schedule 80 rigid ~~nonmetallic~~ PVC conduit, or equivalent, or be Type MI, TC, or MC cable.
Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC Conduit and results in the use of consistent terminology for this product throughout the code.
Panel Meeting Action: Accept in Principle
Accept the recommended action with the following revision:
(A) Fixed Wiring. All fixed wiring above Class I locations shall be in metal raceways or ~~PVC~~ Schedule 80 ~~rigid nonmetallic~~ PVC conduit, RTRC, ~~or equivalent,~~ or be Type MI, TC, or MC cable.
Panel Statement: The use of “rigid” has been deleted because it is redundant and, “or equivalent” has been deleted because it is too subjective. The panel has added RTRC conduit because it is an equivalent wiring method to Schedule 80 PVC.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-185 Log #2213 NEC-P14 **Final Action: Reject**
(515.7(A))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise as follows:
All fixed wiring above Class I locations shall be in meal raceways or PVC Schedule 80 rigid nonmetallic conduit, or equivalent, or be Type MI, TC, PA or MC cable.
Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.
Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (515.7(A)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: This cable is not currently recognized as a Chapter 3 wiring method. CMP-14 notes that CMP-7 rejected a proposal to include this type of cable in Chapter 3.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-186 Log #1756 NEC-P14 **Final Action: Accept**
(515.7(C))

Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Replace the term “portable lamp” with the term “ portable luminaire “. Revise text as follows:
515.7 Wiring and Equipment Above Class I Locations
(C) Portable Lamps or Other Utilization Equipment. Portable ~~lamps~~ luminaires or other utilization equipment and their flexible cords shall comply with the provisions of Article 501 or Article 505 for the class of location above which they are connected or used.
Substantiation: The term “luminaire” has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms “fixture” or “lighting fixture”, which were terms for fixed lighting systems.
The term “portable luminaire” has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled “Portable Electric Lamps” and is now titled “Portable Electric Luminaires”.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-187 Log #1244 NEC-P14 **Final Action: Reject**
(515.8(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "rigid metal conduit" to "rigid steel conduit, silicon bronze conduit, or stainless steel conduit".
Substantiation: Aluminum conduit may be damaged by corrosive elements present.
Panel Meeting Action: Reject
Panel Statement: Proper application of metal conduit in respect to corrosive elements is adequately covered in 300.6 and 344.10(B).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-188 Log #503 NEC-P14 **Final Action: Accept**
(515.16)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
515.16 Grounding and Bonding . All metal raceways, the metal armor or metallic sheath on cables, and all non-current-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded and bonded as provided in Article 250.
Grounding and bonding in Class I locations shall comply with 501.30 for Class I, Division 1 and 2 locations and 505.25 for Class I, Zone 0, 1, and 2 locations.
Substantiation: 501.30 and 505.25 include both grounding and bonding requirements for Class I locations. This proposed change is an effort to clarify what is actually covered by this section.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 516 — SPRAY APPLICATION, DIPPING, AND COATING PROCESSES

14-189 Log #1757 NEC-P14 **Final Action: Accept**
(516.4(D), 516.10(C)(1))

Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Replace the term "portable lamp" with the term " portable luminaire ". Revise text as follows:
516.4 Wiring and Equipment in Class I Locations.
(D) Portable Equipment. Portable electric ~~lamps~~ luminaires or other utilization equipment shall not be used in a spray area during spray operations.
Exception No. 1: Where portable electric ~~lamps~~ luminaires are required for operations in spaces not readily illuminated by fixed lighting within the spraying area, they shall be of the type identified for Class I, Division 1 or Class 1, Zone 1 locations where readily ignitible residues may be present. [NFPA 33:6.9]
516.10 Special Equipment
(C) Powder Coating
(1) Electric Equipment and Sources of Ignition. Electric equipment and other sources of ignition shall comply with the requirements of Article 502. Portable electric ~~lamps~~ luminaires and other utilization equipment shall not be used within a Class II location during operation of the finishing processes. Where such ~~lamps~~ luminaires or utilization equipment are used during cleaning or repairing operations, they shall be of a type identified for Class II, Division 1 locations, and all exposed metal parts shall be effectively grounded.
Exception: Where portable electric ~~lamps~~ luminaires are required for operations in spaces nor readily illuminated by fixed lighting within the spraying area, they shall be of the type listed for Class II, Division 1 locations where readily ignitible residues may be present.
Substantiation: The term "luminaire" has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms "fixture" or "lighting fixture", which were terms for fixed lighting systems.
The term "portable luminaire" has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled "Portable Electric Lamps" and is now titled "Portable Electric Luminaires".
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-190 Log #2214 NEC-P14 **Final Action: Reject**
(516.7(A))

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise as follows:
"...rigid nonmetallic conduit, or electrical nonmetallic tubing, or shall be Type MI, TC, PA or MC cable. Cellular metal floor...".
Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.
Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (516.7(A)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: This cable is not currently recognized as a Chapter 3 wiring method. CMP-14 notes that CMP-7 rejected a proposal to include this type of cable in Chapter 3.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-191 Log #1544 NEC-P14 **Final Action: Accept**
(516.10(C)(1))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 516 and revise text as shown for the affected NEC sections.
516.10(C)(1): (1) Electric Equipment and Sources of Ignition. Electric equipment and other sources of ignition shall comply with the requirements of Article 502. Portable electric lamps and other utilization equipment shall not be used within a Class II location during operation of the finishing processes. Where such lamps or utilization equipment are used during cleaning or repairing operations, they shall be of a type identified for Class II, Division 1 locations, and all exposed metal parts shall be ~~effectively~~ connected to an equipment grounding conductor ~~grounded~~ .
Substantiation: 516.10(C)(1): The definition is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." This section has been revised to prescribe the connection to the equipment grounding conductor.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.
The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."
The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.
This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.
The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-192 Log #502 NEC-P14 **Final Action: Accept in Part**
(516.16)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
All metal raceways, the metal armors or metallic sheath on cables, and all normally non-current-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded and bonded as provided in Article 250. Grounding and bonding shall comply with 501.30, 502.30, or 505.25, as applicable.
Substantiation: 501.30, 502.30, and 505.25 all include both grounding and bonding requirements for Class I and Class II locations. Both grounding and bonding requirements should be referenced here since 501.30, 502.30 and 505.25 each include both grounding and bonding rules and are referenced from this section.
Panel Meeting Action: Accept in Part
Panel Statement: The panel accepts the addition of "and bonded" and "bonding". The panel rejects adding "normally" because it is identified in the NEC Style Manual as a potentially vague and unenforceable term.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

14-193 Log #1064 NEC-P14 **Final Action: Reject**
(516.16)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to 4.1.1 of the NEC Style Manual. This action will be considered by the panel as a public comment.
Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "in accordance with the requirements of Article 250".
Substantiation: Edit. To comply with the Style Manual. Article 250 already applies per 90.3.
Panel Meeting Action: Reject
Panel Statement: The grounding requirement in this section is unique in that it applies regardless of the voltage. Where the reference to an entire article is conditional based on specific requirements in a particular article, the NEC Style Manual permits the reference to an entire article.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 14

ARTICLE 517 — HEALTH CARE FACILITIES

15-2 Log #1526 NEC-P15 **Final Action: Accept in Principle in Part**
(517, 520, 525, and 530)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to the Technical Correlating Committee Grounding and Bonding Task Group for comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 517, 520, 525, and 530 as described in the following, relative to the terms bonding and grounding.
Article 517: In 517.13(A) change:
(A) Wiring Methods All branch circuits serving patient care areas shall be provided with a ground path for fault current by installation in a metal raceway system, or a cable having a metallic armor or sheath assembly. The metal raceway system, or metallic cable armor, or sheath assembly shall itself qualify as an equipment grounding conductor ~~return path~~ in accordance with 250.118.
In 517.13(B) change:
(B) Insulated Equipment Grounding Conductor The grounding terminals of all receptacles and all non–current-carrying conductive surfaces of fixed electric equipment likely to become energized that are subject to personal contact, operating at over 100 volts, shall be ~~grounded by~~ connected to an insulated copper equipment grounding conductor. The equipment grounding conductor shall be sized in accordance with Table 250.122 and installed in metal raceways or as a part of listed cables having a metallic armor or sheath assembly with the branch-circuit conductors supplying these receptacles or fixed equipment.
Exception No. 1: Metal faceplates shall be permitted to be ~~grounded~~ connected to the equipment grounding conductor by means of a metal mounting screw(s) securing the faceplate to a ~~grounded~~ outlet box or ~~grounded~~ wiring device connected to an equipment grounding conductor .
Exception No. 2: Luminaires (light fixtures) more than 2.3 m (7 1/ 2 ft) above the floor and switches located outside of the patient vicinity shall not be required to be ~~grounded by~~ connected to an insulated equipment grounding conductor.
In 517.18(B) change:
(B) Patient Bed Location Receptacles Each patient bed location shall be provided with a minimum of four receptacles. They shall be permitted to be of the single or duplex types or a combination of both. All receptacles, whether four or more, shall be listed ``hospital grade'' and so identified. Each receptacle shall be ~~grounded by means of~~ connected to an insulated copper conductor sized in accordance with Table 250.122.
In 517.19(B)(2) change:
(2) Receptacle Requirements The receptacles required in 517.19(B)(1) shall be permitted to be of the single or duplex types or a combination of both. All receptacles, whether six or more, shall be listed ``hospital grade'' and so identified. Each receptacle shall be ~~grounded~~ connected to the reference grounding point by means of an insulated copper equipment grounding conductor.
In 517.19(D) change:
(D) Panelboard Grounding Where a grounded electrical distribution system is used and metal feeder raceway or Type MC or MI cable is installed, ~~grounding~~ the effective ground-fault current path of a panelboard or switchboard shall be ensured by one of the following means at each termination or junction point of the raceway or Type MC or MI cable:
In 517.20(A) Exception change:
Exception: Branch circuits supplying only listed, fixed, therapeutic and diagnostic equipment shall be permitted to be supplied from a normal grounded service, single- or 3-phase system, provided that
(a) Wiring for grounded and isolated circuits does not occupy the same raceway, and
(b) All conductive surfaces of the equipment are ~~grounded~~ connected to an equipment grounding conductor .
In 527.61(C)(1) change:
(1) Wiring Methods Wiring serving other-than-hazardous (classified) locations, as defined in 517.60, shall be installed in a metal raceway system or cable assembly. The metal raceway system or cable armor or sheath assembly shall qualify as an equipment grounding ~~return path~~ conductor in accordance with 250.118. Type MC and Type MI cable shall have an outer metal armor, ~~or~~ sheath , or sheath assembly that is identified as an acceptable equipment grounding ~~return path~~ conductor .
In 517.62 Grounding change:
In any anesthetizing area, all metal raceways and metal-sheathed cables and all non–current-carrying conductive portions of fixed electric equipment shall be ~~grounded~~ connected to an equipment grounding conductor . Grounding in Class I locations shall comply with 501.30.
Exception: Equipment operating at not more than 10 volts between conductors shall not be required to be ~~grounded~~ connected to an equipment grounding conductor .
In 517.63(B)(2) change:
(2) All conductive surfaces of the equipment are ~~grounded~~ connected to an equipment grounding conductor .
In 517.63(C)(2) change:
(2) All conductive surfaces of luminaires (fixtures) are ~~grounded~~ connected to an equipment grounding conductor .
In 517.64(C)(2) change:
(2) The core and case ~~grounded~~ connected to an equipment grounding conductor
In 517.78(C) change:
(C) Noncurrent–Carrying Metal Parts Noncurrent-carrying metal parts of X-ray and associated equipment (controls, tables, X-ray tube supports, transformer tanks, shielded cables, X-ray tube heads, etc.) shall be ~~grounded~~ connected to an equipment grounding conductor in the manner specified in Article 250, as modified by 517.13(A) and 517.13(B).
In 517.13(A) change:
(A) Wiring Methods All branch circuits serving patient care areas shall be provided with ~~a ground path for fault current~~ an effective ground-fault current path by installation in a metal raceway system, or a cable having a metallic armor or sheath assembly. The metal raceway system, or metallic cable armor, or sheath assembly shall itself qualify as an equipment grounding return path in accordance with 250.118.
In 517.14 Panelboard Bonding change:
The equipment grounding terminal buses of the normal and essential branch-circuit panelboards serving the same individual patient vicinity shall be ~~bonded~~ connected together with an insulated continuous copper conductor not smaller than 10 AWG. Where two or more panelboards serving the same individual patient vicinity are served from separate transfer switches on the emergency system, the equipment grounding terminal buses of those panelboards shall be ~~bonded~~ connected together with an insulated continuous copper conductor not smaller than 10 AWG. This conductor shall be permitted to be broken in order to terminate on the equipment grounding terminal bus in each panelboard.
Article 520: In 520.81 change:
All metal raceways and metal-sheathed cables shall be ~~grounded~~ connected to an equipment grounding conductor . The metal frames and enclosures of all equipment, including border lights and portable luminaires (lighting fixtures), shall be ~~grounded~~ connected to an equipment grounding conductor . Grounding, where used, shall be in accordance with Article 250.
In 520.81 change:
All metal raceways and metal-sheathed cables shall be grounded. The metal frames and enclosures of all equipment, including border lights and portable luminaires (lighting fixtures), shall be grounded. Grounding, where used, shall be in accordance with Parts VI and VII of Article 250.

Article 525: In 525.31 change:

All equipment requiring grounding shall be ~~grounded by~~ connected to an equipment grounding conductor of a type and size recognized by 250.118 and installed in accordance with Article 250. The equipment grounding conductor shall be bonded to the system grounded conductor at the service disconnecting means or, in the case of a separately derived system such as a generator, at the generator or first disconnecting means supplied by the generator. The grounded circuit conductor shall not be connected to the equipment grounding conductor on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means.

In 525.11 Multiple Sources of Supply change:

Where multiple services or separately derived systems or both supply rides, attractions, and other structures, all sources of supply that serve rides, attractions, or other structures separated by less than 3.7 m (12 ft) shall be ~~bonded~~ connected to the same grounding electrode system.

In 525.31 Equipment Grounding change:

All equipment requiring grounding shall be grounded by an equipment grounding conductor of a type and size recognized by 250.118 and installed in accordance with Article 250. The equipment grounding conductor shall be ~~bonded~~ connected to the system grounded conductor at the service disconnecting means or, in the case of a separately derived system such as a generator, at the generator or first disconnecting means supplied by the generator. The grounded circuit conductor shall not be connected to the equipment grounding conductor on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means.

Article 530: In 530.20 change:

Type MC cable, Type MI cable, metal raceways, and all non–current-carrying metal parts of appliances, devices, and equipment shall be ~~grounded~~ connected to an equipment grounding conductor as specified in Article 250. This shall not apply to pendant and portable lamps, to stage lighting and stage sound equipment, or to other portable and special stage equipment operating at not over 150 volts dc to ground.

In 530.64(B) change:

(B) Circuit Breaker Frames Frames of dc circuit breakers installed on switchboards shall not be required to be ~~grounded~~ connected to an equipment grounding conductor .In 530.20 change:

Type MC cable, Type MI cable, metal raceways, and all non–current-carrying metal parts of appliances, devices, and equipment shall be grounded as specified in Parts VI and VII of Article 250. This shall not apply to pendant and portable lamps, to stage lighting and stage sound equipment, or to other portable and special stage equipment operating at not over 150 volts dc to ground.

Substantiation: Article 517: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 520: The proposed change in (A) provides language that better describes the requirement for the ground path and is in alignment with NEC 250.4.

Article 520 (517.14): These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

Article 520: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 520 (520.81): The additions of Parts VI and VII of Article 250 enhance clarity.

Article 525: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 525 (525.11): These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

Article 530: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 530 (530.20): The additions of Parts VI and VII of Article 250 enhance clarity.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

Accept as proposed, except for the following editorial revisions:

"517.13(B) *Exception No. 1: Metal faceplates shall be permitted to be ~~grounded~~ connected to the equipment grounding conductor by means of a metal mounting screw(s) securing the faceplate to a grounded outlet box or a grounded wiring device."*

"517.18(B) Patient Bed Location Receptacles. Each patient bed location shall be provided with a minimum of four receptacles. They shall be permitted to be of the single or duplex type or a combination of both. All receptacles, whether four or more, shall be listed "hospital grade" and so identified. The grounding terminal of ~~E~~ e ach receptacle shall be connected to ~~grounded by means of~~ an insulated copper equipment grounding conductor sized in accordance with Table 250.122."

"517.19(B)(2) Receptacle Requirements. The receptacles required in 517.19(B)(1) shall be permitted to be of the single or duplex type or a combination of both. All receptacles, whether six or more, shall be listed "hospital grade" and so identified. The grounding terminal of ~~E~~ e ach receptacle shall be ~~grounded~~ connected to the reference grounding point by means of an insulated copper equipment grounding conductor."

517.19 **(D) Panelboard Grounding and Bonding.** Where a grounded electrical distribution system is used and metal feeder raceway or Type MC or MI cable that qualifies as an equipment grounding conductor in accordance with 250.118 is installed, grounding ~~the effective ground-fault current path~~ of a panelboard or switchboard shall be ensured by one of the following bonding means at each termination or junction point of the metal raceway or Type MC or MI cable:

517.61(C)(1) The proposal contained a typographical error and should read "527.61(C)(1)".

In 520.81, the panel does not Accept the addition of "Parts VI and VII".

In 530.64(B), the panel does not Accept the addition of "Parts VI and VII".

Panel Statement: The panel's reasons for the revisions are as follows:

In 517.13(B) Exception. No. 1, the panel left the word "grounded" where it is an adjective that describes an outlet box or wiring device, rather than an installation requirement.

In 517.18(B) and 517.19(B)(2), language was added to describe what is to be connected to the equipment grounding conductor in the proposal.

In 517.19(D) action was taken to correlate with the changes accepted in Proposal 15-38.

It is the panel's contention that the proposed changes to 520.81 and 530.64(B) to add "Parts VI and VII" is outside the scope of the task group. The panel also notes other references to complete articles that have not been revised.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Conry, C.

Comment on Affirmative:

VANICE: My vote is based on the understanding that the definition of Equipment Grounding Conductor EGC will be "the conductive path installed to connect normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor". Entertainment industry venues have special grounding issues. If the words in the NEC with respect to grounding and bonding change from the above understanding of any other changes that might occur, the entertainment industry needs to be able to compensate for these changes by modifying the entertainment articles.

In this proposal, we rejected the concept of adding parts to the last sentence of 520.81, in proposal 15-143, we deleted the whole last sentence.

Note that the revised text as stated for 525.11 was further revised in proposal 15-150.

Note that the revised text as stated for 525.31 was further revised in proposal 15-158.

WISEMAN, J.: Under Panel Meeting Action, the line reading

"517.61(C)(1) The proposal contained a typographical and should read "527.61(C)(1)"."

should, instead read:

"527.61(C)(1) The proposal contained a typographical error and should read "517.61(C)(1)"."

15-3 Log #1161 NEC-P15 **Final Action: Reject**

(517.2)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

~~A~~ An ungrounded system comprised of ~~comprising~~ an isolation ~~isolating~~ transformer(s), a generator(s), or batteries, which conform to the definition of Separately Derived System in Article 100, or ~~it's~~ the equivalent, a lie isolation monitor and ungrounded conductors supplied from an ungrounded system .

Substantiation: Ungrounded SYSTEMS is apparently intended. Ungrounded conductors may be supplied from isolation transformers with a grounded secondary, such as a 2-wire 240-volt circuit from a 120/240 secondary which is grounded. There is no definition of an isolating transformer.

Panel Meeting Action: Reject

Panel Statement: The existing text is identical to NFPA 99:3.3.85 and should remain and be identified as extracted text from that document.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-4 Log #2113 NEC-P15 **Final Action: Reject**
(517.2)

Submitter: Burton R. Klein, Burton Klein Associates
Recommendation: 1. Revise the term "Wet location" to "Wet (procedure) location".
2. Add "[NFPA 99: 3.3.185]".
Substantiation: 1. Term is the responsibility of TC on Health Care Facilities. Proposal has been submitted to TC on Health Care Facilities to revise term the same way in order to not be confused with "Wet location" as defined in Article 100 of NFPA 70, and used everywhere in NFPA 70, except in Article 517.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The proposed word "procedure" has not been included in the definition of a "Wet Location" in the 2005 Edition of NFPA 99. The existing text of "Wet Location" in 517.2 is not the same as in NFPA 99, and does not meet the NEC Style Manual requirement for extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
WHITE, A.: While the rationale for using the term "Wet (Procedure) location" is flawed, the phrase adds clarity as to the type of occupancies cited in comparison as to how the term "Wet Location" is used in other parts of the Code.

15-5 Log #1160 NEC-P15 **Final Action: Reject**
(517.2.Isolation)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "Isolation" to "isolating".
Substantiation: Edit. The definition of Isolated Power Systems in this section uses the term "isolating". The use of different terms for the same thing may cause confusion and is to be avoided.
Panel Meeting Action: Reject
Panel Statement: The text in 517.2 for definition of an "Isolation Transformer" is similar to the text in NFPA 99:3.3.86, and should remain consistent for clarity.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-6 Log #1776 NEC-P15 **Final Action: Reject**
(517.2, Ambulatory Health Care Facility)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 101: Chapter 3]"
Substantiation: 1. Term is the responsibility of T/C on Safety to Life.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The definition cited is inconsistent with the definition provided in 517.2; therefore, the text is not extracted and the proposed citation is inappropriate.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
ERICKSON, D.: The new definition in the NFPA Life Safety Code adds a third item that needs to be included in the NEC text. This is not just a matter of NEC style or ownership; it is a matter of adding material that will clarify uses of ambulatory health care facilities.

15-7 Log #1777 NEC-P15 **Final Action: Reject**
(517.2, Anesthetizing Location)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.9]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-1. The differences between the definition in 517.2 and NFPA 99, 3.3.9, are substantial.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-8 Log #1778 NEC-P15 **Final Action: Reject**
(517.2, Critical Branch)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.26]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Critical Branch". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-9 Log #1779 NEC-P15 **Final Action: Reject**
(517.2, Critical Care Areas)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.138.2]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-1. The differences between the definition in 517.2 and NFPA 99, 3.3.138.2, are substantial.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-10 Log #1780 NEC-P15 **Final Action: Reject**
(517.2, Electrical Life Support Equipment)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.37]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Electrical Life Support Equipment". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-11 Log #1781 NEC-P15 **Final Action: Accept**
(517.2, Emergency System)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.41]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept
Panel Statement: The panel notes that although the extact information is correct; it is not in the proper format.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-12 Log #1782 NEC-P15 **Final Action: Reject**
(517.2, Equipment System)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.43]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Equipment System". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-13 Log #1783 NEC-P15 **Final Action: Reject**
(517.2, Essential Electrical System)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.44]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Essential Electrical System". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-14 Log #1784 NEC-P15 **Final Action: Reject**
(517.2, Flammable Anesthetizing Location)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: E.1.3]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Flammable Anesthetizing Location". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-15 Log #1785 NEC-P15 **Final Action: Reject**
(517.2, General Care Areas)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.138.1]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-1. The differences between the definition in 517.2 and NFPA 99, 3.3.138.1, are substantial.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
ERICKSON, D.: While the proposal to place an extract from NFPA 99 under this paragraph should be rejected, the need to accept this proposal in principle is necessary and the definition modified to reflect the changes in NFPA 99.
General Care Areas. Patient bedrooms, examining rooms, treatment rooms, clinics, and similar areas in which it is intended that the patient will come in contact with ordinary appliances such as a nurse call system, electrical beds, examining lamps, telephone, and entertainment devices. ~~In such areas, it may also be inteded that patients be connected electromedical devices (such as heating pads, electrocardiographs, drainage pumps, monitors, otoscopes, opthalmoscopes, intravenous lines, etc.).~~

15-16 Log #1786 NEC-P15 **Final Action: Reject**
(517.2, Hazard Current)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.66; 3.3.66.1, 3.3.66.2, 3.3.66.3]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Hazard Current". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-17 Log #1787 NEC-P15 **Final Action: Reject**
(517.2, Health Care Facilities)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.68]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-1. The differences between the definition in 517.2 and NFPA 99, 3.3.68, are substantial.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-18 Log #1788 NEC-P15 **Final Action: Accept in Principle**
(517.2, Hospital)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 101: Chapter 3]"
Substantiation: 1. Term is the responsibility of T/C on Safety to Life.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept in Principle
Revise the proposed text to read:
"NFPA 101: 3.3.124"
Panel Statement: The Chapter 3 reference provided is too broad. The correct reference is 3.3.124.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-19 Log #1789 NEC-P15 **Final Action: Reject**
(517.2, Life Safety Branch)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.96]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Life Safety Branch". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-20 Log #1790 NEC-P15 **Final Action: Accept in Principle**
(517.2, Limited Care Facility)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 101: Chapter 3]"
Substantiation: 1. Term is the responsibility of T/C on Safety to Life.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept in Principle
Revise the proposed text to read as follows:
"Limited Care Facility. A building or ~~part~~ portion thereof used on a 24-hour basis for the housing of four or more persons who are incapable of self-preservation because of age; physical limitation due to accident or illness; or ~~mental~~ limitations such as mental retardation/developmental disability, mental illness, or chemical dependency. [NFPA 99:3.3.97]"
Panel Statement: The Chapter 3 reference to NFPA 101 provided is too broad. The correct reference in NFPA 101 is 3.3.77.2. However, the panel contends that the correct reference should be NFPA 99, 3.3.97. The revisions to the present definition are considered to be minor, and the panel contends that it is important to correlate the definition with NFPA 99.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-21 Log #1791 NEC-P15 **Final Action: Accept in Principle**
(517.2, Nursing Home)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 101: Chapter 3]"
Substantiation: 1. Term is the responsibility of T/C on Safety to Life.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept in Principle
Revise the proposed text to read:
"NFPA 99: 3.3.129".
Panel Statement: The NFPA 101 Chapter 3 reference provided is too broad. The correct reference is NFPA 99 3.3.129. This action is also needed to correlate with the panel action on Proposal 15-1.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-22 Log #1792 NEC-P15 **Final Action: Reject**
(517.2, Patient Care area)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.138]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: There is a significant difference between the two definitions (517.2 and NFPA 99, 3.3.138). As a result, the definition in 517.2 cannot be considered extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
ERICKSON, D.: While the proposal to place an extract from NFPA 99 under this paragraph should be rejected, the need to accept this proposal in principle is necessary and the definition modified to reflect the changes in NFPA 99.
To maintain consistency with NFPA 99 a new definition of wet location needs to be developed around the definition in 99. The definition of Patient Care Area should read as follows:
Patient Care Area. Any portion of a health care facility wherein patients are intended to be examined or treated. Areas of a health care facility in which patient care is administered are classified as general care areas or critical care areas, ~~either of which may be classified as a wet location.~~
~~The governing body of the facility designates these areas in accordance with the type of patient care anticipated and with the following definitions of the area classification.~~
FPN: Business offices, corridors, lounges, day rooms, dining rooms, or similar areas typically are not classified as patient care areas.
New definition of Wet Location.
Wet Locations. ~~Those patient care areas that are normally subject to wet conditions while patients are present. These include standing fluids on the floor or drenching of the work area, either of which condition is intimate to the patient or staff. Routine housekeeping procedures and incidental spillage of liquids do not define a wet location.~~
<u>Those patient care areas where a procedure is performed that is normally subject to wet conditions while patients are present including standing fluids on the floor or drenching of the work area, either of which condition is intimate to the patient or staff.</u>

15-23 Log #1793 NEC-P15 **Final Action: Accept**
(517.2, Patient Vicinity)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: 1. Change term in sentence one of Definition to read: "Patient care vicinity" and change term in sentence to read "Patient care vicinity."
2. Add "[NFPA 99: 3.3.140]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities. "Patient care vicinity" in NFPA 99.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept
Panel Statement: The panel accepts the proposed changes to the wording of the text but wishes to note that extract material is not in the proper format. This action is also necessary to correlate with the action taken on Proposal 15-1.
The panel affirms that the action on this proposal will change the term being defined to "Patient Care Vicinity."
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-24 Log #1794 NEC-P15 **Final Action: Reject**
(517.2, Selected Receptacles)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.164]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Selected Receptacles". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-25 Log #1795 NEC-P15 **Final Action: Reject**
(517.2, Task Illumination)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 3.3.176]"
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The NFPA Glossary of Terms indicates that NFPA 70 is the responsible document for the definition of "Task Illumination". Therefore, it is not correct to identify this definition in 517.2 as extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-25a Log #CP1500 NEC-P15 **Final Action: Accept**
(517.11, FPN)

Submitter: Code-Making Panel 15,
Recommendation: In the sections shown below, change "Patient Vicinity" to "Patient Care Vicinity".
517.11 FPN;
517.13(B) Ex. 2;
517.14 (2 appearances);
517.19(C) (2 appearances);
517.19(C) FPN; and
517.82(B)
Substantiation: These changes are made to correlate with the action taken on Proposal 15-23.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-26 Log #3628 NEC-P15 **Final Action: Reject**
(517.13(A))

Submitter: Raymond C. Paulson, City of Lincoln, Nebraska
Recommendation: Revise as follows:
517.13(A) Exception: Rigid Nonmetallic Conduit may be used for underfloor installations where metallic conduits would be subject to corrosion.
When RNMC is used, an insulated 10 AWG Copper grounding conductor shall be installed in addition to the redundant insulated grounding conductor sized in accordance with Table 250.122.
Substantiation: When metallic conduits are in contact with earth, especially with the presence of ground moisture, the grounding properties of the conduit are compromised. Metallic conduits sometime rust away to nonexistance. RNMC has an excellent track record in this installation. A 10 AWG insulated copper conductor is used extensively in other parts of 517 and would provide a greater degree of safety in these under slab conduit installations.
Panel Meeting Action: Reject
Panel Statement: The panel reaffirms its long-standing position to retain two different methods and materials for grounding. This proposal would compromise that principle. Maintaining this protection principle alone would be sufficient to reject this proposal.
The second equipment grounding conductor does not provide a separate and distinct grounding method.
Finally, this proposal does not take into account the equipment grounding conductor size that would be required for circuits rated over 60 amps.
The word "redundant" in the second sentence is not a Code-defined term.
The issues of corrosion may be addressed by long-standing methods. See 300.6.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-27 Log #2911 NEC-P15 **Final Action: Reject**
(517.13(A) Exception (New))

Submitter: Raymond C. Paulson, City of Lincoln, NE
Recommendation: Add an exception to 517.13(A) to read as follows:
Exception No. 1: Rigid Nonmetallic Conduit may be used for underfloor installations where metallic conduits would be subject to corrosion conditions. A 10 AWG insulated copper conductor shall be installed as the primary grounding path. Compliance with 517.13(B) shall be required.
Substantiation: Metallic conduit in direct contact with soil under slab construction leads to deterioration of an assured grounding path. RNMC has an excellent track record for this type of installation. A 10 AWG insulated conductor in addition to the redundant grounding conductor would provide a greater degree of safety.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-26.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-28 Log #3364 NEC-P15 **Final Action: Reject**
(517.13(B) Exception No. 2)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Delete Exception No. 2.
Substantiation: This exception leads many to conclude that the wiring method rules in 517.13(A) don't apply to these lighting outlets as well. In fact they do, and this exception is more trouble than it is worth. Any electrical contractor will tell you that the expense in one of these installations is that of installing the raceway. Once the raceway is in place, adding a green wire is a negligible additional consideration. Similarly, in the case of a cable assembly, installing Type AC cable with a separate equipment grounding conductor is comparable to installing the same cable without the separate grounding conductor. This exception adds very little in the way of practical benefit, but at substantial cost in the form of additional confusion and disagreements between installers and inspectors.
Panel Meeting Action: Reject
Panel Statement: The panel contends that Exception No. 2 is not confusing, and that adding a green wire to all affected circuits can be a significant consideration without material safety benefit. There is no prohibition to adding the redundant ground.

Without this exception, all luminaires and switches would have to be connected to an insulated equipment grounding conductor in addition to the raceway or metal cable ground, even though patient contact is unlikely.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-29 Log #2738 NEC-P15 **Final Action: Reject**
(517.17(B))

Submitter: Jim Pauley, Square D Company
Recommendation: Delete the following text from 517.17(B):
~~The additional levels of ground-fault protection shall not be installed as follows:~~
~~(1) On the load side of an essential electrical system transfer switch~~
~~(2) Between the on-site generating unit(s) described in 517.35(B) and the essential electrical system transfer switch(es)~~
~~(3) On electrical systems that are not solidly grounded wye systems with greater than 150 volts to ground but not exceeding 600 volts phase-to-phase~~
Substantiation: This proposal has been submitted as a means to improve the reliability of electrical systems in healthcare facilities. In order to fully understand the impact, the following two basic issues must be understood:
1) The present NEC does not prohibit ground-fault protection on the main feeder disconnecting means of an alternate source of supply for an essential electrical system of a hospital. NEC 700.26 does not prohibit ground-fault protection on an emergency system; it only states that it is not required. As such, an essential electrical system can be designed with GFP on the main feeder device. In fact, one cannot likely achieve the required selective coordination (NEC 700.27) unless GFP is installed to handle the coordination of ground-faults.
2) The current language in 517.17(B) prohibits a <u>second</u> level of GFP from being installed in the system. This is clearly evident in the opening language that states "The additional levels… shall not be installed…" The language in 517.17(B) has nothing to do with the first level of GFP that may be installed, required or allowed by 230.95, 215.10 or 700.26.

The requirements as they currently appear actually reduce the reliability of the system. System designs that properly utilize ground-fault protection of equipment will better limit the outage that the system may be subjected to. I would ask that the panel consider the following points regarding the reliability issue:
1) In today's large health care facility designs the generation systems are not a simply a "standby generator" that will supply a limited load. One recent installation had over 8MW of generation capacity that not only served as the emergency backup, but also as cogeneration operating in parallel with the utility. With generation capacities growing, the ability to supply significant amounts of ground-fault current also grows. As such, equipment "burn-down" due to a ground-fault can occur just as easily with a generator as it can with the utility source.
2) Allowing these large systems to be installed without ground-fault protection actually decreases the reliability of the system. Consider a ground-fault on a 1000A feeder contained in an emergency system switchboard that is on the load side of essential system transfer switch.

Since GFP is prohibited by 517.17(B), the fault will take out the first device ahead of the essential system transfer switch that has GFP installedm (e.g. the normal power main overcurrent device). This causes the normal power system to shut down and the system switches over to emergency power. However, the ground-fault may still be on the 1000A feeder (an in fact may be worse because of the damage that has already occurred). Now the system has the potential to not only shutdown the emergency generators, but may also start a fire at the point where the arcing ground fault is occurring. In fact, the zero sequence reactance of large standby or emergency generators are often significantly less than the zero sequence reactance of the power class transformers that will powered by the local electrical utility. Consequently, the initial available fault current flow from a "phase-to-ground" fault is often significantly greater than a "phase-to-phase" fault if the fault is powered from large generators. In addition, if a "phase-to-ground" fault were to occur downstream when power is provided by the generator, then for a minimum of two cycles the generator will provide more I sc to the fault than a power class transformer of equal KVA Rating.
If GFP were properly installed and coordinated, the 1000A feeder would have been isolated from the system allowing the balance of the system to continue functioning.
3) Having multiple levels of GFP is the only way to have a reliable emergency system installation relative to handling the common ground-fault condition. The number of levels is determined by the design engineer and is predicated on getting the protection down to a level where GF coordination can be done with standard overcurrent devices. The previous conventional wisdom was to eliminate GFP and allow the system to operate in a faulted condition. This might have been acceptable where the generation system would not supply enough fault current to continue the destruction of the equipment, but with the larger systems being installed that is no longer the case.
In summary, there are a number of concerns associated with the current language. It inhibits the design engineer's ability to provide the most reliable system in the modern environment of health care facilities. Specifically noted is:
1) The current language prohibits the design engineer from establishing a more reliable system by using multiple levels of GFP throughout the critical circuits.
2) The objective of the NEC is to provide a system that is essentially free from hazard. Allowing ground-faults to continue to burn up equipment and conductors in the electrical system without taking them off line is contrary to that objective.
3) The design engineer needs the flexibility to be able to provide multiple levels of GFP to accomplish his/her expected level of system reliability.
4) Multi-level GFP systems will provide the most coordinated way to limit the impact of ground faults on the system. Waiting until faults reach a magnitude that will open the normal overcurrent devices in the system can result in not only increased damage, but also (depending on the overall loading) a decrease of coordination.
It is realized that this is a thought process that is different than the code-panel may have taken in the past. However, there is a significant change in the alternate power systems being employed in health care facilities. This proposal will modernize the NEC approach and give the system designer the ability to provide the levels of protection necessary to have maximum reliability.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The issue addressed in the proposed change is the reliability of the emergency system operation to support life and patient care.

The panel defends the principle of multiple levels of ground fault, but acceptance of this proposal would compromise reliability of the emergency system and would be in conflict with the provisions of 700.7(D) and 700.26.

The risk of burn-down is low because the vast majority of hospitals have relatively small standby generators as opposed to the 8 megawatt generators cited in the submitter's example.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:

WISEMAN, J.: NEMA disagrees with the panel action and panel statement. Everyone agrees that a reliable emergency supply system is needed. However, the portion of the panel statement that states "acceptance of this proposal would compromise the reliability of the emergency system and would be in conflict with the provisions on 700.7(D) and 700.26" is completely incorrect.

NEC 700.26 does not prohibit ground-fault to be installed on the emergency system. It is the choice of the designer. As pointed out in the proposal, there are very large systems being installed where a proper design decision to install GFP is being made because of the size of the emergency supply. The current provisions of 517.17 PROHIBIT the installation of a second level of ground fault protection. When the designer has elected to install the first level of ground fault protection, installation of a second level (and, sometimes additional levels) will improve reliability. The current language creates a situation where reliability is compromised and this proposal will remedy that situation.

Although the panel statement indicates that a large number of hospitals have small standby generators, there are very large installations being installed, to which the code also must be responsive.
Comment on Affirmative:

MORGAN, E.: I agree with the panel action to reject this proposal as submitted, as the elimination of all reference to Ground-Fault Protection of Emergency systems would make it appear as though it was required. However, the proposal has a lot of merit, as there are a growing number of very large generators serving hospital emergency systems. A hospital in the jurisdiction I serve is in the process of installing a new set of generators with 4.5 megawatt capacity, far larger than the emergency needs of the hospital. The intent is to have capacity for on-grid power production in the event of a regional power failure.

No part of the Emergency System should be considered "sacrificial". Yet, without the ability to isolate the portion of a system that may have caused the "normal" system to shut down, the emergency system would likely also fail unless isolated by Ground-Fault Protection. This very essential concept is supported by Hospital Engineers whom I have personally interviewed since the Panel meeting. The Panel should give more consideration to this subject during the Report on Comment meetings.

15-30 Log #1798 NEC-P15 **Final Action: Reject**
(517.18(A))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 4.3.2.2.1.1]" at the end of the paragraph, before Exception No. 1.
Substantiation: 1. Text is the performance criteria, and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.18(A) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-31 Log #1796 NEC-P15 **Final Action: Reject**
(517.18(A) Exception No. 1)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 4.3.2.2.1.3]" at the end of the Exception.
Substantiation: 1. Text is the performance criteria, and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.18(A), Exception No. 1, should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-32 Log #1797 NEC-P15 **Final Action: Reject**
(517.18(A) Exception No. 3)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[NFPA 99: 4.3.2.2.1.2]" at the end of the Exception.
Substantiation: 1. Text is the performance criteria, and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.18(A), Exception No. 3, should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-33 Log #1799 NEC-P15 **Final Action: Reject**
(517.18(B))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[sentence 1: NFPA 99: 4.3.2.2.6.2]" at the end of the paragraph, before Exception No. 1.
Substantiation: 1. Text is the performance criteria, and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.18(B) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-34 Log #2114 NEC-P15 **Final Action: Accept in Principle in Part**
(517.18(B) and 517.19(B)(2))

Submitter: Burton R. Klein, and John DiMeglio, & John Shena, Massachusetts General Hospital, Burton Klein Associates
Recommendation: Add the following to each section:
<u>Receptacles shall have a built-in light indicating power to the receptacle.</u>
Substantiation: 1. Provide visual indication to medical and nursing staff as to whether power (whether from normal or emergency system) is available from these receptacles.
2. Problems have occurred when a circuit breaker tripped and power to one feeder was interrupted. Some receptacles on the emergency system were affected, thus confusing staff as to which receptacles were still active. Incident occurred in a pediatric intensive care unit, and resulted in the need to ventilate infants manually because of uncertainty of which receptacles had power, and the lack of time to make determination due to the condition of patients.
Panel Meeting Action: Accept in Principle in Part
Revise the proposed wording to read as follows:
"Receptacles shall have an integral light indicating the receptacle is powered or be part of a listed headwall assembly that provides indication of power to each receptacle."
The revised wording is to be placed in 517.19(B)(2) but is not to be placed in the wording of 517.18(B) for general care areas.
Panel Statement: The panel contends that power indication only needs to be applied to the receptacles in critical care areas.
The revised wording recognizes that it is possible to accomplish indication as part of a listed assembly.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 8 Negative: 4
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
DUNCAN, J.: There is insufficient technical and user justification to add a light to all individual receptacles in critical patient care areas to indicate the receptacle is powered. This light duplicates the function of indicating lights on life safety equipment that already immediately inform medical staff that the equipment is plugged into a powered receptacle. In addition, all current life safety equipment contain an integral battery backup so the device continues to function in the rare case that a receptacle on the emergency system critical branch loses power. There is plenty of time if medical staff would need to plug the equipment into another receptacle.
Over time the medical staff will see the indicating lights as part of the background, and when needed may not recognize or remember the significance of the light. There is also the possibility that the light may malfunction, so medical staff would mistakenly think there was not power available at a particular receptacle. In a critical care patient room with a dozen or more receptacles, the glowing indicator receptacle lights could be very annoying to patients who are trying to sleep.
ERICKSON, D.: The proposal should be rejected. The NEC should not be mandating a new standard based on one reported incident. Where is the national statistical data to indicate a global need to install receptacles with illuminated faces or indicator lights? If a hospital wants to install illuminated devices, they are permitted to do so as long as they are hospital grade. A code is a set of standards that have a substantial justification and should not be changed as a result of a few isolated instances where the staff may not have been properly trained on the environment in which they are working.
LAU, L.: Proposal 15-34 should be Rejected. My voting substantiation is as follows:
There is no national statistical data to support the installation of receptacles equipped with illuminated face or indicator lights for the entire country that is necessary.
NASH, JR., H.: Increased cost of lighted receptacle is unnecessary. Substantiation is inadequate. We cannot justify change based on one incident.

15-35 Log #1800 NEC-P15 **Final Action: Reject**
(517.19(A))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add "[sentence 1: NFPA 99: 4.3.2.2.6.2]" at the end of the paragraph, before Exception No. 1.
Substantiation: 1. Text is the performance criteria, and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.19(A) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-36 Log #1801 NEC-P15 **Final Action: Reject**
(517.19(A) Exception No. 2)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of Exception: "[NFPA 99: 4.3.2.2.1.2]".
Substantiation: 1. Requirement is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.19(A), Exception No. 2, should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-37 Log #1802 NEC-P15 **Final Action: Accept**
(517.19(C))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: 1. Change "Patient Vicinity" to "Patient Care Vicinity".
2. Change "patient vicinity" to read "patient care vicinity" wherever it appears in text.
3. Correlate with proposal on 517.2, Patient Vicinity submitted separately.
Substantiation: 1. Term is the responsibility of T/C on Health Care Facilities. Term as used in NFPA 99 is "Patient care vicinity".
2. Conform to NFPA Standards Council on policy for extracted text.
3. Correlate with proposal in 517.2 on the term "Patient Vicinity".
Panel Meeting Action: Accept
Panel Statement: See panel actions and statements on Proposals 15-1 and 15-23.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-38 Log #1645 NEC-P15 **Final Action: Accept**
(517.19(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(D) Panelboard Grounding <u>and Bonding.</u> Where a grounded electrical distribution system is used and metal feeder raceway or Type MC or MI cable <u>that qualifies as an equipment grounding conductor in accordance with 250.118 is installed,</u> grounding of a panelboard or switchboard shall be ensured by one of the following <u>bonding</u> means at each termination or junction point of the <u>metal</u> raceway or Type MC or MI cable:
(1) A grounding bushing and a continuous copper bonding jumper, sized in accordance with 250.122, with the bonding jumper connected to the junction enclosure or the ground bus of the panel
(2) Connection of feeder raceways or Type MC or MI cable to threaded hubs or bosses on terminating enclosures
(3) Other approved devices such as bonding-type locknuts or bushings.
Substantiation: Grounding of the panelboard or switchboard can be assured by an equipment grounding conductor of the wire type conductor included with the feeder where properly sized. Copper sheath of Type MI cable is suitable for grounding where used with suitable fittings whereas the steel alloy sheath MI cable is not. MC cables in the larger sizes (for feeders) typically include an equipment grounding conductor of the wire type in accordance with the product standard. Adding the text proposed helps clarify what is required to be assured relative to the equipment grounding. Where an equipment grounding conductor included in the feeder as required by 215.6 is a conductor (wire type), grounding should be assured by proper connection of the equipment grounding conductors at termination points all the way back to the point of origin of the feeder. The redundant equipment grounding conductor paths required by 517.13(A) and (B) are not currently applicable in this section for feeders. Adding the term "and bonding" in this section is appropriate because the section covers both grounding and bonding provisions.
Panel Meeting Action: Accept
Panel Statement:
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-39 Log #1711 NEC-P15 **Final Action: Accept**
(517.19(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(D) Panelboard Grounding <u>and Bonding</u> . Where a grounded electrical distribution system is used and metal feeder raceway or Type MC or MI cable <u>that qualifies as an equipment grounding conductor in accordance with 250.118 is installed,</u> grounding of a panelboard or switchboard shall be ensured by one of the following <u>bonding</u> means at each termination or junction point of the <u>metal</u> raceway or Type MC or MI cable:
(1) A grounding bushing and a continuous copper bonding jumper, sized in accordance with 250.122, with the bonding jumper connected to the junction enclosure or the ground bus of the panel.
(2) Connection of feeder raceways or Type MC or MI cable to threaded hubs or bosses on terminating enclosures.
(3) Other approved devices such as bonding-type locknuts or bushings.
Substantiation: Grounding of the panelboard or switchboard can be assured by an equipment grounding conductor of the wire type conductor included with the feeder where properly sized. Copper sheath of Type MI cable is suitable for grounding where used with suitable fittings whereas the steel alloy sheath MI cable is not. MC cables in the larger sized (for feeders) typically include an equipment grounding conductor of the wire type in accordance with the product standard. Adding the text proposed helps clarify what is required to be assured relative to the equipment grounding. Where an equipment grounding conductor included in the feeders as required by 215.6 is a conductor (wire type), grounding should be assured by proper connection of the equipment grounding conductors at termination points all the way back to the point of origin of the feeder. The redundant equipment grounding conductor paths required by 517.13(A) and (B) are not currently applicable in this section for feeders. Adding the term "and bonding" in this section is appropriate because the section covers both grounding and bonding provisions.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-40 Log #1803 NEC-P15 **Final Action: Reject**
(517.19(E) Exception)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at the end of Exception: "[NFPA 99: 4.3.2.6.3.2]".
Substantiation: 1. Requirement is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.19(E) should not be identified as extracted material.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-41 Log #2115 NEC-P15 **Final Action: Accept**
(517.20(A) Exception)

Submitter: Burton R. Klein, Burton Klein Associates
Recommendation: Delete the word "normal" so Exception reads:
Branch circuits supplying only listed, fixed, therapeutic and diagnostic equipment shall be supplied from a ~~normal~~ grounded service, single- or 3-phase system, provided that...(remainder of Exception the same).
Substantiation: 1. Exception is addressing the issue of allowing this equipment to be fed from a grounded service, irrespective of whether that service is from the normal or essential electrical system.
2. This is extracted text from NFPA 99, which does not include the word "normal."
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-42 Log #1044 NEC-P15 **Final Action: Reject**
(517.26)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
The essential electrical system shall meet the <u>applicable</u> requirements ~~of Article 700~~ <u>for emergency systems</u> except as amended by Article 517.
Substantiation: Edit. To comply with Style Manual requirements.
Panel Meeting Action: Reject
Panel Statement: The reference to Article 700 should not be deleted or replaced by the term "for emergency systems," as the term "emergency systems" is utilized elsewhere in the Code.
It is consistent with the NEC Style Manual to refer to an entire chapter (Article) when additional conditions are specified.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-43 Log #2508 NEC-P15 **Final Action: Accept**
(517.26)

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Revise text to read as follows:
517.26 Application of Other Articles. The life safety branch of the emergency system ~~essential electrical system~~ shall meet the requirements of Article 700, except as amended by Article 517. The critical branch shall not be required to meet the requirements of Article 700.
Substantiation: The life safety branch of the health care facility is comparable to the emergency system of commercial (and other) building types, since both provide power for life safety systems. The critical branch of the health care facility serves patient care related circuits and equipment, and thus it is not appropriate to apply Article 700.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
MORGAN, E.: I strongly disagree with the panel action on this proposal. Throughout NFPA 99 and NEC Article 517, the critical branch is considered an inseparable part of the emergency system. By definition, the critical branch serves such important functions as task illumination, special power circuits, and selected receptacles related to patient care. A more complete list of the locations served by these circuits is in NFPA 99, 4.4.2.2.2.3. It includes locations such as coronary care, intensive care, postoperative recovery rooms, hemodialysis rooms and emergency rooms.
Removal of the requirement to comply with Article 700 is more than an editorial change. It would literally remove requirements such as: Identification of boxes, enclosures and panels as part of the emergency system (700.9); the requirement for audible and visual signals for the alternate power source (700.7); and the periodic testing required by 700.4.
Removing the critical branch from requirements of Article 700 may also be mistakenly seen by some designers and installers of smaller facilities as eliminating the requirements for emergency systems in Article 517; such as separation from other circuits, and mechanical protection.

15-44 Log #1804 NEC-P15 **Final Action: Reject**
(517.30(B)(1))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at the end of paragraph: “[NFPA 99: 4.4.2.2.1]”.
Substantiation: 1. Requirement is the performance criteria and responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.19(A) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-45 Log #1805 NEC-P15 **Final Action: Accept**
(517.30(B)(2))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at the end of paragraph: “[NFPA 99: 4.4.2.2.1.1]”.
Substantiation: 1. Requirement is the performance criteria and responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-46 Log #1806 NEC-P15 **Final Action: Reject**
(517.30(B)(3))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at the end of paragraph: “[NFPA 99: 4.4.2.2.1.2]”.
Substantiation: 1. Requirement is the performance criteria and responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.30(B)(3) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-47 Log #1808 NEC-P15 **Final Action: Reject**
(517.30(B)(4))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at the end of paragraph, before FPN No. 1: “[NFPA 99: 4.4.2.2.1.4]”.
Substantiation: 1. Requirement is the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
3. Correlate with 517.41 on this issue.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.30(B)(4) should not be identified as extracted material.
The maximum demand limit of 150 kVA in 517.30(B)(4) is not the same as the 150 kVA continuous load provision of Section 4.4.2.2.1.4 of NFPA 99.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-48 Log #1807 NEC-P15 **Final Action: Accept**
(517.30(B)(4), FPN 1)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Change “NFPA 99-2002” to “NFPA 99-2005”.
Substantiation: Editorial. Reference latest edition of NFPA 99.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-49 Log #1809 NEC-P15 **Final Action: Accept**
(517.30(B)(5))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Change title from “Other loads” to “Optional loads”.
Substantiation: 1. Text is the responsibility of T/CC on Health Care Facilities. Title for this category of loads was changed to “Optional loads” to describe more accurately this category of loads.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-50 Log #1810 NEC-P15 **Final Action: Reject**
(517.30(B)(5))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at the end of section: “[NFPA 99: 4.4.1.1.7.3]”.
Substantiation: 1. Text is the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.30(B)(5) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-51 Log #3025 NEC-P15 **Final Action: Reject**
(517.30(C)(4))

Submitter: Barry F. O’Connell, Tyco Thermal Controls
Recommendation: Add 517.30(C)(4):
Fire Protection of the Emergency Systems Wiring. The wiring of the emergency systems shall be protected to resist potential damage by fire for a period of 2 hours using one of the following methods:
(1) Be encased in a minimum 50 mm (2 in.) of concrete
(2) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 2 hours
(3) Be a listed electrical circuit protective system with a minimum 2-hour fire rating.
Substantiation: It is common practice to fire protect emergency system wiring in hospitals. This proposal would explicitly incorporate the allowable methods traditionally used in 700.9(D) except extending the time to 2-hours. In a hospital, additional time is required to evacuate, because of limited occupant mobility.
Panel Meeting Action: Reject
Panel Statement: Fire protection is primarily a function of the Building Code and Life Safety Code. If incorporated into the wiring requirements for an emergency system, it should be done through expanding the occupancy classes listed in 700.9(D).

Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-52 Log #1811 NEC-P15 **Final Action: Reject**
(517.30(C)(1))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph 1, add: "[NFPA 99: 4.4.2.2.4.1]".
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.30(C)(1), should not be identified as extracted material.
Section 517.30(C)(1) has additional requirements beyond Section 4.4.2.2.4.1 of NFPA 99.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-53 Log #1812 NEC-P15 **Final Action: Reject**
(517.30(C)(3))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph 1, before subparagraph 1, add: "[sentence 1: NFPA 99: 4.4.2.2.4.4]".
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: NFPA 99, Section 4.4.3.3.4.4, refers to NFPA 70 for requirements; therefore 517.30(C)(3) is not extracted text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-54 Log #3300 NEC-P15 **Final Action: Reject**
(517.30(C)(3))

Submitter: Richard Temblador, Southwire Company
Recommendation: Revise text to read as follows:
(3) Mechanical Protection of the Emergency System. The wiring of the emergency system in hospitals shall be mechanically protected. Where installed as branch circuits in patient care areas, the installation shall comply with the requirements of 517.13(A) and 517.13(B). The following wiring methods shall be permitted:
(1) Nonflexible metal raceways, Type MI cable, or Schedule 80 rigid nonmetallic conduit. Nonmetallic raceways shall not be used for branch circuits that supply patient care areas.
<u>(2) Listed MC cable identified as providing crush, impact and penetration circuit protection performance equivalent to Electrical Metallic Tubing.</u>
(~~2~~ <u>3</u>) Where encased in not less than 50 mm (2 in.) of concrete, Schedule 40 rigid nonmetallic conduit, flexible nonmetallic or jacketed metallic raceways, or jacketed metallic cable assemblies listed for installation in concrete. Nonmetallic raceways shall not be used for branch circuits that supply patient care areas.
(~~3~~ <u>4</u>) Listed flexible metal raceways and listed metal sheathed cable assemblies in any of the following:
a. Where used in listed prefabricated medical headwalls
b. In listed office furnishings
c. Where fished into existing walls or ceilings, not otherwise accessible and not subject to physical damage
d. Where necessary for flexible connection to equipment
(~~4~~ <u>5</u>) Flexible power cords of appliances or other utilization equipment connected to the emergency system.
(~~5~~ <u>6</u>) Secondary circuits of Class 2 or Class 3 communication or signaling systems
Substantiation: Traditionally, nonflexible metal raceways and MI cable have been used to provide the needed mechanical protection as required for emergency and critical branch circuits along with redundant ground paths as required by 517.13. MC cable can be designed and constructed to provide the needed mechanical protection - crush, impact and penetration - for emergency and critical branch that is equivalent to that of electrical metallic tubing with redundant ground paths as required by 517.13.
Panel Meeting Action: Reject
Panel Statement: The panel is reluctant to expand the use of MC cable beyond its permitted uses.
The substantiation indicates that MC cable "can be designed and constructed to provide the needed mechanical protection". This statement does not provide the evidence or data to warrant acceptance of this proposed change.
The panel recommends that the submitter provide the panel with a fact finding report to substantiate this change and evidence that this product can be listed and identified as special construction.
In addition, the panel recommends that this information would be more appropriately located in Article 330 under Uses Permitted.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-55 Log #2969 NEC-P15 **Final Action: Reject**
(517.30(C)(3)(3))

Submitter: James H. Maxfield, Dover, NH
Recommendation: Add 517.30(C)(3)(3)e.
Where protected from physical damage for its entire length by any raceway identified in (1) and (2).
Substantiation: Any raceway identified and installed in accordance with (1) or (2) provide adequate physical damage protection for branch circuit conductors that supply patient care areas. Similarly, when installed for its entire length in such raceways listed flexible metal raceways and listed metal sheathed cable assemblies will be as well protected from physical damage. The requirements of 517.13(A) and 517.3(B) are not compromised by the installation of listed flexible metal raceways and listed metal sheathed cable assemblies protected by a nonmetallic raceway. Raceway sections identified in (1) and (2) already permit such an installation. For example, 352.22 "cables shall be permitted to be installed where such use is not prohibited by the respective cable article."
Panel Meeting Action: Reject
Panel Statement: Listed cable assemblies are not tested for performance when installed entirely within a raceway system. Installation of a cable within another raceway "along its entire length" becomes an installation problem for proper termination of the cable system and the raceway at junction points. Proper sizing of a raceway to contain a single cable is unfamiliar to many installers and inspectors.
Section 517.30(C)(3)(3) covers the use of flexible methods. Installation in accordance with the submitter's proposal would constitute a nonflexible installation.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-56 Log #3453 NEC-P15 **Final Action: Reject**
(517.30(C)(3)(3))

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Revise the charging paragraph of the exceptions to read as follows:
Listed flexible metal raceways and listed metal sheathed cable assemblies <u>complying with 250.118 and 517.13 are permitted</u> in any of the following:
Substantiation: Both Section 250.118 and 517.13 contain important information regarding specific grounding requirements for the wiring methods named in (3). Without these references it could be interpreted that these requirements are superseded by the exceptions in 517.30(3)(3). While there is a FPN calling the user's attention to 517.13, this is not enforceable and the safety in patient care areas could be compromised. This revised text should assure that necessary grounding requirements and limitations are met.
Panel Meeting Action: Reject
Panel Statement: Compliance with 517.13 is unnecessary for cables in office furnishings where fished into existing walls or ceilings, or to connect equipment outside the patient care area. Paragraph (3) clearly states the requirement for compliance with 517.13 where located in a patient care area, and 517.13(A) contains the needed reference to 250.118.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-57 Log #1931 NEC-P15 **Final Action: Accept**
(517.30(C)(3)(4) and 517.30(C)(3)(2))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-53. This action will be considered by the Panel as a Public Comment. The Technical Correlating Committee also directs that this proposal be forwarded to Code-Making Panel 8 for Comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise 517.30(C)(3)(1) and 517.30(C)(3)(2) as follows:
(1) Nonflexible metal raceways, Type MI cable, or Schedule 80 rigid ~~nonmetallic~~ <u>PVC</u> conduit. Nonmetallic raceways shall not be used for branch circuits that supply patient care areas.
(2) Where encased in not less than 50 mm (2 in.) of concrete, Schedule 40 rigid ~~nonmetallic~~ <u>PVC</u> conduit, flexible nonmetallic or jacketed metallic raceways, or jacketed metallic cable assemblies listed for installation in concrete. Nonmetallic raceways shall not be used for branch circuits that supply patient care areas.

Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC conduit. It clarifies that rigid polyvinyl chloride conduit is designated as Type PVC, rather than the broader designation of rigid nonmetallic conduit (Type RNC) which includes PVC, HDPE and RTRC. It also results in the use of consistent terminology for this product throughout the code.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
MORGAN, E.: This proposal seemed logical enough when it was being considered by the panel. The actual result could be other than was intended. Depending on the outcome of proposals to separate the existing Article 352 into three new articles covering type PVC, type HDPE and type RTRC conduit, Panel 15 may wish to revisit this in the Comment Meetings. We may have inadvertently eliminated all but PVC conduit for use in installations governed by Section 517.30(C)(1) and (2).

15-58 Log #886 NEC-P15 **Final Action: Accept in Principle**
(517.30(C)(3)(5))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise (5) to read as follows:
" Cable types from Chapter 7 or Chapter 8 with or without raceways for secondary circuits of Class 2 or Class 3 communication or signaling systems."
Substantiation: The list following 517.30(C)(3) is supposed to be a list of permitted wiring methods. The existing item (5) does not describe any wiring methods. The proposed language restores the details of the 2002 exception that was reworded for 2005, especially the clear statement that raceways are not required.
Panel Meeting Action: Accept in Principle
In the current Code text, add "with or without raceways" to the end of the sentence.
Panel Statement: The revised language clarifies that raceway is not required in this application.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-59 Log #1813 NEC-P15 **Final Action: Reject**
(517.30(D))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of first paragraph, add: "[sentence 1: NFPA 99: 4.4.2.1.1.9]".
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The referenced number to NFPA 99 provided by the submitter does not exist. Although the requirements of NFPA 99, 4.4.1.1.9, are similar to those of 517.30(D), the requirements are substantially different and, therefore, 517.30(D) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-60 Log #1814 NEC-P15 **Final Action: Reject**
(517.32)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of first paragraph, before paragraph (A), add: "[sentence 1: NFPA 99: 4.4.2.2.2.2]".
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.32, should not be identified as extracted material.
The text of 517.32 contains more information than 4.4.2.2.2.2 of NFPA 99.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-61 Log #2509 NEC-P15 **Final Action: Accept in Principle**
(517.32(E))

TCC Action: The Technical Correlating Committee notes that the word "emergency" should be inserted between "for" and "battery- powered" to be consistent with the existing code text.
Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Revise text to read as follows:
517.32(E) Generator Set and Transfer Switch Location s. Task illumination battery charger for emergency battery-powered lighting unit(s) and selected receptacles at the generator set and essential electrical system automatic transfer switch location s .
Substantiation: (1) Battery emergency lighting is necessary to troubleshoot and repair automatic transfer switches during a power outage. (2) This change is necessary to correlate with NFPA 99.
Panel Meeting Action: Accept in Principle
Revise the proposed text to read as follows:
"517.32(E) Generator Set and Transfer Switch Location s . Task Illumination battery charger for battery-powered lighting units(s) and selected receptacles at the generator set and essential transfer switch locations. [NFPA 99:4.4.2.2.2.2(5)]"
Panel Statement: As revised, paragraph (E) is the same as the NFPA 99 requirement and should be so identified.
Also, the additional wording satisfies the submitter's intent.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-62 Log #1815 NEC-P15 **Final Action: Reject**
(517.32(H) (New))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add new paragraph (H) to read:
"(H) Auxiliary functions of fire alarm combination systems complying with NFPA 72, National Fire Alarm Code. [NFPA 99: 4.4.2.2.2.2(1) to (8)]."
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The proposal does not provide specific language to indicate those functions deemed necessary to be supplied by the life safety branch.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-63 Log #2510 NEC-P15 **Final Action: Accept in Principle**
(517.32(H) (New))

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Add text to read as follows:
517.32(H) Other Life Safety Equipment. Heating ventilation and air conditioning accessories required for life safety, including control systems, air evacuation and pressurization fans, and electrically operated dampers. Fan motors shall be permitted to be connected to the equipment system.
Substantiation: HVAC controls, dampers, and certain motors are related to the safety of life. The designer should have the option to connect large motors to the equipment system where it is not practical to connect them to the life safety branch.
Panel Meeting Action: Accept in Principle
Create a new 517.32(C)(3) to read as follows:
"517.32(C)(3) Mechanical, control, and other accessories required for effective life safety systems operation shall be permitted to be connected to the life safety branch."
Panel Statement: The new wording meets the intent of the submitter in that it makes it possible to connect smoke dampers, and smoke control actuators, initiated by the fire alarm system, to the life safety branch.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-64 Log #2511 NEC-P15 **Final Action: Accept in Principle**
(517.32(I) (New))

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Add text to read as follows:
517.32 (I) Generator Accessories. Accessories for the onsite standby generator shall be permitted to be connected to the life safety branch. These accessories shall also be permitted to be served by the critical branch or equipment system.

Substantiation: (1) Generator accessories are generally provided for the onsite generator, which is required for the safety of life. (2) For outdoor generators located in weatherproof enclosures, 517.34(E) and most jurisdictions require lighting and receptacles to be supplied by the life safety branch. It is generally best to provide the lighting and receptacles circuits, as well as other accessories (i.e. day tank) from a panel located in the outdoor generator enclosure. Having all circuits from the same panel reduces risk (i.e. the possibility that a worker might open all breakers and then sustain injury from a life safety circuit that originates outside of the generator enclosure). The provision that accessory circuits may also be connected to the critical branch or equipment system covers other contingencies, such as indoor generator installations. The generator accessories should not be restricted to a single branch or system, since the generator exists for patient care, life safety, and other purposes.
Panel Meeting Action: Accept in Principle
Create a new 517.32(F) to read as follows:
"517.32(F) Generator Set Accessories. Generator set accessories as required for generator performance."
Renumber existing (F), (G), and a new (H), accordingly.
Panel Statement: The revised wording meets the intent of the submitter in that all accessories could be connected to the same panel.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-65 Log #1816 NEC-P15 **Final Action: Reject**
(517.33(A)(9))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of sub paragraph (9), revise to read: "[sentence 1: NFPA 99: 4.4.2.2.2.3(1) to (9)]".
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.33(A)(9) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-66 Log #2520 NEC-P15 **Final Action: Accept**
(517.34(A)(7) (New))

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Add text to read as follows:
<u>517.34(A)(7) Supply, return, and exhaust ventilating systems for operating and delivery rooms.</u>
Substantiation: O.R. and D.R. ventilation systems should be connected to the equipment system for the same reasons that the loads described in 517.34(A)(6) are connected to the equipment systems. These loads insure that air circulation, filtration, and air pressure relationships are maintained for infection control purposes. The requirement for space heating in 517.34(B)(1) is not specific to air movement and permits manual transfer, which is not acceptable for infection control purposes. (Note that it is not proposed that these loads be permitted to be supplied from the critical branch as in 517(A)(6). O.R. and D. R. air handling units are generally too large for the life safety branch and a short delay before transfer is acceptable.)
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
WHITE, A.: The current phrase "protective environment rooms" found in 517.34(A)(6) adequately describes the rooms in question.

15-67 Log #2512 NEC-P15 **Final Action: Accept**
(517.34(A) and (B))

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Revise text to read as follows:
517.34(A) Equipment for Delayed Automatic Connection. The following equipment shall be <u>permitted to be</u> arranged for delayed automatic connection to the alternate power source:
517.34(B) Equipment for Delayed Automatic or Manual Connection. The following equipment shall be <u>permitted to be</u> arranged for either delayed automatic or manual connection to the alternate power source:
Substantiation: (1) In spilt of the present code language, few modern health care facilities are programming their automatic transfer switches for delayed automatic transfer. (2) Modern standby generators can handle 100 percent step load with little difficulty, thus there is generally no need for delaying the transfer of loads. (3) Small facilities with essential system loads of less than 150 kVA (or 120 kW) (see 517.30(B)(4)), would be required to have multiple automatic transfer switches if delayed automatic transfer is required. (4) This change is required to correlate with NFPA 99.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-68 Log #1817 NEC-P15 **Final Action: Accept in Principle**
(517.34(A)(6))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: 1. Add at end of sub paragraph (6), revise to read: "[NFPA 99: 4.4.2.2.3.4(1) to (6)]".
2. Delete reference at the end of subparagraph (A)(5).
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Accept in Principle
The recommended text is to appear after (6) and before the exception.
Also, the extract reference in (5) and in (6) is removed.
Panel Statement: The revision complies with the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-69 Log #1818 NEC-P15 **Final Action: Reject**
(517.34(B))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: 1. Add at end of first sentence, before subparagraph (1) add: "[NFPA 99: from 4.4.2.2.2.5(1) to (9)]".
2. In Exception to subparagraph (1), change first word from "eating" to "Heating".
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
Conform to NFPA Standards Council on policy for extracted text.
2. Editorial.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.34(B)(1) through (9) should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
ERICKSON, D.: While the proposal to place an extract from NFPA 99 under this paragraph should be rejected, the need to accept this proposal in principle is necessary and the editorial change made.
(B) Equipment for Delayed Automatic or Manual Connection.
The following equipment shall be arranged for either delayed automatic or manual connection to the alternate power source:
(1) Heating equipment to provide heating for operating, delivery, labor, recovery, intensive care, coronary care, nurseries, infection/isolation rooms, emergency treatment spaces, and general patient rooms and pressure maintenance (jockey or make-up) pump(s) for waterbased fire protection systems.
Exception: Heating of general patient rooms and infection/isolation rooms during disruption of the normal source shall not be required under any of the following conditions;

15-70 Log #1819 NEC-P15 **Final Action: Accept**
(517.34(B)(5))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Delete subparagraph (5): ["Automatically operated doors"].
Substantiation: 1. Text is performance criteria and the responsibility of T/CC on Health Care Facilities.
Conform to NFPA Standards Council on policy for extracted text.
2. Subject of automatically operated doors - those within means of egress - were moved to Life Safety Branch in NFPA 99.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
WHITE, A.: Automatic doors used for egress are required to be connected to the Life Safety Branch as per 517.32(D). There are many applications for non-egress automatic doors within a hospital, Article 517.34(B)(5) provides for the continued operation of these doors in an off-normal situation while not further burdening the Life Safety Branch.
Comment on Affirmative:
MORGAN, E.: The substantiation indicates connection of automatically operated doors was relocated to requirements under the Life Safety Branch. It is true that <u>egress</u> doors are required to be connected to the Life Safety

Branch, both in NFPA 99, 4.4.2.2.2.2(7), as well as NEC 517.32(G). But acceptance of this proposal means there will not be a requirement for connection of automatically operated doors for Operation Rooms or Delivery Rooms to any of the alternate power sources.

Existing 517.34(B)(5) does require delayed automatic or manual connection of "Automatically operated doors" to the equipment system. Since egress doors are already covered in Life Safety Branch requirements, it appears this should have remained to cover the connection of O.R. and D.R. rooms. This also should be revisited at the Comment Meeting.

15-71 Log #1820 NEC-P15 **Final Action: Reject**
(517.35(C))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, before FPN, add: "[NFPA 99: 4.4.1.1.2(5)]".
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.
2. Conform to NFPA Standards Council Policy on extracted text.
Panel Meeting Action: Reject
Panel Statement: Section 517.35(C) is not extracted from NFPA 99, 4.4.1.1.2. The reference stated does not exist.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-72 Log #1821 NEC-P15 **Final Action: Reject**
(517.40(A) Exception)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of subparagraph (c), revise extracted reference to read: "[NFPA 99: 17.3.1.4.2, 18.3.4.1.2]".
Substantiation: Update reference paragraph number.
Panel Meeting Action: Reject
Panel Statement: Section 517.40 is not extracted from the stated reference.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
ERICKSON, D.: The proposal to update the extract from NFPA 99 under this paragraph should be accepted as this does have a current NFPA 99 extract associated with the language.
(c) An automatic battery-operated system(s) or equipment is provided that shall be effective for at least 11/2 hours and is otherwise in accordance with 700.12 and that shall be capable of supplying lighting for exit lights, exit corridors, stairways, nursing stations, medical preparation areas, boiler rooms, and communications areas. This system shall also supply power to operate all alarm systems.
[NFPA 99: 17.3.4.1.2(3), 18.3.4.1.2(3)]

15-73 Log #1822 NEC-P15 **Final Action: Reject**
(517.40(B))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Revise 517.40(B) to read:
"(B) Inpatient hospital care facilities. <u>Nursing homes and limited care facilities that admit patients who need to be sustained by electrical life support equipment, the essential electrical system from the source to the portion of the facility where such patients are treated</u> shall comply with requirements of Part III, 517.30 through 517.35. " <u>[NFPA 99: 17.3.4.2.4, 18.3.4.2.4</u>]" (changes underlined)
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project. It was revised for the 2005 edition of NFPA 99.
2. Conform with the NFPA Standards Council policy on extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.40(B), should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
ERICKSON, D.: This proposal needs to be accepted as the language in NFPA 99 has changed and the proposed language provides the user and enforcer with better guidance. The panel substantiation does not match the recommendation to modify the current language.

15-74 Log #1823 NEC-P15 **Final Action: Reject**
(517.40(C))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, before FPN, add: "[NFPA 99: 13.3.4.3]".
Substantiation: 1. Requirement is performance criteria and the responsibility of T/C on Health Care Facilities.
2. Conform to NFPA Standards Council on policy for extracted text.
Panel Meeting Action: Reject
Panel Statement: The text cited is inconsistent with the language in 517.40(C); therefore, the text is not extracted and the proposed citation is inappropriate.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
ERICKSON, D.: The submitter should be directed to paragraph 517.30(B)(6) and the extract is already included.

15-75 Log #1824 NEC-P15 **Final Action: Reject**
(517.41(C))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, before FPN, add: "[NFPA 99: 4.5.1]".
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.
2. Conform to the Standards Council Policy on extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.41(C) should not be identified as extracted material.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-76 Log #1825 NEC-P15 **Final Action: Reject**
(517.42)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, before FPN, add: "[NFPA 99: 4.5.2.2.2(1) to (7)]".
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.
2. Conform to the Standards Council Policy on extracted text.
Panel Meeting Action: Reject
Panel Statement: Since the two requirements are substantially different, 517.42 should not be identified as extracted material.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-77 Log #2116 NEC-P15 **Final Action: Reject**
(517.42)

Submitter: Burton R. Klein, Burton Klein Associates
Recommendation: 1. Revise title of 517.42 to read:
517.42 Connection to Emergency System
2. Change "life safety branch" to "emergency system" wherever it appears in 517.42.
3. Revise Figures 517.41, No. 1 and 517.41, No. 2 accordingly.
Substantiation: 1. While 517.42 currently only requires items related to life safety to be connected to emergency power, activities in nursing homes is changing. The TC on Electrical Systems (for Chapter 4 of NFPA 99) has recognized this shift and has included a new paragraph in 2005 addressing nursing homes that have "patients" connected to "electrical life support equipment." Thus, it is only a matter of time before nursing homes will have a "life safety branch" and a "critical branch" that needs to be connected to emergency power within 10 seconds (i.e., they will have an "emergency system" of the essential electrical system like hospitals.
2. This change is in concert with Chapter 17 of NFPA 99-2005.
Panel Meeting Action: Reject
Panel Statement: Article 517 and NFPA 99 both recognize the use of terms "Life Safety Branch" and "Critical Branch" as divisions of the facility emergency system. The terms should not be interposed.
It is the panel's position that NFPA 99 should address this substantive change in system arrangement prior to Article 517 being changed.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-78 Log #1826 NEC-P15 **Final Action: Accept**
(517.43)

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, before Exception, add: "[NFPA 99: 4.5.2.2.3.1]".
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.
2. Conform to the Standards Council Policy on extracted text.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-79 Log #2117 NEC-P15 **Final Action: Reject**
(517.43)

Submitter: Burton R. Klein, Burton Klein Associates
Recommendation: 1. Revise title of 517.43 to read:
517.43 Connection to Equipment System
2. Change "critical branch" to "equipment system" wherever it appears in 517.43.
3. Revise Figures 517.41, No. 1 and 517.41, No. 2 accordingly.
Substantiation: 1. Except for first item listed in 517.43(A), all items in this section are "equipment related" (similar to 517.34 which uses the term "Equipment" to describe these items). When nursing homes or limited care facilities begin to treat "patients" (and some already are), they will have to provide for a "critical branch". Thus, this change is recommended now in order to prevent confusion in the future.
2. A similar proposal is being submitted to NFPA 99 for correlation purposes.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-77.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-80 Log #1827 NEC-P15 **Final Action: Accept**
(517.43(A))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, add: "[NFPA 99: 4.5.2.2.3.3(1) to (5)]".
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.
2. Conform to the Standards Council Policy on extracted text.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-81 Log #2513 NEC-P15 **Final Action: Accept**
(517.43(A) & (B))

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Revise text to read as follows:
517.43(A) Delayed Automatic Connection. The following equipment shall be <u>permitted to be</u> connected to the critical branch and shall be arranged for delayed automatic connection to the alternate power source:
517.43(B) Delayed Automatic or Manual Connection. The following equipment shall be <u>permitted to be</u> connected to the critical branch and shall be arranged for either delayed automatic or manual connection to the alternate power source.
Substantiation: (1) In spilt of the present code language, few modern health care facilities are programming their automatic transfer switches for delayed automatic transfer. (2) Modern standby generators can handle 100 percent step load with little difficulty, thus there is generally no need for delaying the transfer of loads. (3) Small facilities with essential system loads of less than 150 kVA (or 120 kW) (see 517.30(B)), would be required to have multiple automatic transfer switches if delayed automatic transfer is required. (4) This change is required to correlate with NFPA 99.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-82 Log #1828 NEC-P15 **Final Action: Accept**
(517.43(B))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, add: "[NFPA 99: 4.5.2.2.3.4(A) and (B)]".
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.
2. Conform to the Standards Council Policy on extracted text.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-82a Log #CP1502 NEC-P15 **Final Action: Accept**
(517.44(B))

TCC Action: The Technical Correlating Committee understands that the reference in the recommendation is to 517.40(A) Exception, and not to 517.40(A) main paragraph.
Submitter: Code-Making Panel 15,
Recommendation: In existing 517.44(B), Revise Exception No. 2 to read as follows:
"Exception No. 2: Nursing homes or limited care facilities meeting the requirement of 517.40(A) and other healthcare facilities meeting the requirement of 517.45 shall be…".
Delete all the existing extract references.
Substantiation: Other facilities, under certain conditions described in 517.40 are permitted to have batteries.

Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
WISEMAN, J.: In the Recommendation, the word "Exception" was inadvertently omitted and should be reinserted following "517.40(A)." It is the requirements of 517.40(A), Exception that apply, not the requirements of 517.40(A).

15-83 Log #1829 NEC-P15 **Final Action: Reject**
(517.44(C))

Submitter: Marvin J. Fischer, Monroe Township, NJ
Recommendation: Add at end of paragraph, add: "[NFPA 99: A.4.4.1.1.1.2(5)]".
Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.
2. Conform to the Standards Council Policy on extracted text.
Panel Meeting Action: Reject
Panel Statement: The NEC Style Manual prohibits the extraction of non-mandatory text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-84 Log #2181 NEC-P15 **Final Action: Reject**
(517.60(B))

Submitter: Dann Strube, Strube Consulting
Recommendation: Revise text to read as follows:
(B) ~~other than hazardous (classified) location~~ <u>unclassified locations</u> ...shall be considered to be an ~~other than hazardous (classified~~) <u>unclassified location</u> .
Substantiation: 500.2 defines areas that have not been classified as "Unclassified Locations". This change will put the language of this section into agreement with the 500.2 definition.
4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.
The base rule in 500.2 clearly states that the definitions in Article 500 only apply for Articles 500-516. Howeve,r it seems logical that Article 517 would follow the same definitions provided for similar locations.
Panel Meeting Action: Reject
Panel Statement: The phrase "Other than Hazardous" found in Article 517 designates a location where installations are to be modified per the requirements of 517.61(C). The phrase "Unclassified Location" as used in Article 500 indicates an installation that occurs in a location not designated as a hazardous location for the purposes of Article 500, it is assumed the general requirements of Chapters 1 through 4 of the NEC are not modified. The suggestion that the two articles are referring to similar locations is in error; Article 500 paints with a very broad brush and Article 517 refers to a location designated for very specific use. Using "Unclassified Locations" in Article 517 will cause confusion as to the applicability of 517.61(C).
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-86 Log #528 NEC-P15 **Final Action: Accept**
(517.61(B)(4))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(4) Seals. <u>Listed</u> ~~Approved~~ seals shall be provided in conformance with 501.15 and 501.15(A)(4) shall apply to horizontal as well as to vertical boundaries of the defined hazardous (classified) locations.
Substantiation: Approved is defined as acceptable to the authority having jurisdiction. This proposed revision is an effort to provide consistency in how defined words are used in NEC requirements. This section 517.61(B)(4) references 501.15. 501.15(C)(1) requires sealing fittings to be listed. CMP-14 addressed the words approved, identified, and listed in the 2002 NEC cycle and in many cases the word approved was changed to the word listed where appropriate. This proposed revision is intended to provide consistency with those actions.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-87 Log #682 NEC-P15 **Final Action: Accept**
(517.61(B)(5))

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
517.61 Wiring and Equipment.
(B) Above Hazardous (Classified) Anesthetizing Locations. ………
(5) Receptacles and Attachment Plugs. Receptacles and attachment plugs located above hazardous (classified) anesthetizing locations shall be listed <u>“hospital grade” and</u> ~~for hospital use~~ for services of prescribed voltage, frequency, rating, and number of conductors with provision for the connection of the grounding conductor. This requirement shall apply to attachment plugs and receptacles of the 2-pole, 3-wire grounding type for single-phase, 120-volt, nominal, ac service.
Substantiation: This requirement should be made clear as to what type or receptacle is required.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-88 Log #684 NEC-P15 **Final Action: Reject**
(517.61(B)(5))

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
517.61 Wiring and Equipment.
(B) Above Hazardous (Classified) Anesthetizing Locations. ………
(5) Receptacles and Attachment Plugs. Receptacles and attachment plugs located above hazardous (classified) anesthetizing locations shall be listed ~~for hospital use~~ for services of prescribed voltage, frequency, rating, and number of conductors with provision for the connection of the grounding conductor. This requirement shall apply to attachment plugs and receptacles of the 2-pole, 3-wire grounding type for single-phase, 120-volt, nominal, ac service.
Substantiation: This requirement should be made clear as to what type or receptacle is required.
Panel Meeting Action: Reject
Panel Statement: See the panel action on Proposal 15-87. Acceptance of this proposal would relax the requirement without proper substantiation.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-89 Log #2182 NEC-P15 **Final Action: Reject**
(517.61(C))

Submitter: Dann Strube, Strube Consulting
Recommendation: In the title and once in (1), (2), and (3), change other than hazardous (classified) location to “unclassified location”.
Substantiation: 500.2 defines areas that have not been classified as “Unclassified Locations”. This change will put the language of this section into agreement with the 500.2 definition.
4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.
The base rule in 500.2 clearly states that the definitions in Article 500 only apply for Articles 500-516. Howeve,r it seems logical that Article 517 would follow the same definitions provided for similar locations.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-84.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-85 Log #2914 NEC-P15 **Final Action: Accept**
(517.61(C)(2))

Submitter: Marcus Sampson, Lysistrata Electric
Recommendation: Revise as follows:
(2) Receptacles and Attachment Plugs. Receptacles and attachment plugs installed and used in other-than-hazardous (classified) locations shall be listed ~~for hospital use~~ <u>as hospital grade</u> for services of prescribed voltage, frequency, rating, and number of conductors with provision for connection of the grounding conductor. This requirement shall apply to 2-pole, 3-wire grounding type for single-phase, 120-, 208-, or 240-volt, nominal, ac service.
Substantiation: What are receptacles and attachment plugs “listed for hospital use?” This has commonly been interpreted, in the case of parallel-blade outlets, to imply that “hospital grade” outlets be installed.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-90 Log #681 NEC-P15 **Final Action: Accept**
(517.61(C)(2))

TCC Action: The Technical Correlating Committee understands that the final text for 517.61(C)(2) is shown in Proposal 15-85.
Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
517.61 Wiring and Equipment.
(C) Other-Than-Hazardous (Classified) Anesthetizing Locations. …..
(2) Receptacles and Attachment Plugs. Receptacles and attachment plugs installed and used in other-than-hazardous (classified) locations shall be listed <u>“hospital grade” and</u> ~~for hospital use~~ for services of prescribed voltage, frequency, rating, and number of conductors with provision for connection of the grounding conductor. This requirement shall apply to 2-pole, 3-wire grounding type for single-phase, 120-, 208-, or 240-volt, nominal, ac service.
Substantiation: This requirement should be made clear as to what type or receptacle is required.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-91 Log #683 NEC-P15 **Final Action: Reject**
(517.61(C)(2))

Submitter: Jamie McNamara, Hastings, MN
Recommendation: Revise as follows:
517.61 Wiring and Equipment.
(C) Other-Than-Hazardous (Classified) Anesthetizing Locations. …..
(2) Receptacles and Attachment Plugs. Receptacles and attachment plugs installed and used in other-than-hazardous (classified) locations shall be listed ~~for hospital use~~ for services of prescribed voltage, frequency, rating, and number of conductors with provision for connection of the grounding conductor. This requirement shall apply to 2-pole, 3-wire grounding type for single-phase, 120-, 208-, or 240-volt, nominal, ac service.
Substantiation: This requirement should be made clear as to what type or receptacle is required.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-90. Acceptance of this proposal would relax the requirement without proper substantiation.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
ERICKSON, D.: The submitter should be notified that he made a mistake and did not add “hospital grade” as he did in all previous submittals on the same subject. I believe this was an oversight and the Panel should have AIP and added “hospital grade”.

15-92 Log #494 NEC-P15 **Final Action: Accept in Principle in Part**
(517.62)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
517.62 Grounding <u>and Bonding.</u> In any anesthetizing area, all metal raceways and metal-sheathed cables and all <u>normally</u> non-current-carrying conductive portions of fixed electric equipment shall be grounded <u>and bonded.</u> Grounding <u>and bonding</u> in Class I locations shall comply with 501.30.
Substantiation: 501.30 includes both grounding and bonding requirements for Class I locations. This proposed change is an effort to clarify what is actually covered by this section. 517.62 references 501.30 and includes both grounding and bonding rules applicable in such areas.

Panel Meeting Action: Accept in Principle in Part

Revise the proposed wording to read as follows:

"517.62 G rounding. In any anesthetizing area, all metal raceways and metal-sheathed cables and all normally non-current-carrying conductive portions of fixed electric equipment shall be connected to an equipment grounding conductor. Grounding and bonding in Class I locations shall comply with 501.30."

The panel notes that the word "normally" is not contained in Proposal 15-2, nor is the phrase "and bonding" in the last sentence and directs the NFPA editorial staff to be aware of the need to include this wording.

Panel Statement: The panel revised the wording to correlate with the panel action on Proposal 15-2. In addition, the revised wording accomplishes the objective of the submitter to address bonding.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-93 Log #1830 NEC-P15 **Final Action: Reject**

(517.63(A))

Submitter: Marvin J. Fischer, Monroe Township, NJ

Recommendation: Add at end of paragraph, add: "[NFPA 99: 13.4.1.2.6(E)]".

Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.

2. Conform to the Standards Council Policy on extracted text.

Panel Meeting Action: Reject

Panel Statement: NFPA 99 refers to NFPA 70 for requirements; therefore, it is not extracted text.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-94 Log #2174 NEC-P15 **Final Action: Reject**

(517.63(B))

Submitter: Dann Strube, Strube Consulting

Recommendation: Revise as follows:

"...above the hazardous (classified) location and in ~~other than hazardous~~ unclassified location...".

Substantiation: 500.2 defines areas that have not been classified as "Unclassified Locations". This change will put the language of this section into agreement with the 500.2 definition.

4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.

The base rule in 500.2 clearly states that the definitions in Article 500 only apply for Articles 500-516. However, it seems logical that Article 517 would follow the same definitions provided for similar locations.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on proposal 15-84.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-95 Log #2172 NEC-P15 **Final Action: Reject**

(517.63(B) Exception)

Submitter: Dann Strube, Strube Consulting

Recommendation: Change other-than-hazardous (classified) location to unclassified location.

Substantiation: 500.2 defines areas that have not been classified as "Unclassified Locations". This change will put the language of this section into agreement with the 500.2 definition.

4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.

The base rule in 500.2 clearly states that the definitions in Article 500 only apply for Articles 500-516. However, it seems logical that Article 517 would follow the same definitions provided for similar locations.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 15-84.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-96 Log #2173 NEC-P15 **Final Action: Reject**

(517.63(B)(2) and (4))

Submitter: Dann Strube, Strube Consulting

Recommendation: In both locations change other-than-hazardous (classified) location to unclassified locations.

Substantiation: 500.2 defines areas that have not been classified as "Unclassified Locations". This change will put the language of this section into agreement with the 500.2 definition.

4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.

The base rule in 500.2 clearly states that the definitions in Article 500 only apply for Articles 500-516. However, it seems logical that Article 517 would follow the same definitions provided for similar locations.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 15-84.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-97 Log #2175 NEC-P15 **Final Action: Reject**

(517.63(C) Exception)

Submitter: Dann Strube, Strube Consulting

Recommendation: Change other-than-hazardous (classified) location to unclassified location.

Substantiation: 500.2 defines areas that have not been classified as "Unclassified Locations". This change will put the language of this section into agreement with the 500.2 definition.

4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.

The base rule in 500.2 clearly states that the definitions in Article 500 only apply for Articles 500-516. However, it seems logical that Article 517 would follow the same definitions provided for similar locations.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 15-84.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-98 Log #2176 NEC-P15 **Final Action: Reject**

(517.63(E))

Submitter: Dann Strube, Strube Consulting

Recommendation: Change other-than-hazardous (classified) location to unclassified location.

Substantiation: 500.2 defines areas that have not been classified as "Unclassified Locations". This change will put the language of this section into agreement with the 500.2 definition.

4.3.2.2 of the NEC Style Manual allows revision of extracted text to make the extract consistent with the style of the NEC.

The base rule in 500.2 clearly states that the definitions in Article 500 only apply for Articles 500-516. However, it seems logical that Article 517 would follow the same definitions provided for similar locations.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 15-84.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-99 Log #1506 NEC-P15 **Final Action: Reject**

(517.71(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise latter part:

"...by means of a suitable wiring method <u>of Chapter 3</u> . ~~that meets the general requirements of this Code.~~

Substantiation: Edit. Present wording is vague and non-specific.

Panel Meeting Action: Reject

Panel Statement: This proposal limits the wiring methods to Chapter 3, which does not take into consideration equipment that may have factory installed cords, supplied as part of the listed equipment.

In addition, the reference to Chapter 3 is too broad and does not meet the NEC Style Manual requirement for references to other articles.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

15-100 Log #1471 NEC-P15 **Final Action: Reject**

(517.74)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Rename the term "fixture wires" to "luminaire wires" in 517.74.

Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".

For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.

Panel Meeting Action: Reject
Panel Statement: “Luminaire wire” is not a recognized term.
It is this panel’s understand that Code-Making Panel 6 rejected a similar proposal to change the designation of fixutre wire to luminaire wire.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-101 Log #2408 NEC-P15 **Final Action: Reject**
(517.80)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
~~517.80 Patient Care Areas. Equivalent insulation and isolation to that required for the electrical distribution systems in patient care areas shall be provided for communications, signaling systems, data system circuits, fire alarm systems, and systems less than 120 volts, nominal.~~
~~FPN: An acceptable alternate means of providing isolation for patient/nurse call systems is by the use of nonelectrified signaling, communications, or control devices held by the patient or within reach of the patient.~~
In patient care areas, installations of communications, signaling systems, data system circuits, fire alarm systems and systems less than 120 volts nominal, shall be in accordance with their respective Articles.
Substantiation: Reading the 2001 ROP and ROC, it appears that the intent of Panel 15 was to make this section more clear and less ambiguous. Panel 15 proposed language similar to this proposal, and was turned down by the Technical Correlating Committee. For the 2005 cycle, this was not proposed. Deleting this section (and 517.81) requires a simple compliance with the limited energy code Articles that are addressed in this section, which appears was the intent of Panel 15 in the 2002 Code cycle. Please refer to the 2001 ROC 17-30 (517-80).
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: References to other NEC articles must be specific, not general as “...in accordance with their respective articles”. The submittal documentation reveals that a similar proposal was rejected by the Technical Correlating Committee during the 2002 NEC ROC committee meeting. This proposal cannot be accepted either, for the same reason: “References that are for explanatory purposes shall be included in a fine print note. References needed in Code text shall include the specific rule(s) being referenced.”
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-102 Log #2409 NEC-P15 **Final Action: Reject**
(517.80)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
~~517.80 Patient Care Areas. Equivalent insulation and isolation to that required for the electrical distribution systems in patient care areas shall be provided for communications, signaling systems, data system circuits, fire alarm systems, and systems less than 120 volts, nominal.~~
~~FPN: An acceptable alternate means of providing isolation for patient/nurse call systems is by the use of nonelectrified signaling, communications, or control devices held by the patient or within reach of the patient.~~
In patient care areas, installations of communications, signaling systems, data system circuits, fire alarm systems and systems less than 120 volts nominal, shall be in accordance with their respective Articles.
Substantiation: Reading the 2001 ROP and ROC, it appears that the intent of Panel 15 was to make this section more clear and less ambiguous. Panel 15 proposed language similar to this proposal, and was turned down by the Technical Correlating Committee. For the 2005 cycle, this was not proposed. I would like to see this section revised to what Panel 15 approved in the 2002 Code cycle, but was rejected on. Please refer to the 2001 ROC 17-30 (517-80).
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: References to other NEC articles must be specific, not general as “...in accordance with their respective articles”. The submittal documentation reveals that a similar proposal was rejected by the Technical Correlating Committee during the 2002 NEC ROC committee meeting. This proposal cannot be accepted either, for the same reason: “References that are for explanatory purposes shall be included in a fine print note. References needed in Code text shall include the specific rule(s) being referenced.”
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-103 Log #1848 NEC-P15 **Final Action: Accept in Principle**
(517.80 Exception (New))

Submitter: Rand Veerman, Town of Normal-Inspections
Recommendation: Add an exception to 517.80:
517.80 Patient Care Areas Equivalent insulation and isolation...nominal.
Exception: Secondary circuits of Class 2 or Class 3 communications or signaling systems.
Substantiation: This exception would resolve a conflict between 517.30(C)(5) (which permits such secondary circuits to be run without raceway protection) and 517.80 which appears to require raceway and 600 volt insulation.
Panel Meeting Action: Accept in Principle
Add the following as a new second paragraph to 517.80:
“Secondary circuits of transformer-powered communications or signaling systems shall not be required to be enclosed in raceways unless otherwise specified by Chapters 7 or 8. [NFPA 99-2005, 4.4.2.2.4.6.]”
Panel Statement: The revised wording clarifies the panel’s intent regarding the installation of these types of sytems and eliminates the need for an exception.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-104 Log #2410 NEC-P15 **Final Action: Reject**
(517.81)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
~~517.81 Other Than Patient Care Areas. In other than patient care areas, installations shall be in accordance with the appropriate provisions of Articles 640, 725, 760, and 800.~~
Substantiation: This is a companion proposal to correlate with the proposal of deleting 517.80. Please refer to its substantiation.
Panel Meeting Action: Reject
Panel Statement: Section 517.81 should be retained, as it gives the necessary distinction between those systems that may come in contact with a patient and those systems outside the patient care area.
See the panel action and statement on Proposal 15-103.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-105 Log #1178 NEC-P15 **Final Action: Reject**
(517.160(A)(1))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second sentence of text:
Such isolation shall be accomplished by means of one or more transformers having no direct electrical connection between primary and secondary windings by means of ~~motor~~ generator s , ~~sets~~ or by means of ~~suitably isolated~~ batteries which conform to the definition of separately derived systems in Article 100, or the equivalent.
Substantiation: Edit. The electrical connection should be specified as direct since isolation type transformers do have (electromagnetic) connection between primary and secondary. A prime mover for generators may be other than a motor; e.g., gas, gasoline, diesel, steam, compressed air, or wind. “Suitably isolated” is not indicative whether it refers to physical or electrical separation.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-3.
An isolated power system does not meet the definition of a Separately Derived System in Article 100.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12
Ballot Not Returned: 1 Conry, C.

15-106 Log #3656 NEC-P15 **Final Action: Accept in Principle**
(517.160(A)(5))

Submitter: Patricia Johnson, Local Union # 98 IBEW
Recommendation: (1) Isolated conductor No. 1 - orange with blue stripes
(2) Isolated conductor No. 2 - brown with blue stripes Examples
Substantiation: In the Report of Proposals - May 2004 15-53 (Log #2216) NEC-P15 (517-160). This proposal is confusing and could become a safety issue. Orange is used as a “high leg” color (110.15). Orange and brown are also used for 480/227V Y transformer colors and now another use is being proposed for the orange and brown color. For the isolated conductor use orange with blue stripes or brown with blue stripes added to the colors, or use another odd color - such as purple for the isolated conductor to avoid confusion.

Panel Meeting Action: Accept in Principle

Revise the proposed text to read as follows:

(1) Isolated conductor No. 1 - orange with a distinctive colored stripe other than white, green or gray

(2) Isolated conductor No. 2 - brown with a distinctive colored stripe other than white, green or gray.

Revise the first sentence of the following paragraph by adding "with a distinctive colored stripe other than white, green or gray" after the word "yellow".

Revise the second sentence of the same paragraph to read: "striped orange".

Panel Statement: Although the panel accepts the concept, the recommended colors have been revised to ensure ready availability of colored striped conductors.

The critical nature of these circuits demands that their conductors be identified in a manner that leaves no question as to the nature of their service.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 1

Ballot Not Returned: 1 Conry, C.

Explanation of Negative:

WISEMAN, J.: NEMA disagrees with the panel action and panel statement. While we certainly agree with the critical nature of these circuits, we do not agree that a change in color coding is desirable. The use of orange and brown in isolated power systems has been mandated by the NEC since 1978, at least. It is our contention that this long-standing use along with the low probability of intermixing, as cited below, "leaves no question as to the nature of their service" (quoting the Panel Statement.)

The submitter correctly notes that the NEC also uses orange as the color to identify the high leg of a 3-phase, 4-wire delta system, and also cites the practice of using orange and brown in 480Y/277 V systems. While the latter may be true, it is not a requirement of the NEC. But, more importantly, the probability of encountering either of the other two uses of the orange / brown color-coding in the same area occupied by conductors on an isolated power system is extremely low.

Properly designed and installed, isolated power systems have very few joints made up within junction boxes or other enclosures. And they are not installed in the same raceway with other systems. So the probability of an electrician being misled through the act of checking for voltage-to-ground on a brown or orange wire – an example of the potential problems that was cited during the Panel meeting – is very low. (That same approach for determining if a circuit is de-energized would be ineffectual if used on the orange wire of a 4-wire delta system. Only through knowledge of the voltage systems in use in the area and the use of proper verification techniques can an electrician assure a circuit is not energized.)

Additionally, we are concerned that this change would significantly impact reasonable availability of properly color-coded conductors for isolated power systems. This has two components. The first is the obvious one of a striped conductor having lower commercial demand than a solid-colored one. The other issue is that isolated power systems typically are designed to use insulated conductors having a very low dielectric constant (as mentioned in 517.160(A)(6) FPN No. 2) in order to meet the requirements of NFPA 99 and expected performance requirements. Availability of such conductors with striped insulation should be assured before a change of this nature is considered.

15-107 Log #1831 NEC-P15 **Final Action: Reject**
(517.160(B))

Submitter: Marvin J. Fischer, Monroe Township, NJ

Recommendation: Before subparagraph (A), add: "[NFPA 99: 4.3.2.6.3.2, 4.3.2.6.3.3, 4.3.2.6.3.4]".

Substantiation: 1. This text is performance criteria and the responsibility of the Health Care Facilities Project.

2. Conform to the Standards Council Policy on extracted text.

Panel Meeting Action: Reject

Panel Statement: Since the two requirements are substantially different, 517.160(B) should not be identified as extracted text.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12

Ballot Not Returned: 1 Conry, C.

ARTICLE 518 — PLACES OF ASSEMBLY

15-108 Log #1167 NEC-P15 **Final Action: Accept in Principle in Part**
(518.3(A) and (B))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete present text of (A) and substitute:

Except as specifically amended in this article all applicable provisions of this code apply.

In (B) revise first sentence: In exhibition halls used for display booths, as in trade shows, the temporary wiring shall be ~~installed~~ permitted in accordance with ~~Article~~ 590. 3 through 590.6 .

Substantiation: Edit. To comply with Style Manual. Temporary wiring methods of Article 590 should be permitted, not required. "Permanent" type wiring methods of Chapter 3 are not prohibited for installations for temporary or short periods.

Panel Meeting Action: Accept in Principle in Part

The panel rejects the changes to proposed (A) and revises (B) to read as follows:

"(B) In exhibition halls used for display booths, as in trade shows, the temporary wiring shall be permitted to be installed in accordance with Article 590."

Panel Statement: The panel does not agree with the proposed revision of (A), as the proposed text does not improve the meaning or enforceability of (A).

Paragraph (B) language is amended by the panel to improve readability, consistent with intent of this part of the proposal.

The panel's contention is that all provisions of Article 590 shall be permitted.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-109 Log #1039 NEC-P15 **Final Action: Accept in Principle**
(518.4)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise last sentence:

Type ~~MI~~ MC or AC cables containing an insulated equipment grounding conductor sized in accordance with Table 250.122, or Type MI cable .

Substantiation: Type MI cable sheath is generally acceptable as an EGC. The proposal is intended to permit panel clarification whether a wire type EGC is intended for Type MI cable.

Panel Meeting Action: Accept in Principle

Revise the proposed wording to read as follows:

"(A) The fixed wiring method shall be metal raceways, flexible metal raceways, nonmetallic raceways encased in not less than 50 mm (2 in.) of concrete, Type MI, MC, or AC cable . ~~s~~ ~~containing~~ The wiring method shall itself qualify as an equipment grounding conductor according to 250.118, or shall contain an insulated equipment grounding conductor sized in accordance with Table 250.122."

Panel Statement: The submitter's request for clarification of the requirement for an equipment grounding path is addressed in the panel revisions to this paragraph. Either the metal raceway or cable sheath shall be a qualified equipment grounding conductor or shall contain an insulated equipment grounding conductor.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-110 Log #3452 NEC-P15 **Final Action: Reject**
(518.4(A))

TCC Action: The Technical Correlating Committee concludes that the panel has addressed the proposal outside of the issues of toxicity. The Technical Correlating Committee does not deem it necessary for this proposal to be forwarded to the Toxicity Advisory Committee at this time.

Submitter: William A. Wolfe, Steel Tube Institute of North America

Recommendation: Add text after (d) to apply to all exceptions:

Conductors and cables shall be protected in a metal raceway or in a 2-hour rated shaft, or the concealed space shall be FULLY sprinklered with a NFPA 13 Type sprinkler system. These conductors and cables shall not be installed exposed.

Substantiation: There is much more knowledge now about the hazards of communications, signaling, and fire alarm conductors and cables that are installed in concealed spaces. The quantity has grown much greater than ever was anticipated, creating a substantial fire load. In addition, the fire characteristics of some cables are not even equal to the fire characteristics required for plenum construction. Those that do meet flame and smoke requirements are primarily fluropolymers that present an elevated concern about hazard from toxic smoke as evidenced by the enclosed supporting information. Although the Code requires that abandoned cables be removed, this is only required where they are deemed accessible or where they are not tagged for future use. This requirement is very difficult and costly to enforce. This proposed requirement for additional protection is especially important for Places of Assembly.

As a matter of information, the Standards Council has ruled that other NFPA standards are permitted to be referenced in the NEC (e.g. 362.10(2) Exception)

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This proposal concerns toxicity issues and is outside the purview of the panel. The panel recommends to the Technical Correlating Committee that this proposal be forwarded to the Toxicity Advisory Committee for Comment.

Toxicity issues aside, recent changes in technology have resulted in substantial improvements in smoke and flame performance.

The NEC also contains requirements for the removal of abandoned cable, and the panel understands that this is being enforced.

In conclusion, the panel does not see a need for such a substantial revision to 518.4 and also contends that 518.4 may not be the most appropriate place for this requirement to be located. As a minimum, it should be considered for inclusion into Articles 640, 725, 760, and 800.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

15-111 Log #3464 NEC-P15 **Final Action: Reject**
(518.4(B))

Submitter: William A. Wolfe, Steel Tube Institute of North America
Recommendation: Revise text to read:

In addition to the wiring methods of 518.4(A), nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed in those buildings ~~or portions thereof~~ that are not required to be of fire-rated construction by the applicable building code.
Substantiation: Where an auditorium or other assembly area is a portion of a building, and that building is permitted to have combustible wiring, the danger from a concealed space fire in the other portions of the building is exacerbated. The Beverly Hills Supper Club is a perfect example of original non-fire-rated construction that was added to over the years. By wiring with N/M cable an avenue was provided for spread of the fire to concealed spaces beyond the source of the fire. Buildings containing an assembly area should be wired by noncombustible methods because electrical wiring can be a source of ignition.
Panel Meeting Action: Reject
Panel Statement: Buildings that have both fire-rated and nonrated construction are required to have fire-resistive construction between the rated and nonrated areas. The addition of rated construction to an existing building that is nonrated should not cause the rewiring of the existing structure, because it is part of the same building.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

15-112 Log #1932 NEC-P15 **Final Action: Reject**
(518.4(C) Exception and FPN (New))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 3 for consideration in Article 300 during the public comment stage. The issues raised in the proposal are not unique to Article 518 and are more appropriately judged by Code-Making Panel 3 relative to general wiring methods. This action will be considered by Code-Making Panel 3 as a public comment. The Technical Correlating Committee also directs that this proposal be sent to Code-Making Panel 8 for comment back to Code-Making Panel 3.
Submitter: William Wagner, Certification Solutions
Recommendation: Add an exception and FPN to 518.4(C) as follows:

Electrical nonmetallic tubing and rigid nonmetallic conduits are not recognized for use in other space used for environmental air in accordance with 300.22(C).

<u>Exception: Type RTRC rigid nonmetallic conduit shall be permitted for use in other space used for environmental air as covered in 300.22(C) if listed as having adequate fire-resistant and low smoke-producing characteristics.</u>

FPN <u>No. 1</u> : A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud of wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

<u>FPN No. 2: One method of defining that RTRC is a fire-resistant and low smoke-producing raceway is that it exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with the plenum test in UL 2024, Standard for Optical Fiber Cable Raceway.</u>
Substantiation: This is a companion proposal for the revised 300.22 and new Article 355.

Manufacturers have developed Type RTRC rigid nonmetallic conduit products that they believe are suitable for use as wiring methods in other space used for environmental air in accordance with 300.22(C). This proposal would permit these products to be employed in this application providing that they have been specifically evaluated as having adequate fire-resistant and low smoke-producing characteristics and listed for such use. Additionally, the new Fine Print Note No. 2 provides a suggested methodology for evaluating the fire and smoke producing aspects of these products, which is based upon other nonmetallic raceway products that have previously been listed for use in these environments.
Panel Meeting Action: Reject
Panel Statement: The submitter is asking the panel to agree to performance criteria without any data or documentation on this type of conduit.

The panel contends that this issue is best addressed by Code-Making Panel 3 in Article 300.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

6-92a Log #214 NEC-P06 **Final Action: Reject**
(518.4(D) (New))

NOTE: The following proposal consists of Comment 6-84 on Proposal 15-69 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-69 was:

Add a new Section as follows:

518.4(D). Installed in Thermal Insulation. Where ENT or RNC is installed in thermal insulation, the conductor insulation rating shall be 90 o C. The ampacity shall be in accordance with 310.15 but in no case shall the ampacity be de-rated less than the following:

(a) 1-3 conductors: 70% of values in Table 310.16
(b) 4-6 conductors: 50% of values in Table 310.16
(c) 7-9 conductors: 40% of values in Table 310.16

It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for consideration of action in Article 310. This action will be considered by Code-Making Panel 6 as a Public Comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for consideration of action in Article 310. This action will be considered by Code-Making Panel 6 as a Public Comment.
Substantiation: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
Panel Meeting Action: Reject
Panel Statement: This proposal deals with a specific application in a specific occupancy. There is no technical support to make this rule applicable to general applications. The panel action and statement should be referred to CMP 15 for information.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-92b Log #215 NEC-P06 **Final Action: Reject**
(518.4(D) (New))

NOTE: The following proposal consists of Comment 6-85 on Proposal 15-70 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-70 was:

Add a new Section as follows:

518.4(D). Installed in Thermal Insulation. Where ENT or RNC is installed in thermal insulation, the conductor insulation rating shall be 90 o C. The ampacity shall be in accordance with 310.15 but in no case shall the ampacity be de-rated less than the following:

(a) 1-3 conductors: 70% of values in Table 310.16
(b) 4-6 conductors: 50% of values in Table 310.16
(c) 7-9 conductors: 40% of values in Table 310.16

It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for consideration of action in Article 310. This action will be considered by Code-Making Panel 6 as a Public Comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for consideration of action in Article 310. This action will be considered by Code-Making Panel 6 as a Public Comment.
Substantiation: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
Panel Meeting Action: Reject
Panel Statement: This proposal deals with a specific application in a specific occupancy. There is no technical support to make this rule applicable to general applications. This appears to be an exact duplicate of 6-92A Comment 6-84 from the 2004 Cycle. The panel action and statement should be referred to CMP 15 for information.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

(Note: Sequence nos. 15-113 and 5-114 were not used)

15-115 Log #1601 NEC-P15 **Final Action: Accept**
(518.5)

TCC Action: The Technical Correlating Committee understands that the panel action taken on Proposal 15-116 reflects the final changes to the code text.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 518.5:
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
Portable switchboards and portable power distribution equipment shall be supplied only from listed power outlets of sufficient voltage and ampere rating. Such power outlets shall be protected by overcurrent devices. Such overcurrent devices and power outlets shall not be accessible to the general public. Provisions for connection of an equipment grounding conductor shall be provided. The neutral <u>conductor</u> of feeders supplying solid-state, 3-phase, 4-wire dimmer systems shall be considered a current-carrying conductor.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
VANNICE, K.: Note that the revised text as stated was further revised in proposal 15-116.

15-116 Log #3316 NEC-P15 **Final Action: Accept in Principle**
(518.5)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for comment as it relates to the use of the term "derating".
Submitter: Steven R. Terry, ETC
Recommendation: Change the last sentence of this paragraph to read:
The neutral of feeders supplying solid-state <u>phase-control</u> , 3-phase, 4-wire dimming systems shall be considered a current-carrying conductor.
Add an additional sentence at the end of the paragraph:
<u>The neutral of feeders supplying solid-state sine wave, 3-phase, 4-wire dimming systems shall not be considered a current-carrying conductor.</u>
Add a FPN:
<u>FPN: For definitions of solid state dimmer types, see section 520.2.</u>
Substantiation: A new class of listed solid state dimmer has been introduced to the professional performance lighting market: the Solid State Sine Wave dimmer. This type of dimmer varies the amplitude of the applied voltage wave form, without any of the nonlinear switching found in traditional phase-control solid state dimmers. Heretofore, nonlinear phase control dimmers were the only type of readily available solid state dimmers. Since solid state sine wave dimmers are linear loads, they do not require the neutral of the feeder to the dimmers to be considered a current-carrying conductor. Wording is now required to clearly state the feeder requirements for <u>both</u> types of solid state dimmers that are now available, in order to avoid the confusion that might arise if only phase-control dimmers were mentioned in the requirement for neutral characteristics. The FPN is required to direct the reader to 520.2 for the definition of both types of solid state dimmers (provided in a separate proposal), since Article 518 has no definitions section.
Panel Meeting Action: Accept in Principle
In the present text, add the phrase "for purposes of derating" to the end of the last sentence.
In the accepted text, add the phrase "for purposes of derating" to the end of the text.
Add an exception before the fine print note to read as follows:
"Exception: The neutral conductor of feeders supplying systems that use or may use both phase-control and sine-wave dimmers shall be considered as current-carrying for purposes of derating."
In the proposed text, change all references to "neutral" to "neutral conductor".
Panel Statement: At least one manufacturer is marketing a mixed phase-control and sine-wave dimming system.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

15-117 Log #216 NEC-P15 **Final Action: Accept in Principle**
(519 (New))

NOTE: The following proposal consists of Comment 15-46 on Proposal 15-72 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-72 was:
(Proposed)

<u>ARTICLE 519</u>

<u>Control Circuits for Permanent Amusement Attractions</u>

NOTICE: A reference in brackets [ ] following a section or paragraph indicates material that has been substantially or exactly extracted from another NFPA document or nationally recognized standard.

<u>I. General</u>

<u>519.1 Scope</u>

<u>This article covers the installation of electrical equipment and wiring used in the control circuits and control systems of a permanent amusement attraction, including associated control wiring in or on all structures, where the conditions of maintenance and supervision ensure that qualified persons service the systems.</u>

<u>519.2 Definitions</u>

<u>Control circuit.</u> <u>A circuit that carries the electric signals directing the performance of a controller, but does not carry the main power current</u> [*UL-508A*]

<u>Entertainment Device.</u> <u>A mechanical device such as show action props, animated props, show action equipment, animated figures, and special effects coordinated with audio and lighting to provide an entertainment experience for patrons.</u>

<u>Overcurrent Protection.</u> <u>A device designed to open a circuit when the current through it exceeds a predetermined value. The ampere rating of the device is selected for a circuit to terminate a condition where the current exceeds the rating of conductors and equipment due to overloads, short circuits and faults to ground.</u> [*UL-508A*]

<u>Permanent Amusement Attraction.</u> <u>An amusement ride or attraction consisting of ride devices, entertainment devices, or combination thereof, that is affixed or installed in such a manner as to make relocation impractical, or whereby the nature of design, is not portable.</u>

<u>Programmable Electronic System (PES).</u> <u>A system based on one or more central processing units (CPUs) connected to sensors or actuators, or both, for the purpose of control or monitoring.</u> [*NFPA 79-2002*]

<u>FPN: The term PES includes all elements in the system extending from sensors to other input devices via data communication paths to the actuators or other output devices.</u> [*NFPA 79-1997*]

<u>Redundancy.</u> <u>The application of more than one device or system, or part of a device or system, with the objective of ensuring that in the event of one failing to perform its function another is available to perform that function.</u> [*NFPA 79-2002*]

<u>Ride Device.</u> <u>A device or combination of devices or elements that carry, convey, or direct a person(s) over or through a fixed or restricted course or within a defined area, for the primary purpose of amusement or entertainment.</u> [*ASTM F 747.*]

Self Checking. An automated test method that detects a fault and the result is indicated.

Static Device. A device that has no moving parts, as associated with electronic and other control or information-handling circuits. [*NFPA 79-1997*.]

FPN: Examples of static devices include displays, keypads, microelectronic circuit boards, solid state semiconductor devices, valve control cards, etc.

II. Supply

519.10 Power Sources other than Transformers

Power sources other than transformers shall be protected by over-current devices rated at not more than 167 percent of the volt-ampere rating of the source divided by the rated voltage. The over-current device shall be permitted to be an integral part of the power supply. [*Article 725.21*]

519.11 Voltage Limitations.

(A) Alternating-Current (ac). Alternating-current (ac) control voltage shall be 150 volts or less to ground. Control circuits utilizing voltages greater than 150 volts (ac) shall comply with Article 725.

(B) Direct-Current (dc). Direct-current (dc) control voltage shall be 250 volts or less to ground. Control circuits utilizing voltages greater than 250 volts (dc) shall comply with Article 725. [*NFPA 79-2002*]

III. Wiring Methods.

519.20 Conductors

(A) Copper Conductors. Stranded copper conductors shall be permitted. Solid copper conductors shall be permitted where not subject to flexing.

(B) Conductors other than Copper. Conductors constructed of materials other than copper, where required for their function, such as RTDs, shall be permitted

(C) Printed Wire Assemblies. Printed wire assemblies of listed flame-retardant material shall be permitted in place of conductor assemblies provided they are within control enclosures and mounted in such a way as to minimize flexing or stress. [*NFPA 79-2002*]

519.21 Conductor Sizing

(A) Conductors within a listed component or assembly. Conductors of size 30 AWG or larger shall be permitted within a listed component or as part of the wiring of a listed assembly.

(B) Conductors within an enclosure or operator station. Conductors of size 30 AWG or larger shall be permitted in a jacketed multiconductor cable within an enclosure or operator station. Conductors in a non-jacketed multiconductor cable, such as ribbon cable, shall not be smaller than 26 AWG. Single conductors shall not be smaller than 24 AWG.

Exception: Single Conductors 30 AWG or larger shall be permitted for jumpers and special wiring applications.[*NFPA 79-2002*]

(C) Conductors outside of control enclosures and operator stations. The size of conductors in a jacketed, multiconductor cable shall not be smaller than 26 AWG. Single conductors shall not be smaller than 18 AWG. [*Ref Article 760.71(B*)]

519.22 Conductor Ampacity

The continuous current carried by conductors 16 AWG and smaller shall not exceed the values given in Table 519.22. The continuous current carried by conductors shall not exceed the values given in Table 310.16 for general wiring, Tables 400.5 (A) and (B) for flexible cords and cables, or Table 402.5 for fixture wires.

519.23 Overcurrent Protection

Overcurrent protection shall be in accordance with the conductor ampacity.

519.24 Separation

Amusement attraction control circuits shall be separated by at least 50 mm (2 in.), separated by a nonconductive sleeve such as flexible tubing, or separated by a barrier, from Class 1, Class 2 and Class 3 circuits, power limited fire alarm, non–power-limited fire alarm and medium power network-powered broadband communications circuits. For other than the circuit types listed above, an amusement attraction control conductor shall be separated by at least 50 mm (2 in.), separated by a nonconductive sleeve such as flexible tubing, or separated by a barrier from a conductor used in a different circuit unless the conductors of both circuits are insulated for the maximum voltage present of either circuit.

Exception No. 1: Associated circuits within enclosures utilizing 150 volts or less to ground and requiring separation shall be permitted to be separated by at least 6 mm (1/4 in.).

Exception No. 2: Different voltage insulation levels or conductor properties shall be permitted in the same cable assembly, provided the cable assembly is listed and has been designed and tested to the identified application. [*NFPA 79-2002*]

519.25 Grounding and Detection

Two-wire dc circuits shall be permitted to be ungrounded. A Ground Fault Detection Device shall monitor ungrounded control circuits operating at greater than 50 volts. [*NEC 685.12, NEC 250.162(A) Exception No. 1*]

519.26 Wet or Submerged locations

Where wet contact (immersion not included) is likely to occur, ungrounded two-wire dc control circuits shall be limited to 30 volts. [*NEC Table 11(B) Note 4*]

Table 519.22 Conductor Ampacity based on copper conductors with 60°C and 75°C insulation in an ambient temperature of 30°C. [*NFPA 79-2002*]

Conductor Size AWG	Ampacity in Cable or Raceway 60°C	Ampacity in Cable or Raceway 75°C	Control Enclosure 60°C
30	-	0.5	0.5
28	-	0.8	0.8
26	-	1	1
24	2	2	2
22	3	3	3
20	5	5	5
18	7	7	7
16	10	10	10

Note 1: For ambient temperatures other than 30°C, see Table 310.16 correction factors. [*NFPA 79-2002*]

Note 2: Ampacity adjustment for conductors with 90°C or greater insulation shall be based on ampacities in the 75°C column.[*NFPA 79-2002*]

A Ground Fault Detection Device shall monitor ungrounded control circuits in wet or submerged locations operating at greater than 15 volts.

Control circuit components or enclosures that are located in wet locations shall carry NEMA 6 or IEC IP67 classification.

Control circuit components or enclosures that are submerged shall carry NEMA 6P or IEC IP68 classification.

Control circuit wiring in submerged environments shall be listed for usage in that environment. [*NEC 400.4*]

Except as modified by above, wiring and equipment in or adjacent to wet or submerged locations shall comply with the applicable provisions of Article 680.

519.27 Safety control circuits – Emergency Stop Circuits

Emergency Stop Circuits utilizing redundancy and self-checking, shall be permitted to follow the wiring methods listed in this article. Emergency Stop Circuits utilizing no redundancy or are not self-checking shall follow the Class 1 wiring methods as listed in Article 725.8.
Submitter: Steve Alkhoja, ITEC Entertainment Corporation
Recommendation: I have no modifications to the proposed new wording. I would like to encourage the implementation of this proposal.
Substantiation: There are several areas of concern with the present interpretation of the current document which this new proposal addresses. I believe that the proposed Article 519 address the areas of concern.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 15-121.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11
Ballot Not Returned: 1 Conry, C.

15-118 Log #217 NEC-P15 **Final Action: Accept in Principle**
(519)

NOTE: The following proposal consists of Comment 15-47 on Proposal 15-72 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 15-117 (Log #216)
Submitter: Jody D. Gerstner, Walt Disney Imagineering / Rep. Walt Disney World Company
Recommendation: Recommend Accepting Proposal in Principle with the understanding that the submittal was not per the NFPA style guide.
Substantiation: Permanent Amusement attractions embody large scale integrated Control Systems similar in nature to that found in the Industrial Complex. When inspected by our Authority Having Jurisdiction, we have been judged against the NEC. The tools of the trade in industrial controls includes predominantly low voltage (NEC Class 2) devices of insulation and wire size that do no comply with Class 1 category against which we are judged. Therefore, we are left with the option of getting exceptions on every product from the AHJ, or forgo the use of common industrial products (sensors, switches, high-tech integrated vision & optical devices). Since we cannot accomplish our mission of guest safety and system functionality without the tools of the trade, we are required to appeal for variances and request alternate methods. This is no way to regulate an industry! Article 519 provides the foundation for which inspection can be made against a consistent standard rather than on subjective variances and alternate methods consideration. Article 519 would result in consistent safe implementations across the industry rather than subjective variances based upon the perspectives of the municipality and the AHJ. Article 519 would also allow the practitioner to use the products unique to our amusement industry in a manner that would be consistent with the goals of the NEC and would be acceptable to the AHJ.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 15-121.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11
Ballot Not Returned: 1 Conry, C.

15-119 Log #218 NEC-P15 **Final Action: Accept in Principle**
(519)

NOTE: The following proposal consists of Comment 15-48 on Proposal 15-72 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 15-117 (Log #216)
Submitter: Sam McCoy, Walt Disney World Co
Recommendation: Recommned Accepting Proposal 15-72 or Accept in Principle.
Substantiation: In regards to proposal 15-72 Log #2495 NEC-P15: I would submit to the Panel that this article (519) gives a clear attempt to the Permanent Amusement Attraction Industry (who by the way is totally focused on the health and safety of the public) the ability to install control systems that would not compromise the ability to install or maintain attractions such as a high speed roller coaster ride. Today, the Authority Having Jurisdiction is holding our industry to Article 725 of the NEC. Article 725 and the fact that all our safety critical applications fall in the Class 1 power requirements by NEC definition, requires that wiring size and insulation type usage of unreasonable size and restricts safe construction and maintainability. One example: the use of low voltage, and current limited circuits (24 volts dc) in attractions for controls does not pose any failure or hazard that would cause a shock or fire hazard that 600-volt insulation and 18-awg wire fixes (given that separation practices are used). This higher insulation and gauge class required by article 725 sometimes compromises good design practices. I agree on the panel's point that this Proposal is limited in scope and does not cover all that should be addressed, however, by your own words in the panel's statement the panel agrees that other electrical considerations of permanent amusement attractions should be addressed, implying some merit in the Proposal. This proposal is the start of addressing some of the issues and if we do not start somewhere then it becomes very difficult to move forward in the quest for safety. I agree that the NEC is not intended to be a design manual and in that regard, the proposed Article (519) was not intended to do that but to give a minimum guideline for the inspector. I appeal to you as engineers to reconsider this Proposal 15-72 Log #2495 NEC-P15 and accept it to be adopted into the 2005 NEC.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 15-121.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11
Ballot Not Returned: 1 Conry, C.

15-120 Log #219 NEC-P15 **Final Action: Accept in Principle**
(519)

NOTE: The following proposal consists of Comment 15-50 on Proposal 15-72 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 15-117 (Log #216)
Submitter: Joseph F. Maida, Maida Engineering Inc.
Recommendation:
There have been significant additions and some modifications
Add new text as follows:
I. General.
519.1 Scope
This article covers the installation of electrical equipment and wiring that are an integral part of a permanent amusement attraction including associated control wiring, where the conditions of maintenance and supervision ensure that qualified persons service the systems.
Control circuits and equipment associated with permanent amusement attractions, herein referred to as permanent amusement control circuits, shall comply with Article 519. Only those sections of Article 725 referenced in this article shall apply to permanent amusement control circuits.
519.2 Definitions
Control Circuit. A circuit that carries the electric signals directing the performance of a controller, but does not carry the main power current*(UL-508A)*
Entertainment Device. Mechanical device such as show action props, animated props, show action equipment, animated figures and special effects coordinated with audio and lighting to provide an entertainment experience for patrons.
Over current Protection. A device designed to open a circuit when the current through it exceeds a predetermined value. The ampere rating of the device is selected for a circuit to terminate a condition where the current exceeds the rating of conductors and equipment due to overloads, short circuits and faults to ground.*(UL-508A)*
Permanent Amusement Attraction. An amusement ride or attraction consisting of ride devices, entertainment devices, or combination thereof, that is affixed or installed in such a manner so as to make relocation impractical, or whereby the nature of design, is not portable.
Redundancy. The application of more than one device or system, or part of a device or system, with the objective of ensuring that in the event of one failing to perform its function another is available to perform that function.*(NFPA 79-2002)*
Ride Device. A device or combination of devices or elements that carry , convey or direct a person(s) over or through a fixed or restricted course or within a defined area, for the primary purpose of amusement of entertainment. (*ASTM F 747)*
Self Checking. An automated test method that detects a fault and the result is indicated.
II Supply.
519.10 Power sources
(A) Alternating-Current (AC). AC Power source control transformers supplying permanent amusement attraction control circuits shall not exceed 120 volts AC and the available short circuit current shall not exceed 1, 000 amperes rms. *(NFPA 79-2002)*

(B) Direct-Current (DC). DC power source supplying permanent amusement attraction control circuits shall be 250 V DC or less.*(NFPA 79-2002)*

III. Wiring Methods.

519.20 Conductors

(A) Power Source Supply Side: Wiring methods on the supply side of the power source shall be installed in accordance with appropriate requirements of Chapters 1 thru 4. A control transformer or other power supply or device supplied from an AC light or power circuit shall be protected by an over current device rated not greater than 20 amperes.

(B) Power Source Load Side: Wiring methods can include individual conductors in raceways, mulitconductor cables supported in accordance with the methods defined in 300.11(A) and 300,17 and multiconductor cables in a cable tray.

(C) Plenum. Permanent amusement attraction control circuit cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CL2P or CL3P.

Abandoned cables shall not be permitted to remain. Listed wires and cables installed in compliance with 300.22 shall be permitted. *(725.61(A))*

(D) Riser. Permanent amusement attraction control circuit cables installed in risers shall be as described in any of (1) or (2):

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft shall be type CL2R or CL3R. Floor penetrations requiring Type CL2R or CL3R shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.

(2) Other cables as covered in Table 519-20 and other listed wiring methods as covered in Chapter 3 shall be installed in metal raceways or located in a fireproof shaft having fire stops at each floor. (*725.61(B))*

(E) Cable Trays. Permanent amusement attraction control circuit cables installed in cable trays outdoors shall be Type PLTC. Cables installed in cable trays indoors shall be Types PLTC. CL3P, CL3R, CL3, CL2P CL2R and CL2. (725.61)(C)

(F) Other wiring within Buildings. Permanent amusement attraction control circuit cables installed in building locations other than those covered in 519.20(C) through (E) shall be as described in any of (1) through (4). Abandoned cables in hollow spaces shall not be permitted to remain.

(1) Type CL2 or CL3 shall be permitted.

(2) Type CL2X or CL3X shall be permitted to be installed in a raceway or in accordance with other wiring methods covered in Chapter 3.

(3) Cables shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).

(4) Type CMUC undercarpet communications wires and cables shall be permitted to be installed under carpet. {725.61(E)}

(F) Cross Connect Arrays Type CL2 or CL3 conductors or cables shall be used for cross-connect arrays. {725.61(F)}

(G) Permanent Amusement Attraction Control Circuit Cable Uses and Permitted Substitutions. The uses and permitted substitutions for Class 2 and Class 3 cables listed in Table 725.61 shall be considered suitable for the purpose and shall be permitted. {725.61(G)}

(H) Conductors. Stranded conductors shall be permitted. Solid conductors shall be permitted where not subject to flexing.

(I) Conductors other than Copper. Conductors constructed of materials other than copper where required for their functions shall be permitted.

(J) Printed Wire Assemblies. Printed wire assemblies of listed flame-retardant material shall be permitted in place of conductor assemblies provided they are within control enclosures and mounted in such ways to minimize flexing or stress. {*NFPA 79-2002}*

519.21 Conductor Sizing

(A) Conductors within a listed component or assembly. Conductors of size 30 AWG or larger shall be permitted within a listed component or as part of the wiring of a listed assembly.

(B) Conductors within an enclosure. Conductors of Size 30 AWG or larger shall be permitted in a multiconductor cable within an enclosure. Conductors in a non-jacketed mulitconductor cable assembly such as ribbon cable, shall not be smaller than 26 AWG. Single conductors shall not be smaller than 24 AWG.

Exception: Single Conductors 30 AWG or larger shall be permitted for jumpers and special wiring applications. {NFPA 79-2002}

(C) Conductors outside of enclosures. The size of conductors in a multiconductor cable shall not be smaller than 2 AWG. Single Conductors shall not be smaller than 18 AWG. {ref Article 760.71 (B)}

519.22 Conductor Ampacity

The continuous current carried by conductors 16 AWG and smaller shall not exceed the values given in Table 519.22. The continuous current carried by conductors shall not exceed the values given in Table 310.16 for general wiring. Tables 400.5(A) and (B) for flexible cords and cables, or Table 402.5 for fixture wires.

Table 519.22 Conductor Ampacity based on copper conductors with 60°C and 75°C insulation in an ambient temperature of 30°C. {NFPA 79-2002}

Conductor Size AWG	Ampacity in Cable or Raceway 60° C	Ampacity in Cable or Raceway 75°C	Control Enclosure 60° C
30		0.5	0.5
28		0.8	0.8
26		1	1
24	2	2	2
22	3	3	3
20	5	5	5
18	7	7	7
16	10	10	10

Note 1: for ambient temperature other than 30°C see table 310.16 correction factors. {NFPA 79-2002}

Note 2: Ampacity adjustment for conductors with 90°C or greater insulation shall be based on ampacitites in the 75° C Column {NFPA 79-2002}

519.23 Overcurrent protection

Overcurrent protection shall be in accordance with the conductor ampacity.

519.24 Separation

Permanent amusement attraction control circuit conductors and multiconductor cables shall be separated by at least 50 mm (2 in), separated by a nonconductive sleeve such as flexible tubing, or separated by a barrier, from lighting and power class 1, class 2 and class 3 circuits, power limited fire alarm non-power limited fire alarm and medium power network-powered broadband communications circuits. For other than the circuit types listed above, a permanent amusement attraction control circuit conductors and multiconductor cables shall be separated by at least 50 mm (2 in.), separated by a nonconductive sleeve such as flexible tubing, or separated by a barrier from a conductor used in a different circuits unless the conductors of both circuits are insulated for the maximum voltage present of either circuit and are functionally associated.

Exception No. 1: Associated circuits within enclosures utilizing 150 volts or less to ground and requiring separation shall be permitted to be separated by at least 6 mm (1/4 in.).

Exception No. 2: Different voltage insulation levels or conductor properties shall be permitted in the same cable assembly, provided the cable assembly is listed and has been designed and tested to the identified application. {NFPA 79-2002}

Exception No. 3: Permanent amusement attraction control circuit conductors and multiconductor cables shall be permitted within the same raceways, cable assembly or enclosure with lighting and power circuits when the circuits are functionally associated; the permanent amusement attraction control circuit conductors and multiconductor cables are #18 AWG or larger and have 600 volt insulation; and when installed in accordance with Article 300 and other appropriate articles in Chapter 3, {NEC 725.25}

519.25 Grounding and Detection

Two-wire dc circuits shall be permitted to be ungrounded. A Ground Fault Detection Device shall monitor ungrounded control circuits operating at greater than 50 volts. *{NEC 685.12, NEC 250.162(A) Exception No. 1}*

519.26 Wet or Submerged locations

Where wet contact (immersion not included) is likely to occur, ungrounded two-wire dc permanent amusement attraction control circuits shall be limited to 30 volts. {NEC Table 11(B) Note 4}

A Ground Fault Detection Device shall monitor ungrounded permanent amusement attraction control circuits in wet or submerged locations operating at greater than 15 volts.

Permanent amusement attraction control circuit wiring, components and enclosure in submerged environments shall be listed for usage in that environment. {NEC 400.4}

519.27 Safety-Control Equipment

(A) Remote Control Circutis. Remote-control circuits utilizing redundancy and self-checking for safety-control permanent amusement attraction control equipment, shall be permitted to follow the wiring methods listed in this article if the failure of the equipment to operate introduces a direct fire or life safety hazard.

(B) Physical Protection. Where damage to remote-control circuits of safety-control equipment would introduce a hazard, as covered in 519.7(A), all conductors of such remote-control circuits shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, electrical metal tubing, Type MI cable, Type MC cable, or be otherwise suitably protected from physical damage.

Substantiation: Amusement and theme parks evolved from what were once known as “Carnivals”, where the rides, side shows, booths, and other structures such as the haunted house, dunking barrel and fast food serving, were supplied by temporary wiring. These structures were moved all over the country. Therefore, the power and control wiring systems for the rides and shows, collectively referred to as amusements, were unique because the amusements had to be arranged so that their mechanical parts could be disassembled and their power and control wiring easily disconnected and reconnected at another site without damaging them. The NEC Article 305, Temporary Wiring applies to these "Carnivals". It was introduced into the 1971 NEC, prior to 1971, it was "fly by the seat of your pants", depending on how strict the local ordinances were at the time.

With the opening of Disneyland followed by Walt Disney World in 1971, more sophisticated rides and shows were needed to satisfy the demands of a more sophisticated amusement industry. These rides and shows have prompted engineers to create new control equipment and complex control circuits which have become an integral part of permanent amusement attractions within the theme park industry. The NEC has not been revised since 1971 with regard to the installation of permanent amusement attractions, therefore permanent amusement attraction control systems must be inspected using the same "fly by the seat of your pants" that existed for Carnivals until 1971.

The patrons of theme parks want an experience that combines both the traditional rides, like the merry-go-round, with the latest and the greatest in thrill rides and shows. the demand for more thrills, and in many cases bringing the movies to life, has been the impetus for new rides and shows which are a hundred times more complex than rides and shows developed less than thirty years ago. Designing and building the effects which have been seen on the movie screen and having the patron of the theme park safely experience the excitement and sometimes fear caused by these effects, has been the responsibility of the engineers in the theme park industry.

Traditionally, many engineers within the theme park industry came from high technology industries. This was beneficial in that much of the advanced control technology utilized to build permanent amusement attractions in the theme park industry required the training derived from their experience in the high technology industries. Because of their training, the advanced control technology they developed did not follow standards established for the building and construction industry. The control system they developed however, met the theme park industry's standards for safety and sustainability. The safety requirement is essential in that millions of theme park patrons pay to safely experience the joy of these rides and shows every year. The sustainability requirement is essential because the effects created for the theme park are build to happen thousand of times and must be repeated many times everyday. With these requirements for safety and sustainability and the advantage of today's control system technology enhanced by personal computers, the design, testing and commissioning of a ride and show control system for permanent amusement attractions follows a path that is similar to the design, testing and commissioning of a pharmaceutical manufacturing line or process. Although phrases like Standard Operating Procedures, Qualifications and Validation are not as commonly used in the theme park industry other phrases like Detailed Design Review (DDR), Failure Modes Effects Analysis(FMEA) and Factory and Site Acceptance Tests (FAT and SAT) are commonly used in both industries. In many ways, steps taken to create, qualify and validate the safeguards and repeatability of a ride or show are the same steps taken by the pharmaceutical industry for the manufacturer of pharmaceutical drugs which is governed by standards which are enforced by the Federal Drug Administration (FDA).

The theme park industry, although subject to review and final acceptance by local governmental agencies, has largely been responsible for policing itself for the rides and shows they have constructed in permanent amusement parks. The Local Authorities Having Jurisdiction in defining the methods to be utilized to construct the rides or shows rarely have the resources available to review every part of a ride and show control systems, For the most part, the agencies which are supported by the local tax base, have relied on the knowledge and skills of the theme park industry engineer who is responsible for making the ride and show safe for the patrons, actors and operators and also compliant with all applicable code and standards, such as the NEC. As a result, many safe and sustainable ride and show permanent amusement attraction control circuits are:

1. Being inspected using the standard defined with the NEC that were never intended to be used for a permanent amusement attraction.

2. Require variances in that they do not comply with some of the provisions of the NEC.

3. Are designed and installed with NEC violations that are missed by inspectors.

The construction material and techniques utilized in many of today's ride and show control system comply with standards like ASTM FM-24 and Underwriter's Laboratories, Inc. (UL) and comply with many of the standards and recommendations written by the National Fire Protection Association (NFPA) but they do not comply with specific articles found within NFPA 70, the National Electrical Code (NEC). The NEC which is one of the finest and most complete codes ever developed has been the basis for electrical codes utilized throughout the world. The NEC however, is a lengthy document and until recently articles in Chapters 5, 6,7 and 8 have not been the focus of many of the theme park industry's controls engineers and the inspectors employed by local governing bodies.

The theme park industry wants to comply with the NEC but finds itself in a situation where the risks and cost associated with doing so requires that they first explore ways of changing the NEC to accept the industry's established techniques and materials. The techniques and materials have been field proven to be safe. Changing the techniques and materials:

* Will introduce opportunities for omissions or errors.

* Will not enhance the safety of the control systems.

* Will decrease the theme park industry engineers abilities to create the rides and shows that are now expected by patrons visiting theme parks.

In an effort to correct an omission of many years, Kevin Schultz, PE of WDW has submitted a proposed Article 519 to the 2005 NEC. I have reviewed this Article and believe that it is an excellent beginning of an Article that should have been included in the NEC many years ago. I have made additions and modifications to the original Article submitted by Kevin Shultz and I am recommending that this revised Article 519 be included into the 2005 NEC. The inclusion of Article 519 into the 2005 NEC will resolve the following technical issues and omissions within the NEC:

1. The 2005 NEC will permit the use of non Class 1 circuits that are as reliable, or even more reliable than class 1 circuits due to the redundancy and self checking for life safety applications in permanent amusement attractions. These circuits are currently permitted on moving vehicles that are not covered by the NEC and should be permitted for ride and show equipment that is tested upon installation and periodically thereafter where conditions of maintenance and supervision ensure that qualified persons service the systems. This will enable the addition of safety features to rides and shows which are not or might not be possible with larger size conductors required for Class 1 circuits.

2. The 2005 NEC will prohibit installing permanent amusement attraction control circuit conductors with other conductors that are utilized for systems not related to the ride or show, thus making these systems easier to inspect and minimizing the possibility that someone working on the building's BAS, fire alarm or telephone system could damage or disturb the permanent amusement attraction control circuit conductors.

3. The 2005 NEC will permit the installation of adequately sized power supplies for all of the permanent amusement attraction control circuits within a ride or show. Presently, in order to comply with the Article 725's provision for Class 2 circuits, a show control system can require multiple, and in one case as many as twelve (12) separate Class 2 power supplies even though these control systems are maintained by qualified personnel. Prior to 1996 NEC, a power supply with properly sized overcurrent protection could be used for Class 2 circuits. The revisions within the 1996 NEC should not have applied to installation where condition of Maintenance and supervision exist that will ensure that only qualified persons service the Class 2 system. The same conditions that apply to power and lighting circuits, which are derived from a comparatively unlimited power source and are protected by overcurrent protection, should be applied to permanent amusement attraction control circuits because of the requirement that they be maintained by qualified personnel. The installation of multiple power supplies increases complexity and therefore increases the probability of failure of a control system that needs to be safe, repeatable and sustainable.

4. The 2005 NEC will provide a standard which engineers and contractors can use for the proper installation of and which inspectors can use for the proper inspection of permanent amusement attraction control circuits. For once, the methods permitted for properly installing permanent amusement attraction control circuits will be clearly defined. Although the 2002 NEC does define the methods for Class 1 and Class 2 cables very well, it is not unusual for engineers and inspectors who are not familiar with Chapter 7 of the 2002 NEC to over look these methods or not apply them properly. Even when they are applied properly, they are not as well suited or as safe as some field proven techniques which are not permitted.

5. Additional provisions for ground fault monitoring have been added for permanent amusement attraction control circuits in wet or submerged locations operating at greater than 15V DC. Currently, there are no standards applicable to control or power circuits for flume rides and other water rides.

With the inclusion of Article 519 into the 2005 NEC, there will now be a place to address many of the specialized type of structures utilized within theme parks which are presently not covered by the NEC. Not including this article in the form presented herein or some variation the form presented herein could not only jeopardize the theme park industry but could jeopardize the life safety of millions of patrons who visit theme parks every year. Currently, rides and shows which include pyrotechnics and special effects and could present hazard to both the actors and audiences, are being engineered and constructed with standards that are less than adequate or nonexistent. The inclusion of Article 519 into the 2005 NEC is a necessary first step to correct this deficiency for the good and well being of the general public.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 15-121.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11
Ballot Not Returned: 1 Conry, C.

15-121 Log #2111 NEC-P15 **Final Action: Accept**
(519 (New))

TCC Action: The Technical Correlating Committee directs the following actions on this proposal.
The Technical Correlating Committee directs that the new Article be numbered as Article 522 to provide for proper placement and allow some additional open article numbers to remain.

Article scope statements and titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee is modifying the panel action on the scope to make it clear that the

conductors covered by the article are control circuit conductors to read as follows:.

"519.1 Scope. This article covers the installation of control circuit power sources and control circuit conductors for electrical equipment, including associated control wiring in or on all structures, that are an integral part of a permanent amusement attraction."

The Technical Correlating Committee accepts the title of the new article.

The Technical Correlating Committee directs the panel to reconsider the proposal and clarify the intended application of wiring methods. The current text permits multi-conductor cable assemblies to be used, but allows conductors down to 30 AWG. It is unclear as to whether Chapter 3 wiring methods are required or some other method is intended. This action will be considered by Code-Making Panel 15 as a Public Comment.

The Technical Correlating Committee directs that this proposal be sent to Code-Making Panel 3 for comment during the public comment phase.

The Technical Correlating Committee directs that Code-Making Panel 3 consider the power limited source and wiring method requirements and submit appropriate public comments.

The Technical Correlating Committee directs the Panel in 519.28 to change the parenthetical reference to a Fine Print Note or remove it.

Submitter: Joe Van Dam, Walt Disney World

Recommendation: Proposing a new Article 519, "Control Systems for Permanent Amusement Attractions" to read as follows:

I. General.

519.1 Scope. This article covers the installation of control circuit power sources and conductors for electrical equipment, including associated control wiring in or on all structures, that are an integral part of a permanent amusement attraction.

519.2 Definitions.

Control Circuit. For the purposes of this article the circuit of a control system that carries the electric signals directing the performance of the controller but does not carry the main power current.

Entertainment Device. A mechanical or electromechanical device that provides an entertainment experience.

FPN: These devices may include animated props, show action equipment, animated figures, and special effects, coordinated with audio and lighting to provide an entertainment experience.

Permanent Amusement Attraction. Ride devices, entertainment devices, or combination thereof, that are installed so that portability or relocation is impracticable.

Ride Device. A device or combination of devices that carry, convey, or direct a person(s) over or through a fixed or restricted course within a defined area for the primary purpose of amusement or entertainment.

519.3 Other Articles. Wherever the requirements of other articles of this Code and Article 519 differ, the requirements of Article 519 shall apply.

519.5 Voltage Limitations. Control voltage shall be a maximum of 150 volts, nominal ac to ground or 300 volts dc to ground.

519.7 Maintenance. The conditions of maintenance and supervision shall ensure that only qualified persons service the permanent amusement attraction.

II. Control Circuits.

519.10 Power Sources for Control Circuits.

(A) Power-Limited Control Circuits. Power-limited control circuits shall be supplied from a source that has a rated output of not more than 30 volts and 1000 volt-amperes.

(1) Control Transformers. Transformers used to supply power-limited control circuits shall comply with the applicable sections within Parts I and II of Article 450.

(2) Other Power-Limited Control Power Sources. Power-limited control power sources, other than transformers, shall be protected by overcurrent devices rated at not more than 167 percent of the volt-ampere rating of the source divided by the rated voltage. The fusible overcurrent devices shall not be interchangeable with fusible overcurrent devices of higher ratings. The overcurrent device shall be permitted to be an integral part of the power source.

To comply with the 1000 volt-ampere limitation of 519.10(A), the maximum output of power sources, other than transformers, shall be limited to 2500 volt-amperes, and the product of the maximum current and maximum voltage shall not exceed 10,000 volt-amperes. These ratings shall be determined with any overcurrent-protective device bypassed.

(B) Non-Power-Limited Control Circuits. Non-power-limited control circuits shall not exceed 300 volts. The power output of the source shall not be required to be limited.

(1) Control Transformers. Transformers used to supply non-power-limited control circuits shall comply with the applicable sections within Parts I and II of Article 450.

(2) Other Non-Power-Limited Control Power Sources. Non-power-limited control power sources, other than transformers, shall be protected by overcurrent devices rated at not more than 125 percent of the volt-ampere rating of the source divided by the rated voltage. The fusible overcurrent devices shall not be interchangeable with fusible overcurrent devices of higher ratings. The overcurrent device shall be permitted to be an integral part of the power source.

III. Control Circuit Wiring Methods.

519.20 Conductors, Busbars, and Slip Rings.

Insulated Control Circuit Conductors. Insulated control circuit conductors shall be copper and shall be permitted to be stranded or solid. Listed multi-conductor cable assemblies shall be permitted.

Exception No. 1: Busbars and slip rings shall be permitted to be materials other than copper.

Exception No. 2: Conductors used as specific purpose devices, such as thermocouples and resistive thermal deices shall be permitted to be materials other than copper.

519.21 Conductor Sizing.

(A) Conductors Within a Listed Component or Assembly. Conductors of size 30 AWG or larger shall be permitted within a listed component or as part of the wiring of a listed assembly.

(B) Conductors Within an Enclosure or Operator Station. Conductors of size 30 AWG or larger shall be permitted in a listed and jacketed multi-conductor cable within an enclosure or operator station. Conductors in a non-jacketed multi-conductor cable, such as ribbon cable, shall not be smaller than 26 AWG. Single conductors shall not be smaller than 24 AWG.

Exception: Single Conductors 30 AWG or larger shall be permitted for jumpers and special wiring applications.

(C) Conductors Outside of an Enclosure or Operator Station. The size of conductors in a listed and jacketed, multi-conductor cable shall not be smaller than 26 AWG. Single conductors shall not be smaller than 18 AWG and shall only installed where part of a recognized wiring method of Chapter 3.

519.22 Conductor Ampacity. Conductors sized 16 AWG and smaller shall not exceed the continuous current values provided in Table 519.22.

Revise text as follows:

505.2 Definitions. For purposes of this article, the following definitions apply.

Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments.

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with, an electrical installation.

FPN: Portable or transportable equipment having self-contained power supplies, such as battery-operated equipment, could potentially become an ignition source in hazardous (classified) locations.

Encapsulation "m". Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

FPN: See ISA 12.23.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection - Encapsulation "m";* IEC 60079-18-1992, *Electrical Apparatus for Explosive Gas Atmospheres - Part 18: Encapsulation "m";* and ANSI/UL 2279-1997 (Part 18), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* ANSI/UL 60079-18, *Electrical apparatus for explosive gas atmospheres - Part 18: Encapsulation "m".*

Flameproof "d". Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition through any joints or structural openings in the enclosure, of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed.

FPN: See ISA 12.22.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection - Flameproof "d";* IEC 60079-1-2000, *Electrical Apparatus for Explosive Gas Atmospheres, Part 1 - Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus;* ANSI/UL 2279-1997, (Part 1), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* ANSI/UL 60079-1, *Electrical apparatus for explosive gas atmospheres - Part 1: Flameproof enclosures "d".*

Increased Safety "e". Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.

FPN: See ISA - 12.16.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection - Increased Safety "e",* IEC 60079-7-1990, *Electrical Apparatus for Explosive Gas Atmospheres, Part 7: - Increased Safety "e",* Amendment No. 1 (1991) and Amendment No. 2 (1993); and ANSI/UL 2279-1997 (Part 7), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* ANSI/UL 60079-7, *Electrical apparatus for explosive gas atmospheres - Part 7: Increased Safety "e".*

Intrinsic Safety "i". Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.

FPN No. 1: See ANSI/UL 913-1997, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations;* ISA- 12.02.01-1999, *Electrical Apparatus for Use in Class I, Zones 0, 1 and 2 Hazardous (Classified) Locations - Intrinsic Safety "i";* IEC 60079-11-1999, *Electrical Apparatus for Explosive Gas Atmospheres - Part II; Intrinsic Safety "i"'* and ANSI/UL 2279-1997 (Part II). *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* ANSI/UL 60079-11, *Electrical apparatus for explosive gas atmospheres - Part II: Intrinsic safety "i".*

FPN No. 2: Intrinsic safety is designated type of protection "ia" for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" for use in Zone 1 locations.

FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe apparatus ("ia" or "ib," respectively) but is located outside the hazardous (classified) locations unless also protected by another type of protection (such as flameproof).

Oil Immersion "o". Type of protection where electrical equipment is immersed in a protective liquid in such as way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: See ISA 12.26.01-1998, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection - Oil-Immersion "o";* IEC 60079-6-1995, *Electrical Apparatus for Explosive Gas Atmospheres, Part 6 - Oil-Immersion "o";* and ANSI/UL 2279-1997 (Part 6), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* ANSI/UL 60079-6, *Electrical apparatus for explosive gas atmospheres - Part 6: Oil-immersion "o".*

Powder Filling "q". Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.

FPN: See ISA-12.25.01-1996, *Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Powder Filling "q";* IEC 60079-5-1996, *Electrical Apparatus for Explosive Gas Atmospheres - Part 5: Powder Filling, Type of Protection "q";* and ANSI/UL 2279-1997 (Part 5), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* ANSI/UL 60079-5, *Electrical apparatus for explosive gas atmospheres - Part 5: Powder filling "q".*

Purged and Pressurized. Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.

FPN No. 1: See NFPA 496-1998, *Standard for Purged and Pressurized Enclosures for Electrical Equipment.*

FPN No. 2: See IEC 60079-2-2000, *Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p";* and IEC 60079-13-1982, *Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization.*

Type of Protection "n". Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

FPN: See IEC 60079-15-2000, *Electrical Apparatus for Explosive Gas Atmospheres, Part 15 - Electrical Apparatus with Type of Protection "n";* and ANSI/UL 2279-1997 (Part 15), *Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations* ANSI/UL 60079-15, *Electrical apparatus for explosive gas atmospheres- Part 15: Type of protection "n".*

Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2: Class I, Zone 0; Class I, Zone 1; Class 1, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.

519.23 Overcurrent Protection for Conductors. Conductors 30 AWG through 16 AWG shall have overcurrent protection in accordance with the appropriate conductor ampacity in Table 519.22. Conductors larger than 16 AWG shall have overcurrent protection in accordance with the appropriate conductor ampacity in Table 310.16.

519.24 Conductors of Different Circuits in the Same Cable, Cable Tray, Enclosure, or Raceway. Control circuits shall be permitted to be installed with other circuits as specified in 519.24(A) and 519.24(B).

(A) Two or More Control Circuits. Control circuits shal be permitted to occupy the same cable, cable tray, enclosure, or raceway without regard to whether the individual circuits are alternating current or direct current, provided all conductors are insulated for the maximum voltage of any conductor in the cable, cable tray, enclosure, or raceway.

(B) Control Circuits with Power Circuits. Control circuits shall be permitted to be installed with power conductors as specified in 519.24(B)(1) through (B)(3).

(1) In a Cable, Enclosure, or Raceway. Control circuits and power circuits shall be permitted to occupy the same cable, enclosure, or raceway only where the equipment powered is functionally associated.

(2) In Factory- or Field-Assembled Control Centers. Control circuits and power circuits shall be permitted to be installed in factory-or field-assembled control centers.

(3) In a Manhole. Control circuits and power circuits shall be permitted to be installed as underground conductors in a manhole in accordance with one of the following:

(1) The power or control circuit conductors are in a metal-enclosed cable or Type UF cable.

(2) The conductors are permanently separated from the power conductors by a continuous firmly fixed nonconductor, such as flexible tubing, in addition to the insulation on the wire.

(3) The conductors are permanently and effectively separated from the power conductors and securely fastened to racks, insulators, or other approved supports.

(4) In cable trays, where the control circuit conductors and power conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power or control circuit conductors are in a metal-enclosed cable.

519.25 Ungrounded Control Circuits. Separately derived ac and 2-wire dc circuits and systems 50 volts or greater shall be permitted to be ungrounded, provided that all the following conditions are met:

a. Continuity of control power is required for orderly shutdown.

b. Ground detectors are installed on the control system.

519.28 Control Circuits in Wet Locations. Where wet contact (immersion not included) is likely to occur, ungrounded two-wire dc control circuits shall be limited to 30 volts maximum for continuous dc or 12.4 volts peak for dc that is interrupted at a rate of 10 to 200 Hz. (Reference - Chapter 9, Table 11B).

Substantiation: The Amusement Ride Industry presented several proposals for a new Article 519 during the 2005 NEC cycle. Panel 15 agreed at the Comment Meeting to "hold" the proposals until a Task Force comprised of industry representatives and panel members could be assembled. The Task Force was assigned the responsibility of reviewing the unique characteristics of the equipment, new technology, and provisions for safety that are not already addressed in existing Code Articles. That information was then put into standard Code language and format. This proposal is the result of that collaborative effort.

Commercially available and standard technologies used by this industry incorporate smaller conductors. The limitation of larger conductors required under the current code hinders the use of these technologies and does not offer any additional safety. In complex control systems for permanent amusement attractions, where control reliability principles are employed, the current wiring methods limit or prevent the use of newer micro devices, connectors, and computer based technologies used for the increased monitoring, verification, redundancy and diagnostics of the apparatus under control. The current restrictions require regular petitioning and work with the authorities having jurisdiction (AHJ) to allow alternate materials and methods appropriate to the application in order to attain the increased level of safety that can be offered to the public.

This proposal was written with the intent to be an inspection code, to provide direction for inspectors, and not intended to be a design manual (design is being addressed by the ASTM Std 2291).

The permanent "theme" or "amusement" park industry has experienced tremendous growth over the past 50 years, with most of the growth occurring over the past two decades. In 1950, there were fewer than 50 theme park sites in the United States; today there are 450 and counting. A theme park brings together a unique combination of rides, show elements, transportation, theaters, standard facilities, live shows and new technologies.

The standard facilities, theaters, projection rooms and stages have a long history of acceptable electrical design practices and are regulated by specific sections of the National Electrical Code (NEC). Transportation systems have their own regulations. But where do the permanent ride and show electrical systems fall? Article 525 of the NEC only addresses portable rides. Permanent rides are not a facility, but usually reside in or around one. The standard components used for the design of the ride and show systems are more closely related to industrial processes, such as those regulated by NFPA 79, than those defined within the NEC.

This inability to classify the ride and show systems presents challenges for design engineers, electricians and inspectors. Application of the NEC should be the baseline for acceptance by the AHJ. However, if the NEC is applied in its present form, standard industrial control products cannot be used due to limitations on component voltage ratings and power supplies presented in Article 725. The resultant design would include ancillary components, wiring transition boxes, and interposing relays, that complicate the design and decrease the reliability and safety of the system. The majority of these integrated systems will also require the AHJ to approve alternative materials and methods not currently addressed in the NEC in order to assure orderly shutdown.

One solution to this dilemma would be to modify Article 525 of the NEC or NFPA 79, but these are industry specific. Modification of these existing standards may force changes to established practices that are not necessary; therefore, it is proposed that we add a new article to the NEC that specifically addresses the control circuits for the rides and shows of this rapidly growing, unique industry. This article will be based on design standards and practices recognized by NFPA, as shown in the supporting documentation. (Not Received by NFPA)

The code currently allows for alternate wiring methods for elevators and other applications. These applications incorporate safety features such as redundancy, orderly shutdown and a systems analysis approach, as do permanent amusement attractions. Due to the similarities to those applications, the same latitude should be allowed for permanent amusement attractions. This requires the introduction of a new article.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11

Ballot Not Returned: 1 Conry, C.

15-122 Log #220 NEC-P15 **Final Action: Accept in Principle**
(519.12)

NOTE: The following proposal consists of Comment 15-52 on Proposal 15-72 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. [Refer to Proposal 15- (Log #216)]
Submitter: Terance J. Hoffman, Ridetronics LLC
Recommendation: 1. 519.12 Power Limitations
Supply power sources, regardless of technology employed, shall not be power limited by this Article. Conductors connected to the load side of power supplies not sized to accommodate the full rated output current of the supply shall be protected by suitable overcurrent protection. Multiple taps from the same load side of a power supply are permissible provided separate overcurrent protection is provided for each conductor.
2. Recommend accepting proposal for addition of Article 519 as revised or accepting it in principle.
Substantiation: The Theme Park and Amusement Industry employs state of the art technology in non-traditional, unique applications that often do not fall within the intent of the NEC of NFPA standards. We often use industrial controls normally used for factory automation to physically handle people. This, as experience has shown, can be a very safe practice. Experience has also shown that local inspectors are often uncertain how to interpret and apply codes written for buildings with elevators and fire alarms to what are essentially industrial systems. We ask that the NEC recognize Permanent Amusement Attractions (PAAs) as a unique entity requiring special attention and provide clear, useable codes for the installation and inspection of such systems. Article 725, although applicable for some PAA systems, is not applicable for the majority of those systems. For example, Article 725, in the case of power supply limitations requires that our large low voltage, high current supplies be split into a number of smaller supplies, increasing the complexity of wiring, circuit isolation, emergency shutdown, etc., thereby decreasing reliability and increasing risk of failure.
The proposed Article 519 is probably not all-inclusive of every legitimate concern in the industry, but it does address a set of immediate needs. As with all other codes, Article 519 will expand and mature with time. The current proposal gives us a solid platform on which to build a set of installation standards to complement the new Design standards of ASTM F2291.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action on Proposal 15-121. The submitter's concerns have been adequately addressed by the action taken on Proposal 15-121.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11
Ballot Not Returned: 1 Conry, C.

ARTICLE 520 — THEATERS, AUDIENCE AREAS OF MOTION PICTURE AND TELEVISION STUDIOS, AND SIMILAR LOCATIONS

15-123 Log #1623 NEC-P15 **Final Action: Reject**
(520 & 530)

Submitter: Dennis Clements, Oregon Building Codes Division / Rep. BCD Electrical Section
Recommendation: Combine Articles 520 and 530 into a single section for clarity.
Substantiation: Electrical professionals searching for code references regarding motion picture and television studios have to look in two different places for information. Combining these articles into one will alleviate confusion.
Panel Meeting Action: Reject
Panel Statement: These are two different occupancies. A motion picture or television studio without an audience is occupied by professionals familiar with the facilities. These occupancies operate in a controlled environment. A theatre (and Motion Picture or Television Studio with an audience) is occupied by both the general public who is unfamiliar with the space along with professionals. A "520 space" is more like a "518 space" than a "530 space" in terms of the occupants, while the equipment is more similar between 520 and 530.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-124 Log #235 NEC-P15 **Final Action: Accept**
(520.2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Cables or conductors that are ~~physically~~ tied, wrapped, taped, or otherwise periodically bound together.
Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context.
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for one main reason. If we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. In many instances, the use of "physically" is bad writing. Here it is not, serving as emphasis; but it's still unnecessary.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-125 Log #3317 NEC-P15 **Final Action: Accept in Principle**
(520.2.Solid-State Phase-Control Dimmer, Solid-State Sine Wave Dimmer)

Submitter: Steven R. Terry, ETC
Recommendation: Add definitions to read:
<u>Solid State Phase-Control Dimmer. A solid state dimmer where the wave shape of the steady-state current does not follow the wave shape of the applied voltage, such that it is a nonlinear load.</u>
<u>Solid State Sine Wave Dimmer. A solid state dimmer where the wave shape of the steady-state current follows the wave shape of the applied voltage, such that it is a linear load.</u>
Substantiation: A new class of listed solid state dimmer has been introduced to the market: the Solid State Sine Wave dimmer. This type of dimmer varies the amplitude of the applied voltage wave form, without any of the nonlinear switching found in traditional phase control solid state dimmers. Heretofore, these phase control dimmers were the only type of readily available solid state dimmers. Since Article 520 makes reference in multiple sections to solid state dimmers as nonlinear loads with special requirements, a definition of solid state dimmer is now required that differentiates nonlinear and linear solid state dimmers.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
" Solid-State Phase-Control Dimmer. A solid-state dimmer where the wave shape of the steady-state current does not follow the wave shape of the applied voltage, such that the wave shape is nonlinear.
Solid-State Sine-Wave Dimmer. A solid-state dimmer where the wave shape of the steady-state current follows the wave shape of the applied voltage, such that the wave shape is linear."
Panel Statement: A dimmer is not a load, it is merely a control device. Therefore, the removal of the word "load" is appropriate.
The revised wording better represents the meaning of the definitions and accomplishes the goal of the submitter.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-126 Log #1095 NEC-P15 **Final Action: Reject**
(520.8)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Control of emergency systems shall comply with <u>Part V</u> of Article 700.
Substantiation: To conform to Style Manual requirements.
Panel Meeting Action: Reject
Panel Statement: Because of the special conditions surrounding Article 520, the panel contends that the reference to all of Article 700 is appropriate.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-127 Log #1603 NEC-P15 **Final Action: Accept**
(520.27(A)(2))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 520.27(A)(2):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(2) Multiple Feeders to Intermediate Stage Switchboard (Patch Panel). Multiple feeders of unlimited quantity shall be permitted, provided that all multiple feeders are part of a single system. Where combined, neutral conductors in a given raceway shall be of sufficient ampacity to carry the maximum unbalanced current supplied by multiple feeder conductors in the

same raceway, but they need not be greater than the ampacity of the neutral conductor supplying the primary stage switchboard. Parallel neutral conductors shall comply with 310.4.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-128 Log #1604 NEC-P15 **Final Action: Accept**
(520.27(B))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 520.27(B):
Change "neutral" to "neutral conductor"
The revised text would appear as follows:
(B) Neutral Conductor . The neutral conductor of feeders supplying solid-state, 3-phase, 4-wire dimming systems shall be considered a current-carrying conductor.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
VANNICE, K.: Note that the revised text as stated was further revised in proposal 15-129.

15-129 Log #3318 NEC-P15 **Final Action: Accept in Principle**
(520.27(B))

TCC Action: See the Technical Correlating Committee Note on Proposal 15-116.
Submitter: Steven R. Terry, ETC
Recommendation: Change section to read:
(B) Neutral. The neutral of feeders supplying solid-state phase-control , 3-phase, 4-wire dimming systems shall be considered a current-carrying conductor. The neutral of feeders supplying solid-state sine wave, 3-phase, 4-wire dimming systems shall not be considered a current-carrying conductor.
Substantiation: A new class of listed solid state dimmer has been introduced to the professional performance lighting market: the Solid State Sine Wave dimmer. This type of dimmer varies the amplitude of the applied voltage wave form, without any of the nonlinear switching found in traditional phase-control solid state dimmers. Heretofore, nonlinear phase control dimmers were the only type of readily available solid state dimmers. Since solid state sine wave dimmers are linear loads, they do not require the neutral of the feeder to the dimmers to be considered a current-carrying conductor. Wording is now required to clearly state the feeder requirements for both types of solid state dimmers that are now available, in order to avoid the confusion that might arise if only phase-control dimmers were mentioned in the requirement for neutral characteristics.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
" (B) Neutral Conductor. For the purpose of derating, the following shall apply:
(1) The neutral conductor of feeders supplying solid-state, phase control 3-phase, 4-wire dimming systems shall be considered a current-carrying conductor.
(2) The neutral conductor of feeders supplying solid-state, sine wave 3-phase, 4-wire dimming systems shall not be considered a current-carrying conductor.
(3) The neutral conductor of feeders supplying systems that use or may use both phase-control and sine-wave dimmers shall be considered as current-carrying."
Panel Statement: The panel recognizes the need to differentiate between solid-state sine wave and solid-state phase control dimmers.
The panel contends that the revised wording more clearly addresses the differences between these two dimmer technologies.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-130 Log #1605 NEC-P15 **Final Action: Accept**
(Table 520.44)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 520.44 Table 520.44 Third paragraph in Note:
Change "neutral" to "neutral conductor", change "common" to "neutral". Change "wires" to "conductors."
The revised text would appear as follows:
In a 3-wire circuit consisting of two phase ~~wires~~ conductors and the neutral conductor of a 4-wire, 3-phase, wye-connected system, ~~a common~~ the neutral conductor carries approximately the same current as the line-to-neutral currents of the other conductors and shall be considered to be a current-carrying conductor.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Also, the word "wires" should be replaced by "conductors" for consistency.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-131 Log #1606 NEC-P15 **Final Action: Accept**
(Table 520.44)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 520.44 Table 520.44, Fourth paragraph in Note:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

On a 4-wire, 3-phase, wye circuit where the major portion of the load consists of nonlinear loads such as electric-discharge lighting, electronic computer/data processing, or similar equipment, there are harmonic currents present in the neutral conductor, and the neutral <u>conductor</u> shall be considered to be a current-carrying conductor.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-132 Log #234 NEC-P15 **Final Action: Reject**
(520.47)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:

Backstage lamps (bare bulbs) installed in backstage and ancillary areas where they can come in contact with scenery shall be located and guarded so as to be free from ~~physical~~ damage and shall provide an air space of not less than 50 mm (2 in.) between such lamps and any combustible material.

Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context.

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unneccessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: four our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-133 Log #1602 NEC-P15 **Final Action: Accept**
(520.51)

TCC Action: The Technical Correlating Committee directs that the action on this proposal be correlated with the action taken on Proposal 15-134. This action will be considered by the Panel as a Public Comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 520.51:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

Portable switchboards shall be supplied only from power outlets of sufficient voltage and ampere rating. Such power outlets shall include only externally operable, enclosed fused switches or circuit breakers mounted on stage or at the permanent switchboard in locations readily accessible from the stage floor. Provisions for connection of an equipment grounding conductor shall be provided. The neutral conductor of feeders supplying solid-state, 3-phase, 4-wire dimmer systems shall be considered a current-carrying conductor.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:

VANNICE, K.: Note that the revised text as stated was further revised in proposal 15-134.

15-134 Log #3319 NEC-P15 **Final Action: Accept in Principle**
(520.51)

TCC Action: See the Technical Correlating Committee Note on Proposal 15-116.
Submitter: Steven R. Terry, ETC
Recommendation: Change the last sentence of the section to read:

The neutral of feeders supplying solid-state phase-control, <u>3-phase,</u> 4-wire dimming systems shall be considered a current-carrying conductor.

Add new wording at end of section:

<u>The neutral of feeders supplying solid-state sine wave, 3-phase, 4-wire dimming systems shall not be considered a current-carrying conductor.</u>

Substantiation: A new class of listed solid state dimmer has been introduced to the professional performance lighting market: the Solid State Sine Wave dimmer. This type of dimmer varies the amplitude of the applied voltage wave form, without any of the nonlinear switching found in traditional phase-control solid state dimmers. Heretofore, nonlinear phase control dimmers were the only type of readily available solid state dimmers. Since solid state sine wave dimmers are linear loads, they do not require the neutral of the feeder to the dimmers to be considered a current-carrying conductor. Wording is now required to clearly state the feeder requirements for <u>both</u> types of solid state dimmers that are now available, in order to avoid the confusion that might arise if only phase-control dimmers were mentioned in the requirement for neutral characteristics.

Panel Meeting Action: Accept in Principle

Replace the last sentence of the present text with the following:

"For purposes of conductor derating, the requirements of 520.27(B) shall apply."

Panel Statement: This condition referenced in the submitter's proposal is already covered in 520.27(B) as modified by the panel action on Proposal 15-129.

The panel contends it is more efficient to refer to the appropriate section rather than restating the information.

Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-135 Log #1608 NEC-P15 **Final Action: Accept**
(520.53(0)(2))

Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 520.53(O)(2):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(2) Supply Neutral Conductor . The power supply conductors for portable switchboards shall be sized considering the neutral conductor as a current-carrying conductor. Where single-conductor feeder cables, not installed in raceways, are used on multiphase circuits, the grounded neutral conductor shall have an ampacity of at least 130 percent of the ungrounded circuit conductors feeding the portable switchboard.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
VANNICE, K.: Note that the revised text as states was further revised in Proposal 15-134.

15-136 Log #3320 NEC-P15 **Final Action: Accept in Principle**
(520.53(0)(2))

Submitter: Steven R. Terry, ETC
Recommendation: Revise text to read:
(2) Supply Neutral. The power supply conductors for portable switchboards utilizing solid state phase-control dimmers shall be sized considering the neutral as a current-carrying conductor. The power supply conductors for portable switchboards utilizing only solid state sine wave dimmers shall be sized considering the neutral as a non-current-carrying conductor. Where single-conductor feeder cables, not installed in raceways, are used on multiphase circuits feeding portable switchboards containing solid state phase-control dimmers, the grounded neutral conductor shall have an ampacity of at least 130 percent of the ungrounded circuit conductors feeding the portable switchboard. Where such feeders are supplying only solid state sine wave dimmers, the grounded neutral conductor shall have an ampacity of at least 100 percent of the ungrounded circuit conductors feeding the portable switchboard.
Substantiation: A new class of listed solid state dimmer has been introduced to the professional performance lighting market: the Solid State Sine Wave dimmer. This type of dimmer varies the amplitude of the applied voltage wave form, without any of the nonlinear switching found in traditional phase-control solid state dimmers. Heretofore, nonlinear phase control dimmers were the only type of dimmers used in portable switchboards. Since solid state sine wave dimmers are linear loads, they do not require an oversize neutral in the feeder to the dimmers since they produce no harmonics and no neutral overcurrent. Wording is now required to clearly state the feeder requirements for both types of solid state dimmers that are now available, in order to avoid the confusion that might arise if only phase-control dimmers were mentioned in the requirement for neutral characteristics.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
"(2) Supply Neutral Conductor. The power supply conductors for portable switchboards utilizing solid state phase-control dimmers shall be sized considering the neutral conductor as a current-carrying conductor for derating purposes. The power supply conductors for portable switchboards utilizing only solid state sine wave dimmers shall be sized considering the neutral conductor as a non-current-carrying conductor for derating purposes. Where single-conductor feeder cables, not installed in raceways, are used on multiphase circuits feeding portable switchboards containing solid state phase-control dimmers, the neutral conductor shall have an ampacity of at least 130 percent of the ungrounded circuit conductors feeding the portable switchboard. Where such feeders are supplying only solid state sine wave dimmers, the neutral conductor shall have an ampacity of at least 100 percent of the ungrounded circuit conductors feeding the portable switchboard."
Panel Statement: The panel recognizes the need to differentiate between solid-state sine wave and solid-state phase control dimmers.
The panel contends that the revised wording more clearly addresses the differences between these two dimmer technologies.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-137 Log #239 NEC-P15 **Final Action: Reject**
(520.53(H)(4)(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
The supply conductors shall not penetrate walls, floors, or ceilings or be run through doors or traffic areas. The supply conductors shall be adequately protected from ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context. (I leave it to you whether you want to get more specific and say "blows and abrasion.")
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-138 Log #300 NEC-P15 **Final Action: Reject**
(520.53(L))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
All supply conductors and connectors shall be protected against ~~physical~~ damage by an approved means.
Substantiation: Use of the word "physical" is superfluous– the intent is obvious given the context (I leave it to you whether you want to get more specific and say "blows and abrasion.").
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-139 Log #1607 NEC-P15 **Final Action: Accept**
(520.53(O))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 520.53(O):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(O) Neutral Conductor .
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-140 Log #303 NEC-P15 **Final Action: Reject**
(520.62(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Fuses and circuit breakers shall be protected against ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous– the intent is obvious given the context (I leave it to you whether you want to get more specific naming some source of damage such as "blows or abrasion.").
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-141 Log #302 NEC-P15 **Final Action: Reject**
(520.68(A)(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Stand Lamps. Reinforced cord shall be permitted to supply stand lamps where the cord is not subject to severe ~~physical~~ damage and is protected by an overcurrent device rated at not over 20 amperes.
Substantiation: Use of the word "physical" is superfluous– the intent is obvious given the context (I leave it to you whether you want to get more specific and say "blows, twisting or abrasion.").
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-142 Log #301 NEC-P15 **Final Action: Reject**
(520.68(A)(4)(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
The breakout assembly is protected from ~~physical~~ damage by attachment over its entire length to a pipe, truss, tower, scaffold, or other substantial support structure.
Substantiation: Use of the word "physical" is superfluous– the intent is obvious given the context (I leave it to you whether you want to get more specific, naming some source of damage such as ("blows, twisting or abrasion.").
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on. Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-143 Log #1086 NEC-P15 **Final Action: Accept**
(520.81)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete last sentence.
Substantiation: Edit. Article 250 already applies per 90.3. Reference should not be made to entire articles per the style manual.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-144 Log #1186 NEC-P15 **Final Action: Accept**
(520.81)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete last sentence.
Substantiation: Edit. Article 250 already applies per 90.3. Reference should not be made to entire articles per the Style Manual.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

ARTICLE 525 — CARNIVALS, CIRCUSES, FAIRS, AND SIMILAR EVENTS

15-144a Log #CP1501 NEC-P15 **Final Action: Accept**
(525.2)

Submitter: Code-Making Panel 15,
Recommendation: Add a new definition for "Operator" to 525.2 to read as follows:
"525.2 Definitions.
Operator. As used in this Article, the operator shall be the individual responsible for starting, stopping, and controlling an amusement ride or supervising a concession.
Portable Structures. For the purposes of this Article the term portable structures shall include, but is not limited to, amusement rides, attractions, concessions, tents, trailers, trucks and similar units."
Substantiation: The panel chose to add the term "operator" to the definitions in 525.2, as in some situations the operator is considered to be the owner of the portable structure and not the individual that is actually controlling or attending the equipment.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.
Comment on Affirmative:
VANNICE, K.: Note that the definition for Portable Structures was accepted here and then revised in proposal 15-145.

15-145 Log #2892 NEC-P15 **Final Action: Accept in Principle**
(525.2)

TCC Action: The Technical Correlating Committee directs that the panel clarify the panel action on this proposal in accordance with 2.2.2 of the NEC Style Manual to not contain the term being defined. The panel is also directed to correlate this proposal with the action taken on Proposal 15-144a. This action will be considered by the panel as a public comment.
Submitter: Mark R. Hilbert, Wolfeboro, NH
Recommendation: Add a new section to read:
525.2 Definition.
Portable Structures. For the purposes of this Article the term portable structures shall include, but is not limited to, amusement rides, attractions, concessions, tents, trailers, trucks and similar units.
Substantiation: Adding a definition of the term "portable structures" will add clarity to what types of portable equipment is actually covered by Article 525. The term has been added to the following sections; 525.5(B), 525.6, 525.11, and 525.30 in companion proposals.
Panel Meeting Action: Accept in Principle
Add a new defintion for Portable Structures to read as follows:
"Portable Structures. The term portable structures applies to units designed to be moved including, but not limited to, amusement rides, attractions, concessions, tents, trailers, trucks, and similar units."
Panel Statement: The revised wording is more concise and more accurately reflects the terms used within the industry.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

15-146 Log #2893 NEC-P15 **Final Action: Accept in Principle in Part**
(525.5)

Submitter: Mark R. Hilbert, Wolfeboro, NH
Recommendation: Revise text to read:
525.5 Overhead Conductor clearances.
(A) Vertical Clearance From Ground . Outdoor conductors shall have a vertical clearance from ~~ground~~ final grade in accordance with 225.18. ~~These clearances shall apply only to wiring installed outside of tents and concessions.~~
(B) Clearance to ~~Rides and Attractions~~ Portable Structures .
(1) Under 600 Volts. ~~Amusement rides and amusement attractions~~ Portable structures shall be maintained not less than 4.5 m (15 ft) in any direction from overhead conductors operating at 600 volts or less, except for the conductors supplying the ~~amusement ride or attraction~~ portable structure. Portable structures included in 525.3(D) shall maintain a 6.9 m (22.5 ft) clearance in any direction from any part of portable structure.
(2) Over 600 Volts. ~~Amusement rides or attractions~~ Portable structures shall not be located under or within 4.5 m (15 ft) horizontally of conductors operating in excess of 600 volts.
Substantiation: Changing the title and text by using the term "portable structures" as it is defined in the new 525.2 will add clarity to what type of equipment is included and will expand the requirement to maintain clearances from overhead conductors for concessions, tents, power plants and similar equipment. This type of equipment was not necessarily considered under the previous language but the same hazards exist with overhead conductors. Further, revising this section as proposed will add clarity to the clearance requirements and resolve a conflict with the requirements of Table 680.8, Parts A and C. As previously written the clearance requirement of 22.5 ft in Table 680.8, Part A had been reduced to 15 ft by Section 525.5(B). Conversely, the horizontal clearance requirement of Table 680.8 Part C reduced the 15 ft requirement of 525.5(B) to 10 ft.
Panel Meeting Action: Accept in Principle in Part
The panel rejects the proposed (A) and the revises the last sentence of proposed (B)(1) to read: "Portable structures included in 525.3(D) shall comply with Article 680, Table 680.8."
The panel accepts the remainder of (B)(1) and all of (B)(2).
Panel Statement: The proposed changes to part (A) are unnecessary as this section applies to overhead conductors.
The proposed change to the second sentence of (B)(1) would conflict with the present requirements of 525.3(D) and, therefore, needed clarification.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

15-147 Log #233 NEC-P15 **Final Action: Reject**
(525.6)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise as follows:
Electrical equipment and wiring methods in or on rides, concessions, or other units shall be provided with mechanical protection where such equipment or wiring methods are subject to ~~physical~~ damage.
Substantiation: Use of the word "physical" generally is superfluous - the intent is obvious given the context. (I leave it to you whether you want to get more specific naming some sources of damage such as "blows or abrasion.").
Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: four our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

15-148 Log #2894 NEC-P15 **Final Action: Accept**
(525.6)

Submitter: Mark R. Hilbert, Wolfeboro, NH
Recommendation: Revise text to read:
525.6 Protection of Electrical Equipment. Electrical equipment and wiring methods in or on ~~rides, concessions or other units~~ portable structures shall be provided with mechanical protection where such equipment or wiring methods are subject to physical damage.
Substantiation: This proposal is a companion proposal to replace the terms "rides, concessions or other units" with the term "portable structures" for clarity and consistency of identifying amusement equipment throughout Article 525.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

15-149 Log #1354 NEC-P15 **Final Action: Reject**
(525.11)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
~~525.11 Multiple Sources of Supply.~~
~~Where multiple services or separately derived systems or both supply rides, attractions, and other structures, all sources of supply that serve rides, attractions, or other structures separated by less than 3.7 m (12 ft) shall be bonded to the same grounding electrode system.~~
Substantiation: This change to the 2005 edition of the code should never have been accepted. There was no technical substantiation.

Are there any documented cases of this being a problem?
Where did 12' come from? Is 11' unsafe? Is 12'1" safe?
Also, this requirement is so vague in its language that it is impossible to create uniform interpretation.
What is to be bonded together here? The generators? The attractions? The rides? The electrodes? Every structure within 12' of any other structure? How do I bond them? 500Kcmil copper? 6 AWG? What portions of Article 250 apply? Do I base the size on 250.122? Do I use Table 250.66?
What happens when a voltage is imposed from one system (during a fault) to the metal, non-current carrying parts of the other system and its rides and attractions? Why are we energizing attractions that were safe until we bond them to something that is under fault? Isn't isolation safer than bonding? I don't want to be touching a ferris wheel that is perfectly safe, only to get shocked because a different generator had a fault and imposed its voltage on me for the time duration of the overcurrent device to open. I would rather just not get shocked! Isolation is the answer, not bonding.

I urge the members of Panel 15 to delete this proposal that never should have passed in the first place.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its position onthe electrical safety provided when two or more sources of supply serving equipment in close proximity (within 12 ft) are bonded together. This is consistent with the requirement for bonding together to a common grounding electrode system as found in 250.58.

The panel contends that the distance of 12 ft. is representative of twice the arm reach of an individual.

Unless otherwise superceded by Article 525, it is understood that the common grounding electrode requirements are covered in Article 250.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Conry, C.

Explanation of Negative:

DUNN, T.: This proposal should have been accepted.

The submitter expressed legitimate concerns in his substantiation. I know these concerns to be legitimate because I have fielded these same questions since 525.11 appeared in the 2005 edition of the NEC.

The panel's comments do not address these concerns. 250.28 applies to, "Where an ac system is connected to a grounding electrode in or at a building or structure ...". At a 525 venue an ac system is connected to a grounding electrode at a generator .

The submitter asks, "Are there any documented cases of this being a problem," the answer is no .

The submitter is correct in that, there was no technical substantiation for introducing this into the 2005 edition.

15-150 Log #2895 NEC-P15 **Final Action: Accept in Principle in Part (525.11)**

Submitter: Mark R. Hilbert, Wolfeboro, NH

Recommendation: Revise text to read:

525.11 Multiple Sources of Supply. Where multiple services or separately derived systems or both supply ~~rides, attractions, and other~~ portable structures , the grounding conductor systems ~~all sources of supply~~ that serve ~~rides, attractions, or other~~ portable structures separated by less than 3.7 m (12 ft) shall be bonded. ~~to the same grounding electrode system.~~

Substantiation: This proposal is a companion proposal to replace the terms "rides, concessions or other units" with the term "portable structures" for clarity and consistency of identifying amusement equipment throughout Article 525. Further, the current text requires all sources of supply to be bonded to the same grounding electrode system. Permitting bonding of the two portable structures separated by less than 3.7 m (12 ft) at the structures in many instances is a more effective means to reduce voltage gradients between the two portable structures, particularly in cases where the sources of supply may be located great distances from each other.

Panel Meeting Action: Accept in Principle in Part

Revise the proposed text to read as follows:

"Multiple Sources of Supply. Where multiple services or separately derived systems, or both, supply portable or other structures, all sources of supply that serve such structures separated by less than 3.7 m (12 ft) shall be connected to the same grounding electrode system."

Panel Statement: The addition of the word "portable" agrees with the definition of Portable Structures. Changing "bonded" to "connected" correlates with the panel action taken on Proposal 15-2.

See panel action and statement on Proposal 15-149.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-151 Log #232 NEC-P15 **Final Action: Reject (525.20(A))**

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

Where flexible cords or cables are used, they shall be listed for extra hard usage. Where flexible cords or cables are used and are not subject to ~~physical~~ damage, they shall be permitted to be listed for hard usage. Where used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant. Extra-hard usage flexible cords or cables shall be permitted for use as permanent wiring on portable amusement rides and attractions where not subject to ~~physical~~ damage.

Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context. (I leave it to you whether you want to get more specific naming some sources of damage such as "blows or abrasion.").

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well – but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: four our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-152 Log #2896 NEC-P15 **Final Action: Accept in Principle in Part (525.21(A))**

Submitter: Mark R. Hilbert, Wolfeboro, NH

Recommendation: Revise text to read:

525.21 Rides, Tents and Concessions.

(A) Disconnecting Means. Each ride and concession shall be provided with a disconnecting means in accordance with (1), (2) or (3).

(1) A fused disconnect switch or circuit breaker located within sight and within 1.8 m (6 ft) of the operator's station. The disconnecting means shall be readily accessible to the operator, including when the ride is in operation. Where accessible to unqualified persons, the enclosure for the switch or circuit breaker shall be of the lockable type.

(2) Where the ride or concession is provided with fused disconnect switch or circuit breaker, an additional disconnecting means without internal overcurrent protection shall be permitted where it is located within sight and within 1.8 m (6 ft) of the operator's station. The disconnecting means shall be readily accessible to the operator, including when the ride is in operation. Where accessible to unqualified persons, the enclosure for the switch or circuit breaker shall be of the lockable type.

(3) A shunt trip device that opens the fused disconnect or circuit breaker when a switch located in the ride operator's console is closed shall be a permissible method of opening the circuit.

Substantiation: Revising this section as proposed will address a very real problem and permit an additional disconnecting means without internal overcurrent protection to be used within sight and within 6 ft of the operator's station when the ride or concession has been provided with overcurrent protection. This will allow the amusement company to carry additional disconnecting means that can be used in a variety of ways such as for a ride that does not have a means that disconnects all conductors or in place of a shunt trip that has been found inoperative, etc. For example, this disconnecting means could be provided with single pole connectors for the line and load connections and placed "in line" of a feeder where necessary.

Panel Meeting Action: Accept in Principle in Part

Change the wording of the first sentence of the existing Code language to read as follows:

"Each portable structure shall be provided with a disconnect switch located within sight of and within 1.8 m (6 ft) of the operator's station."

The remainder of the proposal is rejected.

Panel Statement: The panel acknowledges the submitter's concern for the requirement for overcurrent protection at the disconnecting means located at the operator's station. The panel has eliminated that requirement. The panel action does not prohibit the use of overcurrent protection at this location.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Conry, C.

Explanation of Negative:

VANNICE, K.: This appears to me to be a problem in that it wasn't taken far enough to make sense. We took the existing language from 525.21(A) and changed the first sentence. This removed the overcurrent protection component and left the disconnect component. I don't have a problem with that. The problem is that the remaining sentences are laced with overcurrent protection-type words. I think this should be held until the entire section is reworked.

15-153 Log #231 NEC-P15 **Final Action: Reject**
(525.21(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise as follows:

Electrical wiring for lighting, where installed inside of tents and concessions, shall be securely installed, and where subject to ~~physical~~ damage, shall be provided with mechanical protection.

Substantiation: Use of the word "physical" is superfluous - the intent is obvious given the context. (I leave it to you whether you want to get more specific naming some sources of damage such as "blows or abrasion.").

Submitting proposals removing the adjective may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, half a page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the use of "physical" is not only poor writing–look at William Zinsser's classic, On Writing Well– but silly, and reflects a bit poorly on the Code process. When the references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: four our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-154 Log #1476 NEC-P15 **Final Action: Accept**
(525.21(B))

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

525.21 Rides, Tents and Concessions.

(B) Portable Wiring Inside Tents and Concessions. electrical wiring for lighting, where installed inside of tents and concessions, shall be securely installed and, where subject to physical damage, shall be provided with mechanical protection. All lamps for general illumination shall be protected from accidental breakage by a suitable <u>luminaire (fixture)</u> or lampholder with a guard.

Substantiation: Correlation with the rest of the code.

Panel Meeting Action: Accept

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-155 Log #3483 NEC-P15 **Final Action: Reject**
(525.23)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI

Recommendation: Revise text to read:

525.23

(A) Where GFCI Protection is Required. <u>All 125 V, single phase, 15- and 20-ampere receptacles.</u>

~~(B) Where GFCI Protection is Not Required~~

Substantiation: This article needs rewording because there are not supposed to be any exceptions to this type of protection. Cordsets do not cut the muster because the carnival workers simply replace a faulty cordset with a non-GFCI-protected cordset which negates any GFCI protection. Every duplex type receptacle is accessible to the public so GFCI protect them. Why should items with a twist lock be exempted?

Panel Meeting Action: Reject

Panel Statement: It is the panel's intention to differentiate between receptacles that are mounted on portable structures and supply electrical equipment that is an integral part of the portable structure from those receptacles for general use.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Conry, C.

Explanation of Negative:

MORGAN, E.: The panel statement confirms what the apparent intent of the proposal was. It should have been Accepted in Principle in Part, with a minor revision to the proposal, indicating "general purpose" receptacles were required to be GFCI protected.

15-156 Log #2897 NEC-P15 **Final Action: Accept in Part**
(525.30(3))

Submitter: Mark R. Hilbert, Wolfeboro, NH

Recommendation: Revise text to read:

525.30 Equipment Bonding. The following equipment connected to the same source shall be bonded:

(3) Metal frames and metal parts of ~~rides, concessions, tents,~~ <u>portable structures,</u> trailers, trucks or other equipment that contain or support electrical equipment.

<u>The equipment grounding conductor of the circuit supplying the equipment in (1), (2) or (3) that is likely to energize the metal frame or part shall be permitted to serve as the bonding means.</u>

Substantiation: This proposal is a companion proposal to replace the term "rides, concessions or other units" with the term "portable structures" for clarity and consistency of identifying amusement equipment throughout Article 525. The acceptance of the new last sentence will clarify the bonding requirements of this section and will reduce the number varying interpretations of how the bonding is to take place. The requirement of 525.32 to verify the grounding conductor continuity added in the 2002 cycle further strengthens the integrity of permitting the equipment grounding conductor of the circuit likely to energize the metal frame or part as the bonding means.

Panel Meeting Action: Accept in Part

The panel accepts the addition of the term "portable structures", and rejects the remainder of the proposal.

Panel Statement: The acceptance of "portable structures" is in alignment with the new definition of "Portable Structures".

The remainder of the proposal is rejected because Code-Making Panel 5's Definition for "Equipment Grounding Conductor" addresses the submitter's concern.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-157 Log #2430 NEC-P15 **Final Action: Reject**
(525.30(D))

Submitter: Robert P. McGann, City of Cambridge

Recommendation: Revise text to read as follows:

This equipment shall be installed to comply with applicable requirement of Article 680 <u>Part II</u> .

Substantiation: It is too confusing as to which part of 680 to use now. It is consistently misinterpreted to which (section) part should be enforced in each jurisdiction.

Panel Meeting Action: Reject

Panel Statement: The panel believes that the submitter intended to address the proposal to 525.3(D) rather than 525.30(D). The panel contends that all applicable parts of Article 680 should be applied.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-158 Log #1049 NEC-P15 **Final Action: Accept in Principle**
(525.31)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

All equipment ~~requiring grounding~~ <u>to be grounded</u> shall be grounded by an equipment grounding conductor of a type ~~and size~~ recognized by 250.118 ~~and installed in accordance with Article 250.~~

Substantiation: Edit. The requirements should apply where grounding is done by choice and not required. 250.1 indicates Article 250 applies to equipment "permitted" to be grounded. The word "size" infers a wire type EGC but, 250.118 doesn't refer to size and covers other than wire type equipment grounding conductors. Article 250 already applies per 90.3.

Panel Meeting Action: Accept in Principle

Revise the proposed wording to read as follows:

"All equipment to be grounded shall be connected to an equipment grounding conductor of a type recognized by 250.118 and installed in accordance with Parts VI and VII of Article 250."

Panel Statement: The revised wording correlates with the panel actions taken on Proposal 15-2 and meets the intent of the submitter.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Conry, C.

15-159 Log #1072 NEC-P15 **Final Action: Reject**
(525.31)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence as follows:
All equipment to be grounded ~~requiring grounding~~ shall be grounded...". (remainder unchanged)
Substantiation: Edit. Where equipment is not required to be grounded, but grounded by choice, Code rules should also apply. Code provisions are not limited to mandatory requirements and 110.12 applies to all wiring. 250.1(1) indicates Article 250 covers installations "permitted" to be grounded and the proposal correlates this section.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 15-158.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Conry, C.

ARTICLE 530 — MOTION PICTURE AND TELEVISION STUDIOS AND SIMILAR LOCATIONS

15-160 Log #2215 NEC-P15 **Final Action: Reject**
(530.11)

Submitter: Kyle Cope, Prysmian Cables and Systems
Recommendation: Revise as follows:
"The permanent wiring shall be Type MC cable, Type PA cable . Type AC cable containing an insulated equipment grounding conductor...".
Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.
Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (530.11) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel is aware that Code-Making Panel 7 has rejected the proposal for a new article covering PA cable.
There is insufficient technical data for this panel to make a decision to override the action taken by Code-Making Panel 7.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-161 Log #467 NEC-P15 **Final Action: Reject**
(530.12(A))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
The wiring for stage set lighting and other supply wiring not fixed as to location shall be done with listed hard usage flexible cords and cables. Where subject to ~~physical~~ damage, such wiring shall be listed extra hard usage flexible cords and cables.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-162 Log #466 NEC-P15 **Final Action: Reject**
(530.12(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
The wiring for stage effects and electrical equipment used as stage properties shall be permitted to be wired with single- or multi-conductor listed flexible cords or cables if the conductors are protected from ~~physical~~ damage and secured to the scenery by approved cable ties or by insulated staples.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-163 Log #1507 NEC-P15 **Final Action: Accept in Principle**
(530.13)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change the word "tumbler" to "snap".
Substantiation: Edit. This is an antiquated term, not defined.
Panel Meeting Action: Accept in Principle
In the current code, replace the phrase "such as a tumbler switch" with "suitably rated".
Panel Statement: The panel contends that the rating of the switch, rather than the type of switch, is the important factor regarding the control of a contactor.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-164 Log #1758 NEC-P15 **Final Action: Accept**
(530.16, 530.20)

Submitter: David Belt, Underwriters Laboratores Inc.
Recommendation: Replace the term "portable lamp" with the term " portable luminaire ". Revise text as follows:
530.16 Portable ~~Lamps~~ Luminaires . Portable ~~lamps~~ luminaires and work lights shall be equipped with flexible cords, composition or metal-sheathed porcelain sockets, and substantial guards.
Exception: Portable ~~lamps~~ luminaires used as properties in a motion picture set or television stage set, on a studio stage or lot, or on location shall not be considered to be portable ~~lamps~~ luminaires for the purpose of this section.
530.20 Grounding. Type MC cable, Type MI cable, metal raceways, and all non-current-carrying metal parts of appliances, devices, and equipment shall be grounded as specified in Article 250. This shall not apply to pendant and portable ~~lamps~~ luminaires , to stage lighting and stage sound equipment, or to other portable and special stage equipment operating at not over 150 volts dc to ground.
Substantiation: The term "luminaire" has already been accepted in the Code as the correct terminology for a lighting system and replaces the terms "fixture" or "lighting fixture", which were terms for fixed lighting systems.
The term "portable luminaire" has been accepted by the IEC as the correct term for cord and plug connected lighting products and has also been adopted by UL in their ANSI/UL153 Safety Standard, which was previously titled "Portable Electric Lamps" and is now titled "Portable Electric Luminaires".
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-165 Log #1050 NEC-P15 **Final Action: Accept in Principle in Part**
(530.20)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Insert "exposed" between "carrying" and "metal." Delete "as specified in Article 250".
Substantiation: Edit. See definition of exposed (as applied to live parts) in Article 100. "As specified in Article 250" is superfluous; that article applies per 90.3 unless amended. Reference should not be made to entire articles.
Panel Meeting Action: Accept in Principle in Part
Revise the existing text of the first sentence to read as follows:
"Type MC cable, type MI cable, metal raceways, and all exposed non-current- carrying metal parts of appliances, devices, and equipment shall be connected to an equipment grounding conductor as specified in Article 250."
The remainder of the text remains unchanged.
Panel Statement: Because of the special nature of Article 530 and the users of that article, the panel contends that the reference to the entire Article 250 is important and should remain. This action is correlated with the panel action taken on Proposal 15-2.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 14 Negative: 1
Ballot Not Returned: 1 Conry, C.
Explanation of Negative:
WHITE, A.: Are only exposed metal parts subject to fault currents?

15-166 Log #465 NEC-P15 **Final Action: Reject**
(530.41)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
Only composition or metalsheathed, porcelain, keyless lampholders equipped with suitable means to guard lamps from ~~physical~~ damage and from film and film scrap shall be used at patching, viewing, and cutting tables.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion"; also whether you want to consider replacing "suitable" with specific characteristics, or with "acceptable to the AHJ.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: "Physical damage" is one of the special terms included in the NEC Style Manual (3.2.5.5) and should be retained.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

ARTICLE 540 — MOTION PICTURE PROJECTION ROOMS

15-167 Log #979 NEC-P15 **Final Action: Reject**
(540.11(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:
Control of Emergency systems shall comply with <u>Part V of</u> Article 700.
Substantiation: Edit. To conform to Style Manual requirements.
Panel Meeting Action: Reject
Panel Statement: Because of the special conditions surrounding Article 540, the panel contends that the reference to all of Article 700 is appropriate.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-168 Log #1007 NEC-P15 **Final Action: Accept**
(540.13)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence:
Conductors supplying outlets for arc and xenon projectors of the professional type shall not be smaller than 8 AWG and shall ~~be of sufficient size~~ <u>have an ampacity not less than</u> the projector <u>current rating</u> ~~employed~~ .
Substantiation: Edit. Proposal provides more specific wording.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-169 Log #516 NEC-P15 **Final Action: Accept**
(540.20)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
540.20 <u>Listing Requirements</u> ~~Approval~~ . Projectors and enclosures for arc, xenon and incandescent lamps and rectifiers, transformers, rheostats, and similar equipment shall be listed.
Substantiation: Approved is defined in Article 100 as "acceptable to the authority having jurisdiction." This section appears to be requiring a listing which the inspector can use as a basis for the approval. This proposed change is an effort to promote the use of words and terms consistent with how they are defined.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

15-170 Log #515 NEC-P15 **Final Action: Accept**
(540.32)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
540.32 <u>Listing Requirements</u> ~~Approval~~ . Projection equipment shall be listed.
Substantiation: Approved is defined in Article 100 as "acceptable to the authority having jurisdiction." This section appears to be requiring a listing which the inspector can use as a basis for the approval. This proposed change is an effort to promote the use of words and terms consistent with how they are defined.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Conry, C.

ARTICLE 545 — MANUFACTURED BUILDINGS

19-2 Log #464 NEC-P19 **Final Action: Reject**
(545.4(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
In closed construction, cables shall be permitted to be secured only at cabinets, boxes, or fittings where 10 AWG or smaller conductors are used and protection against ~~physical~~ damage is provided.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: The use of the term Physical Damage is consistent with its use in 300.4 and 300.5(D)(4).

The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code.

In most cases this phrase is used in conjunction with a requirement for conductor/cable protection. If "physical" is deleted the revised text might be interpreted as requiring "total" protection for conductor/cables from any unforeseen circumstances. Such a proposal would be considered more than editorial and it does not appear that is the intent.

Definition of damage:

Harm or injury to property or a person, resulting in loss of value or the impairment of usefulness.

The word "Physical" differentiates mechanical damage from electrical damage.

In addition, this is also consistent with the NEC Style Manual.

Number Eligible to Vote: 8
Ballot Results: Affirmative: 8

ARTICLE 547 — AGRICULTURAL BUILDINGS

19-3 Log #1530 NEC-P19 **Final Action: Accept**
(547, 500, 551, 552, 553 and 675)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 547, 550, 551, 552, 553, and 675 as described in the following, relative to the terms bonding and grounding.

Article 547

547.9(A)(4): change "shall be bonded to" to "shall be connected to"

547.9(B)(3)(b)(2): change "is bonded to" to "is connected to"

547.10(B): change "shall be bonded to" to "shall be connected to"

547.5(F): change "shall be ~~grounded~~ connected by a copper equipment grounding conductor installed between the equipment and grounding connection of the building disconnecting means"

Article 550

550.16: change "The grounding bus shall be ~~grounded~~ connected through the green-colored insulated conductor in the supply cord or the feeder wiring to the service ground in the service-entrance equipment located adjacent to the mobile home location."

550.16(B)(3): change "Cord-Connected Appliances. Cord-connected appliances, such as washing machines, clothes dryers, and refrigerators, and the electrical system of gas ranges and so forth, shall be grounded by means of a cord with an equipment grounding conductor and grounding-type attachment plug."

Article 551

551.20(C): change "The non–current-carrying metal enclosure of the voltage converter shall be ~~bonded~~ connected to the frame of the vehicle with a minimum 8 AWG copper conductor."

551.40(A): in 2 places, change "with ground" to "with equipment grounding conductor"

551.56(D)(2): change "is bonded to" to "is connected to"

551.76(C): change "ground" to "equipment grounding conductor"

Article 552.10(C)(4): change "The chassis-grounding terminal of the battery shall be ~~bonded~~ connected to the unit chassis with a minimum 8 AWG copper conductor. In the event the power lead from the battery exceeds 8 AWG, the bonding conductor shall be of an equal size."

552.20(C): change "bonded to" to "connected to"

552.40(A): in 2 places, change "with ground" to "with equipment grounding conductor"

552.57(D)(2): change "is bonded to" to "is connected to"

Article 553.10(A): change "All enclosures and exposed metal parts of electrical systems shall be ~~bonded~~ connected to the grounding bus."

553.11: change "shall be bonded to" to "shall be connected to"

Article 675.14: change "Where electrical grounding is required on an irrigation machine, the metallic structure of the machine, metallic conduit, or metallic sheath of cable shall be ~~bonded~~ connected to the grounding conductor. Metal-to-metal contact with a part that is ~~bonded~~ connected to the grounding conductor and the non–current-carrying parts of the machine shall be considered as an acceptable bonding path."

Substantiation: Article 547: The proposed changes are intended to make the requirements more prescriptive in nature and to include a reference to where the requirements are found in Article 250.

Article 547.5(F): These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

Article 550: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

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Article 553: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

Article 675: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-4 Log #3433 NEC-P19 **Final Action: Accept in Principle in Part**
(547.1)

Submitter: David Filipiak, Sky Electric, Inc.
Recommendation: Add the following new paragraph to the scope to read as follows:

The provisions of this article shall be permitted to apply to other buildings and structures on the same property, and to buildings and structures on farm, ranch, orchard, or vineyard property where buildings or adjacent areas as described in 547.1(A) or 547.1(B) do not exist.

Substantiation: There are several provisions in this article that are unique to farm, ranch, orchard, and vineyard electrical installations that do not exist elsewhere in the code. There are thousands of farms and ranches in particular across the country that do not have buildings or areas as described in 547.1(A) or 547.1(B) that should be permitted to be wired according to the rules in Article 547, but are excluded by the scope as presently written. For example, the 2002 and 2005 editions of the NEC do not permit UF or NMC cable to be used in those other buildings according to 334.10 and 334.12 unless the cables are run within fire-rated construction. Most buildings on farms are not of fire-rated construction, and concealing cables within building cavities is not recommended because of possible rodent damage. It is better for the cable to be exposed where its condition can be easily visually monitored. Central point electrical distribution is not recognized unless at least one of the buildings meets the conditions described in 547.1(A) or 547.1(B). With this new paragraph added to the scope, the electrical contractor has the option of applying all of the rules in Article 547 to all buildings and structures on a farm.

Panel Meeting Action: Accept in Principle in Part

Revise the existing code as follows:

"547.2 Definitions

Distribution Point. An electrical supply point from which service drops, service conductors, feeders, or branch circuits to buildings or structures utilized under single management are supplied."

In 547.9 Electrical Supply to Building(s) or Structure(s) from a Distribution Point, add the following new first sentence (Note: The existing 1st sentence becomes the second sentence):

"A distribution point shall be permitted to supply any building or structure located on the same premises."

Revise 547.9(A)(1) to read as follows:

"(1) Where Required. A site-isolating device shall be installed at the distribution point where two or more agricultural buildings, or structures are supplied from the distribution point."

Panel Statement: The new language allows buildings without 547.1 environments to receive supply according to the provisions of 547.9.

There is inadequate technical justification provided that 547 wiring methods should be permitted to be used for internal wiring of building without 547.1 environments.

Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-5 Log #2418 NEC-P19 **Final Action: Reject**
(547.2)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.
Recommendation: Delete definition for Equipotential Plane.
Substantiation: For additional substantiation, please read also 547.10 Proposal.

The definition of "equipotential plane" is a complete misunderstanding and misconception as there is **no such item as an equipotential plane that prevents a difference in voltage from developing within the plane.**

Ohm's Law states that **Voltage = Current X Resistance**

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the mesh will have some resistance. Any current flowing over and through the mesh will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

Cow Contact (cc) is defined as any two places on a cow that can encounter an energized "conductor" or conducting surface. For example, a cow drinking from a water trough that is energized standing on the earth would have a cow contact from the water through the tongue through the legs to the earth completing part of the circuit.

With the approval of Code Making Panel # 5's acceptance of the dangerous and hazardous multigrounded neutral distribution system, stray current has been measured flowing within dairies.

EPRI: "Created by the nation's electric utilities in 1973, EPRI is one of America's oldest and largest research consortia, with some 700 members and an annual budget of about $ 500 million. Linked to a global network of technical specialists, EPRI scientists and engineers develop innovative solutions to the world's toughest energy problems while expanding opportunities for a dynamic industry."

The Electric Power Research Institute (EPRI) an organization of utilities companies states that 40 to 60 percent of the return neutral current from the high voltage electrical circuit returns over or through the earth. We have measured as high as eighty-eight (88) percent of the neutral current returning over the earth and thus through the dairy, back yards of homes through hot tubs, swimming pools, etc.

Mr. Lawrence C Neubauer has conducted investigations and has measured stray current in over 600 – 800 dairies. To prove there is a voltage in an equipotential plane Mr. Neubauer took a large plastic container, which is an insulator. He placed a coil of bare copper under the bucket in intimate contact with the concrete. Next, he placed a coil of copper in the bottom of the plastic bucket. A milliammeter was connected between the coil in the bottom of the bucket and the coil of copper "connected" to the concrete holding area where the equipotential plane had been installed.

The plastic bucket was filled with water. As the cows entered they attempted to drink out of the plastic bucket, however, it was evident they received an electrical shock as they jerked their heads out of the water. When two or more cows drank the voltage divided between the cows and they continued to drink

The electrical circuit was from the equipotential, which supposedly prevents a difference in voltage from developing, up the legs of the cow, through the body to the tongue, into the water, through the copper in to bottom of the plastic bucket, to the milliammeter and finally to the copper which is in intimate contact with the concrete equipotential plane. Readings of over a milliamp were recorded on VHS.

The American Society of Agricultural Engineers (ASAE) EP473-2001, Equipotential Planes in Animal Containment Areas is incorrect as it is producing a false sense of security when actually the equipotential plane is harming the animals.

What happens is the equipotential plane is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. This equipotential plane is connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the primary neutral thus completing the connection to the primary electrical circuit back to the transformer.

What should be done is to connect all conductive metallic surfaces that can become energized to the grounding system through bonding conductors. No more, no less just as would be done in a home or industry.

If equipotential planes were such a great idea, why not require the basements and garage floors to have equipotential planes in case someone walked on the floor in their bare feet? Now watch some panel think that this is a great idea. A fool is born every code cycle.

No doubt, someone will make the comment that equipotential planes must do some good, must have a little advantage or may afford some help. That person needs to face the facts – **THERE IS NO BENEFIT IN ANY WAY, SHAPE OR FORM FROM EQUIPOTENTIAL PLANES, ONLY HARM.** The concept was based on erroneous ideas and conclusions and mis-understanding of electrical principles.

The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers. Now if only the WI PUC was as smart.

Panel Meeting Action: Reject

Panel Statement: The panel contends that it is necessary to retain the definition of Equipotential Plane because it is used in Article 547.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-6 Log #3255 NEC-P19 **Final Action: Reject**

(547.2)

Submitter: Donald Dekker, N. Muskegon, MI

Recommendation: Delete the following text:

~~(Equipotential Plane. An area where wire mesh or other conductive elements are embedded in or placed under concrete, bonded to all metal structures and fixed nonelectrical equipment that may become energized, and connected to the electrical grounding system to prevent a difference in voltage from developing within the plane.)~~

Substantiation: The term Equipotential Plane is defined in 2 separate sections of the Code and its methods are utilized in 3 distinct articles. I recommended deleting the 2 separate definitions and adding the definition of Equipotential Plane to 100-1. See companion proposals.

Panel Meeting Action: Reject

Panel Statement: The panel contends that it is necessary to retain the definition of Equipotential Plane because it is used in Article 547.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-7 Log #3637 NEC-P19 **Final Action: Reject**

(547.2)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Delete definition for Equipotential Plane.

Substantiation: For additional substantiation, please read also 547.10 Proposal.

The definition of "equipotential plane" is a complete misunderstanding and misconception as there is **no such item as an equipotential plane that prevents a difference in voltage from developing within the plane.**

Ohm's Law states that **Voltage = Current X Resistance**

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the mesh will have some resistance. Any current flowing over and through the mesh will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

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The plastic bucket was filled with water. As the cows entered they attempted to drink out of the plastic bucket, however, it was evident they received an electrical shock as they jerked their heads out of the water. When two or more cows drank the voltage divided between the cows and they continued to drink

The electrical circuit was from the equipotential, which supposedly prevents a difference in voltage from developing, up the legs of the cow, through the body to the tongue, into the water, through the copper in to bottom of the plastic bucket, to the milliammeter and finally to the copper which is in intimate contact with the concrete equipotential plane. Readings of over a milliamp were recorded on VHS.

The American Society of Agricultural Engineers (ASAE) EP473-2001, Equipotential Planes in Animal Containment Areas is incorrect as it is producing a false sense of security when actually the equipotential plane is harming the animals.

What happens is the equipotential plane is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. This equipotential plane is connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the primary neutral thus completing the connection to the primary electrical circuit back to the transformer.

What should be done is to connect all conductive metallic surfaces that can become energized to the grounding system through bonding conductors. No more, no less just as would be done in a home or industry.

If equipotential planes were such a great idea, why not require the basements and garage floors to have equipotential planes in case someone walked on the floor in their bare feet? Now watch some panel think that this is a great idea. A fool is born every code cycle.

No doubt, someone will make the comment that equipotential planes must do some good, must have a little advantage or may afford some help. That person needs to face the facts – **THERE IS NO BENEFIT IN ANY WAY, SHAPE OR FORM FROM EQUIPOTENTIAL PLANES, ONLY HARM.** The concept was based on erroneous ideas and conclusions and mis-understanding of electrical principles.

The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers. Now if only the WI PUC was as smart.

Panel Meeting Action: Reject

Panel Statement: The panel contends that it is necessary to retain the definition of Equipotential Plane because it is used in Article 547.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-8 Log #2419 NEC-P19 **Final Action: Reject**
(547.3)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: New paragraph following existing paragraph 547.3 to read:

Grounding of agriculture Buildings shall follow Article 250 requirements.

Substantiation: With the deletion of equipotential planes, Section 547.10, the panel may feel more comfortable stating the obvious.

Panel Meeting Action: Reject

Panel Statement: The panel did not Accept the deletion of equipotential planes.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-9 Log #2768 NEC-P19 **Final Action: Accept in Principle in Part**
(547.3)

Submitter: Truman C. Surbrook, Michigan State University

Recommendation: Revise the section as follows:

547.3 Other Articles. For ~~agricultural~~ buildings <u>and structures</u> not having conditions as specified in 547.1, the electrical installations shall be <u>permitted to be</u> made in accordance with the applicable articles in this code.

Substantiation: The term agricultural does not need to be repeated as it is implied by the title of the article. Structures need to be added as this section refers to wiring on structures as well as on or in buildings. The phrase "permitted to be" needs to be added to make it clear that the wiring methods of Article 547 are permitted to be used for other buildings on the farm not necessarily covered by 547.1(A) and (B). As it is stated now, it is required to wire the other buildings by methods in Chapters 1 through 4 and the methods of Article 547 are not permitted. The option of using the methods described in Article 547 needs to be open for use in all buildings on the farm property.

Panel Meeting Action: Accept in Principle in Part

The panel Rejected the inclusion of "permitted to be".

Panel Statement: There is inadequate technical justification provided that 547 wiring methods should be permitted to be used for internal wiring of building without 547.1 environments.

Also, see the panel action and statement on Proposal 19-4.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-10 Log #3210 NEC-P19 **Final Action: Reject**
(547.5)

Submitter: H. Dean Schumacher, H. Dean Schumacher Electrical Inspections

Recommendation: Add new paragraph:

Type MC, IMC, RMC, FMC, LFMC, EMT, an FMT with approved termination fittings shall be the wiring methods employed for concealed wiring.

Substantiation: Rodents in agricultural buildings present a constant threat to concealed wring systems. Metallic barrier wiring system would minimize potential safety hazard to personnel and structures.

Panel Meeting Action: Reject

Panel Statement: Section 547.5(A), in conjunction with the appropriate articles in Chapter 3, already specify the acceptable wiring methods and installation instructions. The metallic wiring systems recommended by the submitter are permitted in 547.5(A) when suitable for the location.

Although the submitter is correct in claiming that metallic wiring systems would minimize "potential" hazards, data verifying the effects of these hazards should be submitted before this change is warranted.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

Comment on Affirmative:

BERNSON, J.: There is legitimate concern about rodent destruction. The wiring methods suggested provide a viable solution to the problem and increase safety issues that occur due to rodent damage. Perhaps a FPN would be in order to remind installers that these particular wiring methods will be less subject to rodent damage.

19-11 Log #94 NEC-P19 **Final Action: Accept in Principle**
(547.5(A))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 7 for comment.

Submitter: Adam Joyce, Montrose, MI

Recommendation: Add a new last sentence as follows:

<u>"Cables shall be permitted to be installed as exposed or concealed wiring in any structure where not exposed to physical damage."</u>

Substantiation: In 334.10(3), it seems to be prohibiting the use of nonmetallic sheathed cables as exposed wiring or concealed within walls, ceilings, or floors that do not have a 15-minute finish fire rating. In 340.10(4), Type UF cable when installed in buildings is required to be installed according to the rules in Part II and Part III of Article 334. This seems to create a restriction on the use of Type UF cable for installation in agricultural buildings. The purpose of this new sentence is to make it clear that for installation in agricultural buildings, Type UF cable is permitted to be run as a surface wiring method. Use of Type UF cable and surface wiring where possible is the preferred wiring method for agricultural buildings.

Panel Meeting Action: Accept in Principle

In existing 547.5(A) add the following as a new second sentence:

"For the purpose of this section Types UF, NMC, and Copper SE cables shall be permitted to be exposed."

Panel Statement: Concealment of nonmetallic type cables in agricultural facilities increases the probability of rodent damage. Where the cable is concealed, insulation damage caused by rodents cannot be assessed. The revised wording addresses the concerns of the Submitter.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 6 Negative: 1

Explanation of Negative:

BERNSON, J.: The cables mentioned are not permitted to be exposed in these types of building construction and we should not be allowing it here.

The submitter mentions that Type UF cable and surface wiring are the preferred wiring methods for agricultural buildings. A change of this nature should not be made based on individual preference. This preference statement does not provide adequate substantiation to allow cables to be used in a manner prohibited elsewhere in this Code.

If rodent damage is an issue, other wiring methods not susceptible to rodent damage should be selected (See Proposal 19-10). If the issue is that damaged cables can be detected and replaced more easily, there will be no issue if metallic wiring methods are used. Replacing the cable a time or two may prove more costly than using the metallic wiring methods. There is no reason to reduce the safety of an individual who may come into contact with these conductors, particularly when the argument is that they are very likely to withstand damage due to rodents.

19-12 Log #3250 NEC-P19 **Final Action: Reject**
(547.5(A))

Submitter: David Filipiak, Sky Electric, Inc.
Recommendation: Add text to read as follows:
Type NM cable shall be permitted in dry locations other than those areas described in 547.1(A) and 547.1(B).
Substantiation: In buildings where the conditions are dry, it should be permitted to use type NM cable particularly as surface wiring. According to 334.10, type NM cable for installations other than dwellings is only permitted to be installed within fire-rated construction. It is recommended to run wiring exposed in farm.
Panel Meeting Action: Reject
Panel Statement: Section 334.10(3) requires cables to be concealed within walls, floors or ceilings providing a thermal barrier. 334.15(B) requires protection from physical damage. Since, as the submitter claims, it is recommended to run wiring exposed on a farm, Type NM cable is not suitable. Section 547.3 already addresses the circumstances suggested in the Submitter's substantiation.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-13 Log #1933 NEC-P19 **Final Action: Accept**
(547.5(A), FPN)

TCC Action: The Technical Correlating Committee directs the panel to reconsider the proposal relative to 353.44 which does not exist. This action will be considered by the panel as a public comment.
It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 8 for comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise the FPN to 547.5(A) as follows:
FPN: See 300.7 , ~~and~~ 352.44, 353.44, and 355.44 for installation of raceway systems exposed to widely different temperatures.
Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100, the revised Article 352 for Type PVC Conduit and the new Article 355 for RTRC. It clarifies that the broad designation of rigid nonmetallic conduit (Type RNC) includes PVC, HDPE and RTRC, each of which will now have a separate Article, and includes references to the respective Articles.
Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-14 Log #3420 NEC-P19 **Final Action: Accept in Principle**
(547.5(B))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 3 and Code-Making Panel 9 for comment.
The Technical Correlating Committee is concerned that the text modifies a basic rule of Chapters 1-4 without any specific substantiation, other than convenience, as to why the installations in Article 547 should be different. Although the text regarding Article 300 is in the existing NEC, the Technical Correlating Committee is raising the issue at this juncture to allow for public comments.
Submitter: Donald Dekker, N. Muskegon, MI
Recommendation: Revise text to read:
The 6 mm (1/4 in.) airspace required for nonmetallic boxes, fittings, conduit, and cables in 300.6 ~~(C)~~ (D) shall not be required in buildings covered by this article.
Substantiation: Change 300.6(C) to 300.6(D). 300.6(C) is the incorrect reference for this section. 300.6(D) refers to the minimum 1/4 in. airspace between the wall or supporting surface and nonmetallic boxes, fittings, conduit and cables.
Panel Meeting Action: Accept in Principle
Revised the proposed wording to read as follows:
"The 6 mm (1/4 in.) airspace required for nonmetallic boxes, fittings, conduit, and cables in 300.6 (D), and 312.2(A), shall not be required."
Panel Statement: The issue stated in the submitter's proposal is also addressed by 312.2(A), and was added to eliminate a conflict.
This change will allow mounting of nonmetallic raceways, boxes, and fittings on a wood surface without the 1/4 in. air space indoors or outdoors.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-15 Log #1943 NEC-P19 **Final Action: Accept**
(547.5(C)(3), FPN 1)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Correct cross reference within FPN, as a result of new Table location, as follows:
"FPN No. 1: See Table ~~430.91~~ 110.20 for appropriate enclosure type designations."
Substantiation: This is a companion proposal to the proposal to move text from 430.91 and Table 430.91 into a new 110.20. It should be done ONLY IF that proposal is accepted.
Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-16 Log #382 NEC-P19 **Final Action: Accept**
(547.5(D))

Submitter: Brian Dolan, IBEW/NECA Technical Institute
Recommendation: Revise text to read:
"Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metallic conduit, liquidtight flexible nonmetallic conduit , or...".
Substantiation: The current wording is not as concise as it could be. It forces the reader to interpret the phrase "liquidtight flexible conduit". That is, exactly which types of liquidtight flexible conduit are permitted?
Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-17 Log #463 NEC-P19 **Final Action: Reject**
(547.5(E))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
~~Physical~~ Protection. All electrical wiring and equipment subject to ~~physical~~ damage shall be protected.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The use of the term "Physical Damage" is consistent with its use in 300.4 and 300.5(D)(4).
The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code.
In most cases this phrase is used in conjunction with a requirement for conductor/cable protection. If "physical" is deleted the revised text might be interpreted as requiring "total" protection for conductor/cables from any unforeseen circumstances. Such a proposal would be considered more than editorial and it does not appear that is the intent.
Definition of damage:
Harm or injury to property or a person, resulting in loss of value or the impairment of usefulness.
The word "physical" differentiates mechanical damage from electrical damage.
In addition, this is also consistent with the NEC Style Manual.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-18 Log #221 NEC-P19 **Final Action: Accept**
(547.5(F))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. It is unclear as to whether the panel was accepting the held proposal or the held public comment. The Technical Correlating Committee also notes that this action is unclear relative to the action taken by accepting Proposal 19-3 that revised 547.5(F).

This action will be considered by the Panel as a Public Comment.

The Technical Correlating Committee also refers this proposal to the Technical Correlating Committee Bonding and Grounding Task Group for comment.

NOTE: The following proposal consists of Comment 19-8 on Proposal 19-10 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 19-10 was:

Revise text as follows:

(F) Separate Equipment ~~Grounding~~ <u>Bonding</u> Conductor. Non–current-carrying metal parts of equipment, raceways, and other enclosures, where required to be grounded, shall be grounded by a copper equipment ~~grounding~~ <u>bonding</u> conductor installed between the equipment and the building disconnecting means. If installed underground, the equipment ~~grounding~~ <u>bonding</u> conductor shall be insulated or covered.

Submitter: Monte Ewing, State of Wisconsin

Recommendation: Where an equipment grounding conductor is installed within a location falling under the scope of Article 547 it shall be a copper conductor. Where an equipment grounding conductor is installed underground it shall be insulated or covered copper.

Substantiation: Article 250 already requires noncurrent-carrying metal parts of equipment to be grounded (redundant language). The requirement to use copper from the building disconnect to the equipment does not prohibit the use of of the equipment grounds where the supply comes from other than the building disconnect. The copper restriction prohibits the use of aluminum messenger supported cable located outside the 547 area to get overhead from the building disconnect to other areas of the building (such as to a silo). This revision will allow copper out of the building to aluminum (above grade) and back to copper to go back in.

Panel Meeting Action: Accept

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-19 Log #1085 NEC-P19 **Final Action: Reject**
(547.5(F))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

<u>Exposed</u> non-current-carrying metal parts of equipment ~~where required~~ to be grounded shall be...(remainder unchanged).

Substantiation: Where grounding is not required, but done by choice, the requirements should apply. 250.1 indicates Article 250 applies where grounding is "permitted".

Panel Meeting Action: Reject

Panel Statement: The present code text requires both concealed and exposed non-current carrying metal parts of all equipment likely to become energized to be bonded, which provides a greater level of safety. Where equipment bonding is not required by code, but is voluntarily installed, the insulated or covered copper conductor requirement does apply. By installation of the equipment grounding conductor, the installer has identified that the equipment is likely to become energized.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-20 Log #2596 NEC-P19 **Final Action: Reject**
(547.5(F))

Submitter: Barry Bauman, Alliante Energy / Rep. American Society of Agricultural and Biological Engineers

Recommendation: Revise text to read:

547.5 Wiring Methods.

(F) Separate Equipment Grounding Conductor. Non-current-carrying metal parts of equipment, raceways, and other enclosures, where required to be grounded, shall be grounded by a copper equipment grounding conductor installed between the equipment and the building disconnecting means. ~~If installed underground, the~~ <u>A direct-buried</u> equipment grounding conductor shall be insulated or covered.

Substantiation: Existing text does not differentiate between conductors installed underground in a conduit and conductors used in a direct burial application. The existing text is intended to apply to direct burial applications. There has been no justification to require a copper equipment grounding conductor installed in an underground conduit to be insulated or covered. I am not aware of a failure of a copper conductor in an underground conduit.

Panel Meeting Action: Reject

Panel Statement: For the purpose of this Article the present text provides a greater level of survivability and safety than what is proposed. Unlike the text found in 547.9(D) which applies to supply conductors installed from a distribution point to a building or structure (which is typically not installed through confinement areas), 547.5(F) applies to branch circuits and feeders installed between buildings or structures and to equipment (such as heated livestock waterers located within confinement areas). The submitter has failed to provide justification to alter the requirements of the present text.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-21 Log #1130 NEC-P19 **Final Action: Accept in Principle**
(547.5(G))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete "general purpose."

Substantiation: A perceived interpretation of "general use" indicates receptacles for a specific utilization equipment does not require GFCI protection. All such receptacles should have GFCI protection.

Panel Meeting Action: Accept in Principle

Revise the current Code wording to read as follows:

(G) All 125-volt, single-phase, 15- and 20-ampere general-purpose receptacles installed in the locations listed in (1) through (4) shall have ground-fault circuit-interrupter protection for personnel:

(1) In areas having an equipotential plane
(2) Outdoors
(3) Damp or wet locations
(4) Dirt confinement areas for livestock

(GFCI) protection shall not be required for an accessible receptacle supplying a dedicated load where a GFCI protected receptacle is located within 3 ft of the non-GFCI protected receptacle."

Panel Statement: The panel did not accept the deletion of "general-purpose" as it is a term generally used throughout the Code and is understood.

However, the panel has revised 547.5(G) by adding a new paragraph to require a GFCI protected general-purpose receptacle at each accessible non-GFCI protected receptacle.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

Comment on Affirmative:

BERNSON, J.: This will allow specific non-GFCI-compatible utilization equipment to operate while enhancing safety by providing an alternate GFCI protected receptacle in these locations.

19-22 Log #3130 NEC-P19 **Final Action: Reject**
(547.5(G))

TCC Action: The Technical Correlating Committee directs that this proposal be reported as "Reject" because the use of the term "for personnel" is consistent with other parts of the Code when referring to the type of protection required.

Submitter: Jonathan R. Althouse, Michigan State University

Recommendation: At the end of the sentence delete the word "for personnel" to read as follows:

(G) Receptacles. All 125-volt, single-phase, 15- and 20-ampere general-purpose receptacles installed in the following locations shall have ground-fault circuit-interrupter protection ~~for personnel~~ .

Substantiation: The definition in Article 100 makes it clear that when the term ground-fault circuit-interrupter or GFCI is used in the Code it means for personnel protection. Some sections throughout the Code use these terms and state "for personnel" and other uses of the terms do not state "for personnel". The inconsistent use of the words "for personnel" confuses the user as to the purpose of ground-fault circuit-interrupter protection.

Panel Meeting Action: Accept

Number Eligible to Vote: 7

Ballot Results: Affirmative: 6 Negative: 1

Explanation of Negative:

MCNEIVE, T.: NEMA favors this explicit text as there still exists some confusion over the intended purpose of GFCI protection and its distinction from GFPE (Ground fault protection for equipment).

19-23 Log #1013 NEC-P19 **Final Action: Accept in Principle**
(547.8(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
A luminaire (fixture) that ~~may be~~ exposed to physical damage shall be protected by a suitable guard.
Substantiation: "May be" is very "iffy" and subjective and encompasses conditions that may prevail in the future. Proposal allows assessment to be made with prevailing conditions, including location.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
"Exposed to Physical Damage. Luminaires (lighting fixtures) exposed to physical damage shall be protected by suitable guard."
Panel Statement: The revised wording more clearly expresses the intent of the panel, and is editorial in nature. The language will now correlate with 410.4.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-24 Log #1129 NEC-P19 **Final Action: Accept in Principle**
(547.8(B) and (C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "may be" to "is".
Substantiation: Edit. "May be" is indefinite and requires consideration of future scenarios. Other similar code articles do not use this phrase. Judgement should be made according to prevailing conditions.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
"Exposed to Water. Luminaires (lighting fixtures) exposed to water from condensation, building cleansing water, or solution shall be watertight."
Panel Statement: The revised wording more clearly expresses the intent of the panel, and is editorial in nature. The language will now correlate with 410.4(A).
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-25 Log #92 NEC-P19 **Final Action: Reject**
(547.9)

Submitter: Jerome Thelen, St. Johns, MI
Recommendation: Revise the first sentence as follows:
" ~~Overhead~~ Electrical supply <u>to buildings and structures</u> shall comply with ~~547.9(~~ A) and ~~547.9~~ (B), or with ~~547.9~~ (C). Underground electrical supply shall comply with ~~547.9(C) and 547.9~~ (D)."
Substantiation: Out of the meeting of CMP 19 in December, 2003 came a new rule for equipment at the farm distribution point that was never presented in proposal form and made available for public comment. It is my understanding this is not consistent with the NFPA code making process. The entirely new rule is the lead paragraph of 547.9. A site isolation device is now only permitted as the only device when the electrical supply to the agricultural buildings is overhead. The rule needs to remain as in NFPA 70-2002 and as presented by CMP 19 in Comment 19-18. No justification other than speculation was ever presented to make such a significant change in the requirements for the distribution point equipment.
The Code Panel frequently used the reason for proposal or comment rejection "submitter has not provided sufficient technical substantiation" yet accepted Comment 19-18 based on submitter statements, the validity of which are questionable, and with absolutely no technical substantiation. It appears considered in the decision were Proposals 19-16, 19-17, and 19-19 and Comments 19-19, 19-20, and 19-21 the substantiations of which were based on speculation and alleged possibilities and not on actual experience and documented facts or real probability.
The switch at the distribution point is exactly what the name implies "a site isolation device." I have been a farmer for over 30 years and now I am an electrician, and a switch at the distribution point is used to disconnect power to overhead and underground customer owned wires to buildings and structures, and to provide a point for the connection of a standby generator. Given the length and size of conductors serving agricultural buildings and structures from the distribution point, the probability of an explosion at the site isolation switch as alleged is an extremely low probability. A quality transfer switch to be used as a site isolation switch with sufficient interrupting rating for the conditions is not hard to find from an electrical wholesale distributor.
It is obvious that statements made in the ROP and ROC are from persons with a lack of knowledge of farm wiring installations outside their local area or state. There are thousands of farm distribution point installations nationwide where the only means of power disconnection is to open the primary fuse or pull the meter. Grade level transfer switches are common across the nation and yet I know of no documented accident as speculated could occur in Propoals 19-16, 19-17, and 19-19 and Comments 19-19, 19-20, and 19-21.
It seems reasonable to me that rules based upon probability that can be documented are appropriate in order to achieve an Article 547 that is reasonable. Maybe then states such as Michigan can be convinced it is good practice to include Article 547 as a part of the State Electrical Code. Presently, Article 547 is not part of the Michigan Electrical Code.
Panel Meeting Action: Reject
Panel Statement: The submitter's substantiation is incorrect w ith regard to a site-isolation device being the only method of disconnection permitted for overhead distribution. The present 547.9 language is written to provide two methods for site disconnection and three methods for distribution. In applying 547.9, overhead distribution shall comply with (A) and (B) (a site-isolating device located at the distribution point with the service disconnecting means located at the supplied building or structure), or (C) (up to 6 service disconnects installed in accordance with Article 230 at the distribution point). This provides the permitted 2 methods of site disconnecting means and 2 forms of overhead distribution (one method provides ground-fault, short-circuit, and overcurrent protection for the conductors while the other method does not). The third method of distribution is underground and 547.9 requires underground distribution to comply with (C) and (D). The present language also permits for a combined installation of (A) and (C) at the distribution point to supply both overhead and underground distribution.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-26 Log #2411 NEC-P19 **Final Action: Accept in Principle**
(547.9)

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the proposal and avoid repeating the requirements of Article 250 in 547.9. The Technical Correlating Committee notes that all of the requirements outlined in 547.9(B)(3) are covered in Article 250 with the exception of the increased requirement that the equipment grounding conductor be the same size as the ungrounded conductors.
For correlation purposes, it would be more appropriate for the panel to reference the requirements in Article 250 and include the increased requirement for the EGC sizing.
This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
547.9 Electrical Supply to Building(s) or Structure(s) from a Distribution Point. Overhead electrical supply shall comply with 547.9(A) and 547.9(B), or with 547.9(C). Underground electrical supply shall comply with 547.9(C) and 547.9(D).
(A) Remain unchanged.
(B) Service Disconnecting Means and Overcurrent Protection at the Building(s) or Structure(s). Where the service disconnecting means and overcurrent protection are located at the building(s) or structure(s), the requirements of 547.9(B)(1) through (B)(3) shall apply.
(1) Conductor Sizing. The supply conductors shall be sized in accordance with Part V of Article 220.
(2) Conductor Installation. The supply conductors shall be installed in accordance with the requirements of Part II of Article 225.
(3) Grounding and Bonding. <u>For each building or structure, a separate equipment-grounding conductor shall be run with the supply conductors to the building(s) or structure(s), and the following conditions shall be met:</u> ~~the conditions in either (B)(3)(a) or (B)(3)(b) shall be permitted.~~
~~(a) System with grounded neutral conductor. The grounded circuit conductor shall be connected to the building disconnecting means and to the grounding electrode system of that building or structure where all the requirements of 250.32(B)(2) are met.~~
~~(b) A separate equipment grounding conductor shall be run with the supply conductors to the building(s) or structure(s), and the following conditions shall be met:~~
(1) Remain unchanged.
(2) Remain unchanged.
(3) Remain unchanged.
(4) Remain unchanged.
FPN: A system with a separate equipment grounding conductor is commonly referred to as a "4-wire system" in single-phase applications.
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.

Panel Meeting Action: Accept in Principle

Revise the text in the proposal to read as follows:

"547.9(B)(3) Grounding and Bonding. For each building or structure, a separate equipment grounding conductor shall be run with the supply conductors to the building(s) or structures(s), and the following conditions shall be met:

(1) The equipment grounding conductor shall be the same size as the largest supply conductor if of the same material, or adjusted in size in accordance with the equivalent size columns of Table 250.122 if of different materials.

(2) The equipment grounding conductor is bonded to the grounded circuit conductor and the site-isolating device at the distribution point.

(3) A grounding electrode system is provided in accordance with Part III of Article 250 and connected to the equipment grounding conductor at the building(s) or structure(s) disconnecting means.

(4) The grounded circuit conductor is not connected to a grounding electrode or to any equipment grounding conductor on the load side of the distribution point.

Exception: For existing premises wiring systems only, the grounded conductor run with the supply to the building or structure shall be permitted where all the requirements of 250.32(B)(1), Exception are met."

Panel Statement: The panel Accepts the Submitter's intent to require a separate equipment grounding conductor be installed with supply conductors to buildings or structures. Provisions for existing premises wiring systems, with no equipment grounding conductor run with the supply conductors to a building or structure, are included in new 547.9(B), Exception. The proposed new changes address the requirements, therefore, the FPNs in 547.9(B) were deleted. This action correlates with the accept in principle action taken by Code-Making Panel 5 on Proposal 5-119.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-27 Log #2922 NEC-P19 **Final Action: Accept in Principle in Part**
(547.9(10))

Submitter: Marcus Sampson, Lysistrata Electric

Recommendation: Revise as follows:

547.9 Electrical Supply to Building(s) or Structure(s) from a Distribution Point.

<u>(10) Where multiple site isolating devices are installed or used, they shall be identified in accordance with 230.2.</u>

Substantiation: Where an existing service with a utility owned site isolating device is supplemented with an additional service as allowed in 230.2, an additional site isolating device will be installed. Both devices should be identified as isolating switches.

Panel Meeting Action: Accept in Principle in Part

Add language to read as follows:

"547.9(A)(10) Marking A site-isolating device shall be permanently marked to identify it as a site-isolating device. This marking shall be located on the operating handle or immediately adjacent thereto."

The panel Rejects "identified in accordance with 230.2".

Panel Statement: The submitter is proposing identification of these devices where 547.9(A)(9) permits the installation of a second site isolation device installed in series with the utility supplied site isolation device. A site-isolating device located at the distribution point acts as a disconnecting means for everything it supplies similar to the purpose of a service disconnect. The revised language meets the submitter's recommendation to require identification of the site-isolating devices where series devices are installed, in addition to requiring the identification of a site-isolating device where not installed in series. This should help eliminate confusion of which direction the service is supplied where both a site-isolating device and a service disconnect are incorporated together for distribution.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-28 Log #649 NEC-P19 **Final Action: Reject**
(547.9(A)(2))

Submitter: Larry T. Smith, National Electrical Seminars

Recommendation: Revise text to read as follows:

(A) Site-Isolating Device. Site-isolating devices shall comply with 547.9(A)(1) through (A)(9).

(1) Where Required. A site-isolating device shall be ~~installed~~ <u>located on, or immediately adjacent to</u> ~~at~~ the distribution point where two or more agricultural buildings, structures, associated farm dwelling(s), or other buildings are supplied from the distribution point. <u>It shall meet the minimum clearance requirements of 230.24.</u>

~~(2) Location. The site-isolating device shall be pole-mounted and shall meet the clearance requirements of 230.24.~~

Substantiation: There is no logical reason to insist that the site-isolating device be pole-mounted; it could be mounted on a separate structure adjacent to the distribution point. Some agricultural installations are installed using service laterals - there is no pole - a separate structure is installed for the support of the site isolating device.

Panel Meeting Action: Reject

Panel Statement: The present language provides practical safeguarding with the requirement for pole mounting. This reduces the accessibility of the site-isolating device to those not qualified to work with electricity.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-29 Log #650 NEC-P19 **Final Action: Reject**
(547.9(A)(3))

Submitter: Larry T. Smith, National Electrical Seminars

Recommendation: Revise text to read as follows:

(A) Site-Isolating Device. Site-isolating devices shall comply with 547.9(A)(1) through (A)(9).

(1) Where Required. A site-isolating device shall be installed at the distribution point where two or more agricultural buildings, structures, associated farm dwelling(s), or other buildings are supplied from the distribution point.

(2) Location. The site-isolating device shall be pole-mounted and shall meet the clearance requirements of 230.24.

(3) Operation. The site-isolating device shall ~~simultaneously disconnect all underground service conductors from the premises wiring~~ . <u>consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard.</u>

Substantiation: In central Colorado, for example, the serving utility provides, at the distribution point, a meter/main combination consisting of three main circuit breakers; one main for the dwelling unit, one main for the agricultural building, and one main for the water well. Simultaneously disconnecting all ungrounded conductors at the site isolating device disconnects power to the water well, interrupting water flow that may be needed to fight a fire. This arrangement has been deemed essential for fire fighting in that region of the country for years.

There just doesn't appear to be any practical reason for not allowing the site-isolating device to consist of up to six switches or circuit breakers as is permitted for services in 230.71(A).

Panel Meeting Action: Reject

Panel Statement: The provision of 547.9(C) permits the installation described in the submitter's substantiation. Also see panel statement on Proposal 19-25.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-29a Log #CP1903 NEC-P19 **Final Action: Accept**
(547.9(E))

Submitter: Code-Making Panel 19,

Recommendation: Add the following new text:

"547.9(E) Identification. Where a site is supplied by more than one service with any two services located a distance of 150 m (500 ft) or less apart, as measured in a straight line, a permanent plaque or directory shall be installed at each of these distribution points denoting the location of each of the other distribution points and the buildings or structures served by each."

Substantiation: The submitter of Proposal 19-27 has brought to the committee's attention the lack of marking for isolating devices in comparison to service disconnecting means found in Article 230. Sites are now being supplied with multiple services due to load capacity and the need for different voltages. The proposed language is similar to the requirement found in 230.2(E) which is intended to provide an additional level of safety for the disconnection of the buildings or structures served as it pertains to 547.9. The basis for determining the distance of 500 ft. or less between distribution points is derived from the distribution policies of many utilities that for safety reasons prohibit more than one service where located less than 500 ft apart.

Panel Meeting Action: Accept

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-30 Log #2420 NEC-P19 **Final Action: Reject**
(547.10)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Delete the whole Section 547.10.

Substantiation: For additional substantiation please read 547.2 also.

How did the misunderstood equipotential planes get into the NEC? In the early 1980s it is opined that some agriculture professors read IEEE Standard 80 and being familiar with cow shit and not electrical engineering, misunderstood IEEE Standard 80. Four Ag professors wrote three papers on equipotential planes and dairies.

In 1985 the misinformed Ad Hoc Subcommittee on Electrical Grounding of Agriculture Buildings submitted the above inaccurate, ill-conceived proposal # 19-16, Log # 1363, 1985 ROP for the 1987 NEC, which since it came from a supposable informed subcommittee, was adopted by Panel 19 Unanimously Affirmative. Now it is hoped that none of the original members of the above groups are still on Panel 19, because it is against human nature to disown a concept supported previously.

It is opined that Gustafson, et al and the NEC Making Panels did not take into consideration the purpose of the IEEE Standard 80, "Guide for Safety in AC Substation Grounding".

IEEE Standard 80 states:

"**1.2 Purpose.** The intent of this guide is to provide guidance and information pertinent to safe grounding practices in ac substation design.

"The specific proposes of this guide are to

a) Establish, as a basis for design, the safe limits of potential differences that can exist in a substation under fault conditions between points that can be contacted by the human body.

b) Review substation grounding practices with special reference to safety, and develop criteria for a safe design.

c) Provide a procedure for the design of practical grounding systems, based on these criteria.

d) Develop analytical methods as an aid in the understanding and solution of typical gradient problems."

It is very clear that Clause 1.2 a) states that IEEE Standard 80 is under **fault conditions.** Stray current or if one insists, stray voltage, exists under normal steady state, continuous operating conditions, not fault conditions.

Professor Robert J. Gustafson writes, "Gradient control is used by the electrical industry to minimize the risk of hazardous step (foot-to-foot) and touch (hand-to-foot) potentials **under fault conditions** (emphases by author) at substations and around electrical equipment. In addition to protecting people, animals, and equipment **under fault or lightning conditions** , proper equipotential systems in livestock facilities can solve stray voltage/current problems." The concept of "equipotential planes" made up by the same Ag professors is totally false.

Fault currents in electrical substations are several magnitudes larger than any fault current that will be found on dairy farms. In substations we expect hundreds of thousands of amperes where on a dairy farm in the middle of nowhere maybe have 5,000 amperes for seconds until the protective device such as the circuit breaker or fuse operates. They are two very different conditions, fault current and steady state normal flowing stray current, and are not related.

Now compare that small amount of FAULT current for a few seconds to the continuous flow of steady state stray neutral current flowing continuously from the dangerous and hazardous multigrounded neutral electrical distribution system which is flowing across the equipotential plane continuously causing the dairy cow harm. Electric Power Research Institute states that 40 to 60 percent of the neutral return current will flow over the earth.

It is evident that this is an enormous, immense, huge, gigantic, colossal, mammoth, tremendous, stupendous, gargantuan, mis-application of an electrical principle that has caused untold harm to dairy cows and to humans.

No doubt, someone will make the comment that equipotential planes must do some good, must have a little advantage or may afford some help. That person needs to face the facts – **THERE IS NO BENEFIT IN ANY WAY, SHAPE OR FORM FROM EQUIPOTENTIAL PLANES, ONLY HARM.** The concept was based on erroneous ideas and conclusions and mis-understanding of electrical principles.

The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers.

Please also read my proposals on 547.2 where additional substantiation and educational information is contained.

Panel Meeting Action: Reject

Panel Statement: The use of equipotential planes is an accepted practice in various industries for reducing step-touch potential. Code-Making Panel 19 maintains that they are appropriate in Article 547. The submitter's substantiation is anecdotal and provides insufficient data to justify removing the requirement for equipotential planes.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-31 Log #3131 NEC-P19 **Final Action: Reject**
(547.10)

Submitter: Jeff Fitzloff, State of Idaho Division of Building Safety

Recommendation: Revise text as follows:

The installation and bonding of equipotential planes shall comply with 547.10(A) and 547.10(B). For the purposes of the section, the term livestock shall not include equine and poultry.

Substantiation: The equine businesses of Idaho have concerns that the introduction of the equipotential planes in the alley ways near and around stalls will have step voltage consequences where the equine step off of the concrete alley way into stalls with dirt floors. This concern is also voiced when the equine step from the alley to a riding arena area. The equine facilities are very well kept and do not have wet corrosive atmosphere that other large animal facilities have.

Panel Meeting Action: Reject

Panel Statement: The submitter did not substantiate how equine differ from other livestock.

Wet and corrosive atmospheres are not the only issues necessitating installation of the equipotential plane. If step voltage is at a level that livestock can feel when they enter or exit the equipotential plane, a voltage gradient ramp can be installed.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-32 Log #3513 NEC-P19 **Final Action: Reject**
(547.10)

Submitter: Paul Dobrowsky, Holley, NY

Recommendation: Revise as follows:

547.10 Equipotential Planes and Bonding of Equipotential Planes. The installation and bonding of equipotential planes shall comply with 547.10(A) and 547.10(B). For the purposes of this section, the term livestock shall not include poultry.

(A) Where Required. Equipotential planes shall be installed in all concrete floor confinement areas in livestock buildings, and in all outdoor confinement areas such as feedlots, containing metallic equipment that ~~may~~ is likely to become energized become energized and is accessible to livestock. The equipotential plane shall encompass the area where the livestock stands while accessing metallic equipment that ~~may~~ is likely to become energized become energized.

Substantiation: The term "may" should be used only for granting permission as indicated in the NEC Style Manual. "Likely to become energized" is explained as the failure of insulation".

Panel Meeting Action: Reject

Panel Statement: There are issues with lightning and other sources of voltage differences in addition to those caused by insulation failure.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-33 Log #3610 NEC-P19 **Final Action: Reject**
(547.10)

Submitter: Jim M. Schmer, Boise, ID

Recommendation: Add, equine and, after include and before poultry.

Substantiation: The equine businesses of Idaho have concerns that the introductions where the equine step off of the concrete alley way into stalls with dirt floors. This concern is also voiced when the equine step from the alley to a riding arena area. The equine facilities are very well kept and do not have wet corrosive atmosphere that other large animal facilities have.

Panel Meeting Action: Reject

Panel Statement: The submitter did not substantiate how equine differ from other livestock.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-34 Log #3616 NEC-P19 **Final Action: Reject**
(547.10)

Submitter: Joseph A. Hertel, State of Wisconsin

Recommendation: The language in 547.10 (A) should be permissive and not require the installation of an equipotential plane. The opening sentence should read...

(A) Where Installed Equipotential planes may be installed in all concrete floor confinement areas...".

Substantiation: The installation of an equipotential plane in an agricultural facility is a design issue and as such should noit be mandated in the NEC.

Panel Meeting Action: Reject

Panel Statement: The purpose of the equipotential plane is to minimize voltage gradients at animal contact points. This is the practical safeguarding of property (livestock) as indicated in 90.1(A). No substantiation has been provided to warrant a less restrictive requirement.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-35 Log #2597 NEC-P19 **Final Action: Accept**
(547.10, FPN)

Submitter: Barry Bauman, Alliante Energy / Rep. American Society of Agricultural and Biological Engineers
Recommendation: Revise text to read:
547.10 Equipotential Planes and Bonding of Equipotential Planes.
FPN No. 1: Methods to establish equipotential planes are described in American Society of Agricultural and Biological Engineers (ASAE) EP473. 2 -2001, Equipotential Planes in Animal Containment Areas.
FPN No. 2: Methods for safe installation of livestock waterers are described in American Society of Agricultural and Biological Engineers (ASAE) EP342.2-1995, Safety for Electrically Heated Livestock Waterers.
FPN No. ~~2~~ 3 : Low grounding electrode system resistances may reduce potential differences in livestock facilities.
Substantiation: The referenced engineering practice describes the safe installation of electrically heated livestock waters. Reference in a FPN will increase the use of this engineering practice. ASAE has added Biological to there name.
Panel Meeting Action: Accept
Panel Statement: This reference provides guidance for connecting livestock waterers to the equipment grounding conductor and the equipotential plane.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-36 Log #2595 NEC-P19 **Final Action: Accept in Principle**
(547.10(A))

Submitter: Barry Bauman, Alliante Energy / Rep. American Society of Agricultural and Biological Engineers
Recommendation: Revise text to read:
547.10 Equipotential Planes and Bonding of Equipotential Planes.
(A) Where Required. Equipotential planes shall be installed in all concrete floor confinement areas in livestock buildings, and in ~~all~~ concrete pads located outdoor s ~~confinement areas such as feedlots~~ , containing metallic equipment that may become energized and is accessible to livestock. The equipotential plane shall encompass the area where the livestock stands while accessing metallic equipment that may become energized.
Substantiation: Analysis of changes, 2005 NEC, stated that outdoors dirt confinement areas containing metallic equipment that may become energized and is accessible to livestock requires an equipotential plane. This was not the intent of CMP-19. The proposed language clarifies this issue.
Panel Meeting Action: Accept in Principle
Revise the proposed text to read as follows:
"547.10 Equipotential Planes and Bonding of Equipotential Planes.
(A) Where Required. Equipotential planes shall be installed where required in (1) and (2).
(1) Indoors. Equipotential planes shall be installed in confinement areas with concrete floors where metallic equipment is located that may become energized and is accessible to livestock.
(2) Outdoors. Equipotential planes shall be installed in concrete slabs where metallic equipment is located that may become energized and is accessible to livestock.
The equipotential plane shall encompass the area where the livestock stands while accessing metallic equipment that may become energized."
Panel Statement: The text was rewritten for clarity and meets the submitter's objectives.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-37 Log #3415 NEC-P19 **Final Action: Accept in Principle**
(547.10(A))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
(A) Where Required. Equipotential planes shall be installed in all concrete floor confinement areas in livestock buildings, and in outdoor confinement areas that employ a concrete deck. The outdoor requirement may include feedlots, but shall be limited to areas that contain metallic equipment that may become energized and is accessible to livestock. The equipotential plane shall encompass the area where the livestock stands while accessing metallic equipment that may become energized.
Substantiation: The 2005 NEC effectively requires a concrete deck under outdoor confinement areas whether or not one was anticipated, because the term "equipotential plane" as defined in 547.2 includes a concrete floor or deck of some kind. According to members of the panel this submitter has spoken with, this was a mistake and it was never intended to require the use of concrete structures outdoors. This proposal removes the mandatory requirement for outdoor concrete decks.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 19-36.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-38 Log #1355 NEC-P19 **Final Action: Reject**
(547.10(B))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
547.10(B)
~~FPN No. 2: Low grounding electrode system resistances may reduce potential differences in livestock facilities.~~
Substantiation: A low resistance connection to the earth does not reduce potential differences (from Stray Voltage) in a facility to any significant degree. Stray Voltage potential differences are reduced by bonding, as is indicated by this section.
Panel Meeting Action: Reject
Panel Statement: The submitter is correct that potential differences are reduced by bonding. Potential differences may be due to lightning or electrical faults and the substantiation only addresses stray voltage. No technical substantiation has been provided that warrants eliminating the Fine Print Note.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

ARTICLE 550 — MOBILE HOMES, MANUFACTURED HOMES, AND MOBILE HOME PARKS

19-39 Log #1614 NEC-P19 **Final Action: Accept in Principle**
(550.4(C))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to the Technical Correlating Committee Neutral Conductor Task Group for comment.
Submitter: Technical Correlating Committee on National Electrical Code
Recommendation: Make the following change in 550.4(C):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(C) Connection to Wiring System. The provisions of this article shall apply to mobile homes intended for connection to a wiring system rated 120/240 volts, nominal, 3-wire ac, with grounded neutral conductor .
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
"550.4(C) Connection to Wiring Systems. The provisions of this article shall apply to mobile homes intended for connection to a wiring system rated 120/240 volts, nominal, 3-wire ac, with a grounded neutral point."
Panel Statement: The panel concludes that the requirement refers to the point of connection to the wiring system and not the conductor itself.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-40 Log #1356 NEC-P19 **Final Action: Accept**
(550.11)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
550.11 Disconnecting Means and Branch-Circuit Protective Equipment.
(B) Branch-Circuit Protective Equipment. Branch-circuit distribution equipment shall be installed in each mobile home and shall include overcurrent protection for each branch circuit consisting of either circuit breakers or fuses.
The branch-circuit overcurrent devices shall be rated as follows:
(1) Not more than the circuit conductors; and
(2) Not more than 150 percent of the rating of a single appliance rated 13.3 amperes or more that is supplied by an individual branch circuit; but
(3) Not more than the overcurrent protection size and of the type marked on the air conditioner or other motor-operated appliance.
(C) Two-Pole Circuit Breakers. Where circuit breakers are provided for branch-circuit protection, 240-volt circuits shall be protected by a 2-pole common or companion trip, or circuit breakers with identified handle ties. ~~or handle-tied paired circuit breakers.~~
Substantiation: This change is meant to provide correlation with the 2005 change to 240.20.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-41 Log #1610 NEC-P19 **Final Action: Accept**
(550.11(A))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 550.11(A):
Delete "neutral bar." Change the word "termination" to "terminations"
The revised text would appear as follows:
(A) Disconnecting Means. A single disconnecting means shall be provided in each mobile home consisting of a circuit breaker, or a switch and fuses and its accessories installed in a readily accessible location near the point of entrance of the supply cord or conductors into the mobile home. The main circuit breakers or fuses shall be plainly marked "Main." This equipment shall contain a solderless type of grounding connector or bar for the purposes of grounding, with sufficient terminals for all grounding conductors. The ~~neutral bar~~ termination s of the grounded circuit conductors shall be insulated in accordance with 550.16(A). The disconnecting equipment shall have a rating not less than the calculated load. The distribution equipment, either circuit breaker or fused type, shall be located a minimum of 600 mm (24 in.) from the bottom of such equipment to the floor level of the mobile home.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
In this section, the phrase "neutral bar" does not correspond to "grounded circuit conductors."
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-42 Log #1120 NEC-P19 **Final Action: Reject**
(550.11(B)(1) and FPN (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change the last word "and" in (1) to "or."
Add:
FPN: Where only motor loads are supplied, see Article 430 Part IV.
Substantiation: (B)(1) is a limited requirement and not mitigated by (B)(2) or (B)(3) which are ADDITIONAL requirements. There may be motor loads with a manufactured home., e.g., sump pump, well pump, food waste disposer, whole house exhaust fan, furnace blower, etc. a well pump motor with a FLA rating of 12 amperes supplied by No. 14 AWG conductors rated 15 amperes requires an overcurrent device rated 15 amps per (1) (prone to trip or blow a 15 ampere circuit breaker or nontime-delay fuse) since (2) does not apply, and in cases where it does, the 150 percent rating of the overcurrent device also requires the ampacity of the circuit conductors to be at least 150 percent, per (1). This is at odds with Article 430. 550.12(D) FPN references Article 440 for central air conditioning which appears to negate this section for air conditioning equipment.
Panel Meeting Action: Reject
Panel Statement: The submitter's first sentence explains how the provisions are to be used but does not substantiate a change. There are no documented instances of problems caused due to the current requirements in this section. This language parallels language used in recreational vehicles (551.43(A)). Requirements in 550 are permitted to modify those in Chapter 4, which applies generally.
550.12(D), FPN is used when determining the number of branch circuits. Therefore, it does not negate 550.11(B) which is used to determine the size of the branch-circuit protective device.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-43 Log #1032 NEC-P19 **Final Action: Reject**
(550.12(D)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
The ampere rating of a single cord- and plug connected appliance on a circuit ~~having no other outlets~~ supplying two or more outlets or receptacles shall not exceed 80 percent of the branch circuit rating.
Substantiation: This section appears analagous to 210.23, however, if a circuit with only one outlet (receptacle) supplying a single appliance appears to be an individual circuit, by definition in Article 100. 210.23 indicates an individual circuit may supply any load for which it is rated.
Panel Meeting Action: Reject
Panel Statement: No technical substantiation has been provided. Requirements in Article 550 are permitted to modify those in Article 210.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-44 Log #970 NEC-P19 **Final Action: Accept**
(550.13(D)(2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "duplex" in the second sentence to "multiple type."
Substantiation: Edit. 550.13(A) permits multiple types other than duplex.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-46 Log #1125 NEC-P19 **Final Action: Reject**
(550.15(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "boxes" to "enclosures".
Substantiation: Edit. Boxes may be perceived as not including other enclosures such as cabinets, conduit bodies, etc.
Panel Meeting Action: Reject
Panel Statement: Section 550.15(A) overrides the Exceptions in 314.3 and does not pertain to the broader scope of all enclosures.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-47 Log #462 NEC-P19 **Final Action: Reject**
(550.15(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
Nonmetallic Cable Protection. Nonmetallic cable located 380 mm (15 in.) or less above the floor, if exposed, shall be protected from ~~physical~~ damage by covering boards, guard strips, or raceways.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The use of the term Physical Damage is consistent with its use in 300.4 and 300.5(D)(4).
The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code.
In most cases this phrase is used in conjunction with a requirement for conductor/cable protection. If "physical" is deleted the revised text might be interpreted as requiring "total" protection for conductor/cables from any unforeseen circumstances. Such a proposal would be considered more than editorial and it does not appear that is the intent.
Definition of damage:
Harm or injury to property or a person, resulting in loss of value or the impairment of usefulness.
The word "physical" differentiates mechanical damage from electrical damage.
In addition, this is also consistent with the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-48 Log #1545 NEC-P19 **Final Action: Accept in Principle**
(550.15(D))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to the Technical Correlating Committee Grounding and BondingTask Group for comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 550 and revise text as shown for the affected NEC sections.
550.15(D): (D) Metal Faceplates. Where metal faceplates are used, they shall be ~~effectively~~ grounded by contact with the grounded mounting strap of the device .
Substantiation: 550.15(D): The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." This section has been revised to prescribe the connection of the faceplate to the equipment grounding conductor by contact with the device mounting strap connected to the equipment grounding conductor.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.
The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."
The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.
This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.
The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read:
"550.15(D) Metal Faceplates. Where metal faceplates are used, they shall be grounded."
Panel Statement: This is identical to the language used in 406.5(B). There is no need to be more prescriptive as to the method of grounding.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-45 Log #1079 NEC-P19 **Final Action: Accept in Principle in Part**
(550.15(E))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
~~If~~ Where a range, clothes dryer, or similar appliance is connected by metal covered cable or flexible ~~metal~~ conduit, a length of not less than 900 mm (3 ft) of free unsupported cable or conduit, but not longer than necessary to service the appliance shall be provided to service the appliance. The cable or flexible ~~metal~~ conduit shall be secured to the wall where the unsupported length begins . (remainder unchanged)
Substantiation: Edit. This section does not cover other types of flexible conduit permitted by the first paragraph of 550.15 such as LFMC and LFNMC and not prohibited by this section, although not addressed. Where used, they are not covered by this section.

Panel Meeting Action: Accept in Principle in Part

Revise proposed text to read as follows:

"550.15(E) Installation Requirements. Where a range, clothes dryer, or similar appliance is connected by metal covered cable or flexible metal conduit, a length of not less than 900 mm (3 ft) of unsupported cable or conduit, shall be provided to service the appliance. The cable or flexible metal conduit shall be secured to the wall."

Panel Statement: There is no justification to remove the requirement for metallic conduit or cable. In this type of installation, the metallic covering affords an extra level of protection against physical damage.

"Not longer than necessary to serve the appliance" is subjective and may be unenforceable.

"Where the unsupported length begins" is unnecessary language as the unsupported length clearly begins after the last support.

The panel points out to the submitter that the requirement is not directed at LFMC and LFNMC; it is directed at metal covered cable and FMC (Article 348). See the first sentence of 550.15

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

19-49 Log #461 NEC-P19 **Final Action: Reject**

(550.15(H))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise text to read as follows:

Where outdoor or under-chassis line-voltage (120 volts, nominal, or higher) wiring is exposed to moisture or ~~physical~~ damage, it shall be protected by rigid metal conduit or intermediate metal conduit.

Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion," which also would eliminate the awkwardness entailed by the fact that moisture is itself a potential source of damage, wet-location wiring or no.)

Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: The use of the term "Physical Damage" is consistent with its use in 300.4 and 300.5(D)(4).

The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code.

In most cases this phrase is used in conjunction with a requirement for conductor/cable protection. If "physical" is deleted the revised text might be interpreted as requiring "total" protection for conductor/cables from any unforeseen circumstances. Such a proposal would be considered more than editorial and it does not appear that is the intent.

Definition of damage:

Harm or injury to property or a person, resulting in loss of value or the impairment of usefulness.

The word "Physical" differentiates mechanical damage from electrical damage.

In addition, this is also consistent with the NEC Style Manual.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

19-50 Log #2216 NEC-P19 **Final Action: Reject**

(550.15(J)(2))

Submitter: Kyle Cope, Prysmian Cables and Systems

Recommendation: Revise as follows:

"...These conductors shall be in a suitable raceway or Type AC, <u>type PA</u> or MC cable of at least...".

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (550.15(J)(2)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: A fact finding report is required before an article can be included in the Code for this new cable type.

See the panel statment on Proposal 7-10 for further information on this cable construction.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

19-51 Log #1609 NEC-P19 **Final Action: Accept**

(550.16)

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 550.16:

Delete "(neutral)"

The revised text would appear as follows:

Grounding of both electrical and nonelectrical metal parts in a mobile home shall be through connection to a grounding bus in the mobile home distribution panelboard. The grounding bus shall be grounded through the green-colored insulated conductor in the supply cord or the feeder wiring to the service ground in the service-entrance equipment located adjacent to the mobile home location. Neither the frame of the mobile home nor the frame of any appliance shall be connected to the grounded circuit conductor ~~(neutral)~~ in the mobile home. Where the distribution panelboard is the service equipment as permitted by 550.32(B), the neutral conductors and the equipment grounding bus shall be connected.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
- The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

19-52 Log #1611 NEC-P19 **Final Action: Accept**

(550.16(A))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 550.16(A):

Delete "(neutral)"

The revised text would appear as follows:

(A) Grounded ~~(Neutral)~~ Conductor.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-53 Log #1612 NEC-P19 **Final Action: Accept**
(550.16(A)(1))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 550.16(A)(1):

Delete "(neutral)"

The revised text would appear as follows:

(1) Insulated. The grounded circuit conductor ~~(neutral)~~ shall be insulated from the grounding conductors and from equipment enclosures and other grounded parts. The grounded (neutral) circuit conductor terminals in the distribution panelboard and in ranges, clothes dryers, counter-mounted cooking units, and wall-mounted ovens shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panelboard or in appliances shall be removed and discarded. Where the distribution panelboard is the service equipment as permitted by 550.32(B), the neutral conductors and the equipment grounding bus shall be connected.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Panel Statement: The panel understands that the submitter intended to delete the reference to "(neutral)" in the second sentence of 550.16(A)(1) although the proposed revised text does not include a strikeout for that term.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-54 Log #1477 NEC-P19 **Final Action: Accept**
(550.16(B)(2))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:

550.16 Grounding.

(B) Equipment Grounding Means.

(2) Electrical System. In the electrical system, all exposed metal parts, enclosures, frames, luminaire (fixture) canopies ~~lamp fixture canopies~~ , and so forth shall be effectively bonded to the grounding terminal or enclosure of the distribution panelboard.

Substantiation: Correlation with the rest of the code.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-55 Log #460 NEC-P19 **Final Action: Reject**
(550.16(C)(2))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:

...The bonding conductor shall be routed so as not to be exposed to ~~physical~~ damage.

Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")

Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: The use of the term Physical Damage is consistent with its use in 300.4 and 300.5(D)(4).

The adjective "physical" is clearly understood and its deletion does not improve the readability of the Code.

In most cases this phrase is used in conjunction with a requirement for conductor/cable protection. If "physical" is deleted the revised text might be interpreted as requiring "total" protection for conductor/cables from any unforeseen circumstances. Such a proposal would be considered more than editorial and it does not appear that is the intent.

Definition of damage:

Harm or injury to property or a person, resulting in loss of value or the impairment of usefulness.

The word "physical" differentiates mechanical damage from electrical damage.

In addition, this is also consistent with the NEC Style Manual.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-56 Log #1613 NEC-P19 **Final Action: Accept**
(550.17(A))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 550.17(A):

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

(A) Dielectric Strength Test. The wiring of each mobile home shall be subjected to a 1-minute, 900-volt, dielectric strength test (with all switches closed) between live parts (including neutral conductor) and the mobile home ground. Alternatively, the test shall be permitted to be performed at 1080 volts for 1 second. This test shall be performed after branch circuits are complete and after luminaires (fixtures) or appliances are installed.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-57 Log #953 NEC-P19 **Final Action: Accept**
(550.18)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "legs" to "ungrounded conductors."
Substantiation: Edit. A 3-wire system has three "legs"; which two legs are not specified?
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-58 Log #1128 NEC-P19 **Final Action: Accept**
(550.18)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "legs" to "ungrounded conductors".
Substantiation: Edit. There are three "legs" of a 120/240 volt system; which two are not specified.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-59 Log #1177 NEC-P19 **Final Action: Reject**
(550.18(A)(2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
~~Number of circuits times 1500~~ 3000 volt-amperes for ~~each~~ the two or more twenty ampere small appliance branch circuits specified in 550.12(B).
Delete remainder.
Substantiation: All appliance circuits are not small appliance circuits. The requirement for 1500 va for each circuit tends to discourage installation of more than two circuits. Additional circuits provide reliability and diversity without actually increasing load. The apparent intent is not to require load calculation for the circuit permitted in 210.52(B)(1), Exception. Where more than the minimum number of circuits required by 550.12(A) is installed, no additional load is specified beyond that of 550.18(A)(1). Once minimum loads are calculated for the feeder or service,additional circuits for the small appliances do not increase this load.
Panel Meeting Action: Reject
Panel Statement: If more than two circuits are installed for small appliances, they should be calculated at 1500 VA each as required by this section. For other appliance circuits, requirements are given in 550.18(B)(4) and (6).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-60 Log #1180 NEC-P19 **Final Action: Accept in Part**
(550.20(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete this section or substitute the following:
(A) OUTDOOR USE . Luminaires (fixtures) installed outdoors shall comply with 410.4(A); receptacles installed outdoors shall comply with 406.8; switches installed outdoors shall comply with 404.4; utilization equipment installed outdoors shall comply with 110.11.
Substantiation: Most lighting fixtures for outdoor use are listed for wet or damp locations. This section doesn't require the "bubble" type cover required in 406.8(B) and modifies that section. Outdoor switches are not covered, therefore, 404.4 applies. "Equipment" is a general term (Article 100) and includes material and items which do not require listing. Some outdoor (utilization) equipment is listed for outdoor use, not "wet" or "damp" locations.
Panel Meeting Action: Accept in Part
Revise the existing Code text to read as follows:
"(A) Listed for Outdoor Use. Outdoor luminaires (fixtures) and equipment shall be listed for wet locations or outdoor use. Outdoor receptacles shall comply with 406.8. Where located on the underside of the home or located under roof extensions or similarly protected locations, outdoor luminaires (fixtures) and equipment shall be listed for use in damp locations."
Panel Statement: Outdoor switches are covered by the term "equipment" (See Article 100). Requirements in Article 550 modify those in Chapters 1 through 4. The first sentence of 550.20 already permits the use of equipment listed for outdoor use.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-61 Log #963 NEC-P19 **Final Action: Reject**
(550.xx (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
LIGHTING OUTLETS REQUIRED . Lighting outlets shall be installed where specified in 210.70(A)(1), (2), and (3).
Substantiation: Manufactured home and mobile home occupants merit the same requirements for site-built units to comply with 90.1(A) and (B).
Panel Meeting Action: Reject
Panel Statement: The requirements in Chapters 1 through 4 apply generally, except as amended by Chapters 5 through 7. Since the lighting outlet requirements are not amended in Article 550, those requirements in Article 210 already apply.
There is no need for the additional language.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-62 Log #222 NEC-P19 **Final Action: Accept in Principle in Part**
(550.25)

TCC Action: See Technical Correlating Committee Note on Proposal 19-64.
NOTE: The following proposal consists of Comment 19-31 on Proposal 19-57 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 19-57 was:
Revise this section to refer to Article 100 for the definition of the term "arc-fault circuit-interrupter":
550.25 Arc-Fault Circuit-Interrupter Protection.
(A) ~~Definition.~~ Arc-fault circuit interrupters are defined in Article 100 ~~210.12(A)~~ .
(B) Bedrooms of Mobile Homes and Manufactured Homes. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in bedrooms of mobile homes and manufactured homes shall be protected by arc-fault circuit interrupter(s).
Submitter: Joseph A. Ross, Ross Seminars
Recommendation: Revise (B) and add new Exceptions as follows:
All branch circuits that supply ~~125~~ 120-volt, ~~single-phase,~~ 15 and 20-ampere outlets installed in bedrooms of mobile homes and manufactured homes shall be protected by arc-fault circuit interrupter(s).
Exception Nos. 1 and 2: (As accepted by CMP 2 addressing receptacle-type AFCIs, ROP 2-134a) and as accepted by CMP 2 addressing life-support equipment in dwelling unit bedrooms, ROP 2-167).
Exception No. 3: AFCI protection shall not be required for permanently installed alarm systems (fire, smoke, and burglar) in mobile homes and manufactured homes.
Substantiation: See substantiation for companion comments for Proposal Nos. 2-127, 2-134a, and 3-236. This is not new material. It certainly has had Public Review in the ROP and it addresses omissions and correlation (See NFPA Committee Regulations 4-4.6.2.1). Regardless of any Action by CMP 2 on new Exception No. 3, the provisions of 90.3 permit Chapter 5 (Article 550) to amend the general rules of Chapter 2 (Article 210). Alarm systems are life-saving systems. After all, isn't it saving lives that it's all about?
Panel Meeting Action: Accept in Principle in Part
The panel Accepts in Principle the change to include "120-volt".
The panel Rejects the remainder of the changes.
Panel Statement: The definition for arc-fault circuit-interrupters are in 210.12(A) and no exceptions are given for permanently installed alarm systems.
The change to "120-volt" was accepted in order to correspond with the language in 210.12.
The panel rejected the remainder of the proposed language in order to correlate with 550.25 and 210.12.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-63 Log #1127 NEC-P19 **Final Action: Reject**
(550.25(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Insert "receptacle" between "ampere" and "outlet".
Substantiation: There is no reason to require AFCI protection where a circuit supplies only fixed lighting outlets or equipment which is not cord connected or fire alarm/smoke detectors. If there are removed or dead batteries in the smoke/fire alarms and AFCI deenergizes the 120 volt power, the protection of those alarm systems is lost when they may be most needed.

Panel Meeting Action: Reject
Panel Statement: The panel intends 550.25 to correlate with 210.12 which makes no exceptions for permanently installed alarm systems.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-64 Log #1357 NEC-P19 **Final Action: Accept**
(550.25(B))

TCC Action: The Technical Correlating Committee notes that the text contained in this proposal is considered to be the final text and supercedes the action of the panel in Proposal 19-62.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
(B) Bedrooms of Mobile Homes and Manufactured Homes.
All 120-volt branch circuits that supply ~~125-volt, single-phase,~~ 15- and 20-ampere outlets installed in bedrooms of mobile homes and manufactured homes shall ~~be protected by arc-fault circuit interrupter(s)~~ comply with 210.12(B) .
Substantiation: The current text of 550.25 is not in alignment with 210.12. The text of 550.25 could either be changed to match the text of 210.12, or 210.12 can simply be called out, making further edits unnecessary.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-65 Log #939 NEC-P19 **Final Action: Accept in Principle**
(550.31)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second paragraph:
It shall be permissible to calculate the feeder or service load in accordance with Table 550.31. Where demand factors less than 100 percent are used, there shall be no reduction of the ampacity of the neutral as permitted in 220.61 (Remainder unchanged).
Substantiation: This section does not modify 220.61. A demand factor of 22 percent may be applied to the neutral. The last sentence does not exclude the provisions of 220.61 which are essentially the same as demand factors. Application of this section and 220.61 essentially results in a demand factor for a demand factor which could result in a neutral with insufficient ampacity.
Panel Meeting Action: Accept in Principle
In the existing Code text, delete the words "except as provided in this Code."
Panel Statement: The submitter is correct in that a demand factor applied to another demand factor could result in undersized conductors.
The revised language clearly states that the demand factors in Table 550.31 are permitted to be used and no other demand factors shall be allowed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-66 Log #954 NEC-P19 **Final Action: Accept in Principle in Part**
(550.32(B)(2), (4), and (6))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
(2) The installation of the service ~~equipment~~ shall comply with Part I through Part VII of Article 230.
(4) Bonding and grounding of the service shall be in accordance with Part II through Part V of Article 250.
Delete (6).
Alternatively, delete (2), (4), and (6).
Substantiation: To comply with Style Manual. Service "equipment" in (2) does not cover other portions of the service. In (6) the manufacturers may not know what type of grounding electrode will be used, which could affect the maximum size of the grounding electrode conductor.
90.3 already covers (2) and (4).
Panel Meeting Action: Accept in Principle in Part
In proposed (2), the panel Rejects the deletion of "equipment", and Accepts the addition of "Part I through Part VII".
In proposed (4), change "Part II" to "Part I".
The panel Rejects the deletion of (6).
Panel Statement: The definition of Equipment in Article 100 covers other portions of the service as the submitter intends.
The panel retains the use of references as allowed in 4.1 of the NEC Style Manual when they improve clarity of the rule.
In Item (4) the reference should be to Part I through Part V of Article 250 as the general rules for grounding shall apply.
The panel Rejects deleting item (6) as the manufacturer must specify the "minimum" size, not the "maximum" as suggested by the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-67 Log #1002 NEC-P19 **Final Action: Reject**
(550.32(B)(2) and (4))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete (2) and (4).
Substantiation: Edit Reference should not be made to an entire article per the Style Manual.
Panel Meeting Action: Reject
Panel Statement: Although the panel agrees with the submitter's substantiation; the panel disagrees with the proposed deletion.
See panel action and statement on Proposal 19-66.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-68 Log #1358 NEC-P19 **Final Action: Accept**
(550.33)

TCC Action: The Technical Correlating Committee directs the panel to reconsider the proposal and determine if the current reference to 310.15(B)(6) is necessary in 550.31 since the panel has accepted the addition of the same reference in 550.33(B). This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise as follows:
(B) Feeder Capacity. Mobile home and manufactured home lot feeder circuit conductors shall have a capacity not less than the loads supplied and shall be rated at not less than 100 amperes at 120/240 volts , and shall be permitted to be sized in accordance with 310.15(B)(6).
Substantiation: This proposal is not intended to create a technical change, but rather to make the code a friendlier document. Section 550.33 contains everything that the code user needs to know, except which table to use to size the conductors. The allowance to use 310.15(B)(6) is already found in 215.2(A)(3); this proposed change simply adds clarification.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-69 Log #2412 NEC-P19 **Final Action: Accept**
(550.33(A) Exception)

TCC Action: It was the action of the Technical Correlating Committee that the proposal be reconsidered and that the panel consider correlating this proposal with the Code-Making Panel 5 action on Proposal 5-119 relative to an exception for existing installations. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
550.33 Feeder.
(A) Feeder Conductors. Feeder conductors shall consist of either a listed cord, factory installed in accordance with 550.10(B), or a permanently installed feeder consisting of four insulated, color-coded conductors that shall be identified by the factory or field marking of the conductors in compliance with 310.12. Equipment grounding conductors shall not be identified by stripping the insulation.
~~Exception: Where a feeder is installed between service equipment and a disconnecting means as covered in 550.32(A), it shall be permitted to omit the equipment grounding conductor where the grounded circuit conductor is grounded at the disconnecting means as required in 250.32(B).~~
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-70 Log #1083 NEC-P19 **Final Action: Accept**
(550.33(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "at 120/240 volts".
Substantiation: Edit. Conductors are not rated at 120/240 volts. 310.11 requires the maximum rated voltage to be marked. Voltage rating has no direct bearing on ampacity.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-71 Log #1126 NEC-P19 **Final Action: Accept**
(550.33(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "at 120/240 volts."
Substantiation: Edit. Conductors and cables are only to be marked for the maximum rated voltage per 310.11(A). Ampere rating is not directly rated to voltage.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 551 — RECREATIONAL VEHICLES AND RECREATIONAL VEHICLE PARKS

19-72 Log #544 NEC-P19 **Final Action: Reject**
(551)

TCC Action: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
Submitter: Souheil Chehayeb, Chehayeb & Associates
Recommendation: Amend Article 551 to include Recreational Vehicle Storage Facilities. For each occurrence of recreational vehicle "site", add "or storage space".
Substantiation: Storage facilities equipped for RV storage are currently required to calculate electrical service and feeders without diversity causing excessively sized equipment to be installed. Unoccupied RVs in storage have similar demand loads to RV parks.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide sufficient documentation to warrant adding storage space to Article 551.
The assumption that a recreational vehicle storage facility has similar electrical demands as a recreational vehicle park is unsubstantiated.
The panel recognizes that RVs in storage areas are intended to be uninhabited.
In addition, the scope of the article is under the jurisdiction of the NEC Technical Correlating Committee.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-73 Log #2302 NEC-P19 **Final Action: Accept**
(551.1, FPN)

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Revise FPN to read:
FPN: For information on low-voltage systems, ~~see~~ refer to NFPA 1192-200 ~~2~~ 5 , *Standard ~~for~~ on Recreational Vehicles* , and ANSI/RVIA 12V- 2005, Standard for Low-Voltage Systems in Conversion and Recreational Vehicles, ~~*2002 edition.*~~
Substantiation: This change identifies the latest published editions of these two standards.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-74 Log #2598 NEC-P19 **Final Action: Accept in Principle**
(551.4, 551.20, 551.31, 551.40, 551.42, 551.44 and 551.46)

Submitter: Barry Bauman, Alliante Energy / Rep. American Society of Agricultural and Biological Engineers
Recommendation: Revise text to read:
551.4 General Requirements.
(A) Not Covered. A recreational vehicle not used for the purposes as defined in 551.2 shall not be required to meet the provisions of Part I pertaining to the number of capacity of circuits required. It shall, however, meet all other applicable requirements of this article if the recreational vehicle is provided with an electrical installation intended to be energized from a 120- , 120/208- or 120/240-volt, nominal, ac power-supply system.
(B) Systems. This article covers combination electrical systems, generator installations, and 120- , 120/208 or 120/240-volt, nominal, systems.
551.20 Combination Electrical Systems.
(F) Receptacles and Plug Caps. Where a recreational vehicle is equipped with a 120-volt or 120/ 208- 240-volt ac system, a low-voltage system, or both, receptacles and plug caps of the low-voltage system shall differ in configuration from those of the 120- or 120/ 208- 240-volt system. Where a vehicle equipped with a battery or other low-voltage system has an external connection for low-voltage power, the connector shall have a configuration that will not accept 120-volt power.
551.31 Multiple Supply Source.
(C) Alternate Power Sources Exceeding 30 Amperes. If an alternate power source exceeds 30 amperes, 120 volts, nominal, it shall be permissible to wire it as a 120-volt, nominal, system or a 120/ 208- 240-volt, nominal, system, provided an overcurrent-protective device of the proper rating is installed in the feeder.
IV. Nominal 120-Volt or 120/ 208- 240-Volt Systems.
551.40 120-Volt or 120/ 208- 240-Volt, Nominal, Systems.
(A) General Requirements. The electrical equipment and material of recreational vehicles indicated for connection to a wiring system rated 120 volts, nominal, 2-wire with ground, or a wiring system rated 120/ 208- 240 volts, nominal, 3-wire with ground, shall be listed and installed in accordance with the requirements of Parts I, II, III, IV, and V of this article. Electrical equipment connected line-to-line shall have a voltage rating of 208-230 volts.
551.42 Branch Circuits Required. Each recreational vehicle containing a 120-volt electrical system shall contain one of the following.
(D) More Than Five Circuits Without a Listed Energy Management System. A 50-ampere, 120/ 208- 240-volt power-supply assembly shall be used where six or more circuits are employed. The load distribution shall ensure a reasonable current balance between phases.
551.44 Power-Supply Assembly. Each recreational vehicle shall have only one of the following main power-supply assemblies.
(A) Fifteen-Ampere Main Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(A) shall use a listed 15-ampere or larger main power-supply assembly.
(B) Twenty-Ampere Main Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(B) shall use a listed 20-ampere or larger main power-supply assembly.
(C) Thirty-Ampere Main Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(C) shall use a listed 30-ampere or larger main power-supply assembly.
(D) Fifty-Ampere Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(D) shall use a listed 50-ampere, 120/ 208- 240-volt main power-supply assembly.
551.46 Means for Connecting to Power Supply.
(D) Labeling at Electrical Entrance. Each recreational vehicle shall have permanently affixed to the exterior skin, at or near the point of entrance of the power-supply cord(s), a label 75 mm × 45 mm (3 in. × 1 3/4 in.) minimum size, made of etched, metal-stamped, or embossed brass, stainless steel, or anodized or alclad aluminum not less than 0.51 mm (0.020 in.) thick, or other suitable material [e.g., 0.13 mm (0.005 in.) thick plastic laminate] that reads, as appropriate, either THIS CONNECTION IS FOR 110-125-VOLT AC, 60 HZ, ______ AMPERE SUPPLY. or THIS CONNECTION IS FOR 120/208- or 120/240-VOLT AC, 3-POLE, 4-WIRE, 60 HZ, _____ AMPERE SUPPLY.
Substantiation: Many recreational vehicle parks require a service larger than is available from a single-phase service or they require a 3-phase service for 3-phase loads. Due to the unavailability for 120/240-volt 3-phase service from the providing utilities, the park will be served with a 120/208-volt 3-phase service. Experience with serving parks with 120/208-volt 3-phase has resulted in no problems. The service voltage has been transparent to the park and recreational vehicle owners. The existing code language requires the recreational park owner to install a transformer to convert from 120/208-volt to 120/240-volt for line-to-line connected equipment. This is an unnecessary burden for the park owner. The proposed language reflects how parks are typically served at 120/208 volts.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
551.4 General Requirements.
(A) Not Covered. A recreational vehicle not used for the purposes as defined in 551.2 shall not be required to meet the provisions of Part I pertaining to the number of capacity of circuits required. It shall, however, meet all other applicable requirements of this article if the recreational vehicle is provided with an electrical installation intended to be energized from a 120-volt , 208Y/120-volt or 120/240-volt, nominal, ac power-supply system.
(B) Systems. This article covers combination electrical systems, generator installations, and 120-volt , 208Y/120-volt or 120/240-volt, nominal, systems.
551.20 Combination Electrical Systems.
(F) Receptacles and Plug Caps. Where a recreational vehicle is equipped with a n ~~120-~~ ~~or 120/240-volt ac~~ AC system, a low-voltage system, or both, receptacles and plug caps of the low-voltage system shall differ in configuration from those of the ~~120- or 120/240-volt~~ AC system. Where a vehicle equipped with a battery or other low-voltage system has an external connection for low-voltage power, the connector shall have a configuration that will not accept ~~120-volt~~ AC power.
551.31 Multiple Supply Source.
(C) Alternate Power Sources Exceeding 30 Amperes. If an alternate power source exceeds 30 amperes, 120 volts, nominal, it shall be permissible to wire it as a 120-volt, nominal, system, a 208Y/120-volt, nominal, system, or a 120/240-volt, nominal, system, provided an overcurrent-protective device of the proper rating is installed in the feeder.
IV. Nominal 120-Volt or 120/240-Volt Systems.
551.40 120-Volt or 120/240-Volt, Nominal, Systems.
(A) General Requirements. The electrical equipment and material of recreational vehicles indicated for connection to a wiring system rated 120 volts, nominal, 2-wire with ground, or a wiring system rated 120/240 volts, nominal, 3-wire with ground, shall be listed and installed in accordance with the requirements of Parts I, II, III, IV, and V of this article. Electrical equipment connected line-to-line shall have a voltage rating of 208-230 volts.

551.42 Branch Circuits Required. Each recreational vehicle containing a n AC ~~120-volt~~ electrical system shall contain one of the following.

(D) More Than Five Circuits Without a Listed Energy Management System. A 50-ampere, 120/ 208- 240-volt power-supply assembly shall be used where six or more circuits are employed. The load distribution shall ensure a reasonable current balance between phases.

551.44 Power-Supply Assembly. Each recreational vehicle shall have only one of the following main power-supply assemblies.

(A) Fifteen-Ampere Main Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(A) shall use a listed 15-ampere or larger main power-supply assembly.

(B) Twenty-Ampere Main Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(B) shall use a listed 20-ampere or larger main power-supply assembly.

(C) Thirty-Ampere Main Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(C) shall use a listed 30-ampere or larger main power-supply assembly.

(D) Fifty-Ampere Power-Supply Assembly. Recreational vehicles wired in accordance with 551.42(D) shall use a listed 50-ampere, 120/ 208- 240-volt main power-supply assembly.

551.46 Means for Connecting to Power Supply.

(D) Labeling at Electrical Entrance. Each recreational vehicle shall have permanently affixed to the exterior skin, at or near the point of entrance of the power-supply cord(s), a label 75 mm × 45 mm (3 in. × 1 3/4 in.) minimum size, made of etched, metal-stamped, or embossed brass, stainless steel, or anodized or alclad aluminum not less than 0.51 mm (0.020 in.) thick, or other suitable material [e.g., 0.13 mm (0.005 in.) thick plastic laminate] that reads, as appropriate, either THIS CONNECTION IS FOR 110-125-VOLT AC, 60 HZ, ______ AMPERE SUPPLY. or THIS CONNECTION IS FOR 208Y/120-VOLT or 120/240-VOLT AC, 3-POLE, 4-WIRE, 60 HZ, _____ AMPERE SUPPLY.

Panel Statement: The revised wording is editorial in nature to correlate with the language used throughout the Code.

The term "AC systems" was used to differentiate between the low voltage DC systems and the AC systems.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

WEAKLEY, K.: Argument against changing from single phase 3 wire to single phase derived from 3 phase 4 wire.

When currents add, as in single phase circuits derived from a three phase supply, there is no canceling of currents by balancing the load. Therefore, voltage drop on a typical RV feeder poses a possible touch voltage condition, and the possibility of a 5 ma personnel fault, when the typical RV feeder is fully loaded, with additional differences in potential when momentarily overloaded (i.e., when a motor starts). To reduce the frequency of this condition occurring, the CMP should not accept the proposals that introduce 208-120v single phase systems, and should retain the requirement that all RV feeders are derived from single phase systems.

Problems related to two wire appliances that are bonded to the neutral, i.e., a toaster in proximity to grounded fixtures or appliances, would be frequent. This situation/condition, could, in fact, have enough potential to be a danger to those individuals that are sensitive to the voltage levels that may be present.

Three wire single phase system derived from a three phase four wire supply. When a momentary current of 250 amps at 208 volts is developed, a potential of 5.2875 volts is on the neutral conductor.

Calculations; 225 ft of 250 mcm AL conductor,.094 ohms per 1000 ft, 160 amp load, = 3.384 volts drop. A momentary load of 250 amps line to line would create a 5.2875 volt drop on one of the ungrounded conductors.

I see no reason to change from a rationale that has worked for years without the above problems surfacing.

Summary; using a single phase system derived from a three phase supply will have a greater propensity for tingle voltage situations. By allowing this into Article 551, we will increase problems with voltage differentials between sites and other services, i.e., the grounded sheath on CATV cabling.

ZIEMAN, M.: I change my vote to Negative. The concerns raised in the other Explanation of Negative Vote need to be addressed.

19-75 Log #2303 NEC-P19 **Final Action: Accept**
(551.4(B), FPN)

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA

Recommendation: Revise FPN to read:

FPN: For information on low-voltage systems, refer to NFPA 1192-200 ~~2~~ 5 , *Standard on Recreational Vehicles* , and ANSI/RVIA 12V-200 ~~2~~ 5 , *Standard for Low-Voltage Systems in Conversion and Recreational Vehicles.*

Substantiation: This change identifies the latest published editions of these two standards.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

19-76 Log #2304 NEC-P19 **Final Action: Reject**
(551.30(E))

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA

Recommendation: Revise language to read as follows:

(E) Supply Conductors. The supply conductors from the engine generator to the first termination on the vehicle shall be of the annealed stranded type and shall be installed in listed flexible conduit or...

Substantiation: Current language is intended to prohibit use of NM sheathed cable but falls short because 8 AWG or larger NM cable supply and neutral conductors are stranded. Adding the word annealed would ensure use of conductors capable of withstanding vibration.

Panel Meeting Action: Reject

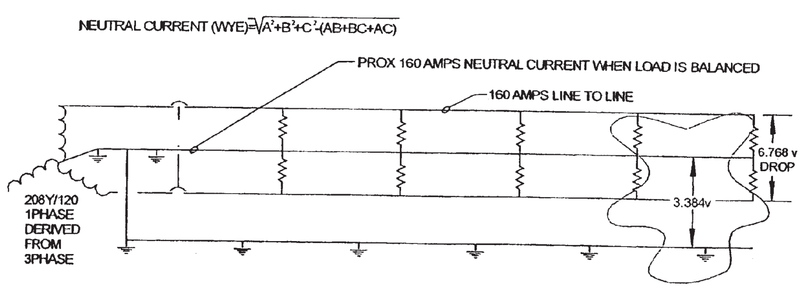
Panel Statement: The listing standards require that all stranded conductors be annealed.

Number Eligible to Vote: 12

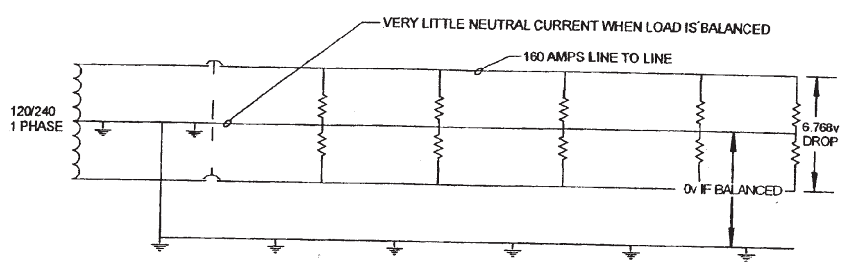
Ballot Results: Affirmative: 12

Comment on Affirmative:

BERNSON, J.: If the current language is intended to prohibit use of NM sheathed cable, more straightforward language should be included in this section to clarify this intent.



Three wire single phase system. When a momentary current of 250 amps line to line at 240 volts, is developed, a potential of 0 volts is on the neutral conductor.



19-77 Log #1014 NEC-P19 **Final Action: Reject**
(551.41(B)(4) (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add new paragraph (4) to read:
(4) At least one receptacle shall be installed outdoors on the exterior of the unit.
Substantiation: Receptacle outlets required by this code are presumed to be for safety purposes. The exterior receptacle outlet required by 552.41(C)(4) for a park trailer is equally justified for recreation vehicles of this article.
Panel Meeting Action: Reject
Panel Statement: Section 552.41(C)(4) does not require a receptacle on the exterior of a park trailer as the submitter suggests. Section 552.41(C)(4) requires GFCI protection for receptacles on the exterior of the unit. The same requirement exists for recreational vehicles in 551.41(C)(4).
Every RV site with electrical supply within an RV park is already required to be equipped with at least one 20-ampere, 125-volt receptacle (See 551.71). This receptacle should alleviate the safety concerns of the submitter.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-78 Log #2305 NEC-P19 **Final Action: Accept in Principle**
(551.42(C))

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Add new sentence after current 2nd sentence: Distribution panelboards rated 120/240 volts shall be permitted if listed for either 30 amp or 50 amp applications.
Substantiation: Currently, panelboards listed for use with either 30 amp or 50 amp systems are available. Safety is not compromised since the listing would cover this application.
Panel Meeting Action: Accept in Principle
Insert the following text as a new second sentence in 551.42(C):
"Such recreational vehicles shall be permitted to be equipped with distribution panelboards rated 120/240 volts maximum listed for 30 amp or 50 amp applications supplied by the appropriate power supply assemblies."
Panel Statement: The revised wording provides clarity as to the panel's intent and addresses the issues raised by the Submitter.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
HOPKINS, B.: The Panel agreed with the intent of the proposal, but may have added confusion when revising the text in the Panel statement.
The permission of a panelboard rated at 120 volts with a 30 ampere rated power supply assembly is now in question as the revised panel text only permits a panelboard rated 120/240 volts maximum for the 30 ampere power supply assembly.
Some may argue that 120-volt is less than 120/240 volts, which is stated as a maximum, thus allowing a 120-volt rated panelboard, but that is not clearly defined by this new language. In addition, the current title of Part IV of Article 551 is "Nominal 120-volt or 120/240-volt Systems," which clearly indicates that there are two systems.
Therefore, to be consistent with the title of Part IV the proposal should be accepted because it is adding a new sentence to address 120/240 volt applications and retains the current second sentence to address 120 volt applications, thus eliminating any possibility for confusion.
MILLER, T.: The Panel agreed with the intent of the proposal, but may have added confusion when revising the text in the panel statement.
The permission of a panelboard rated at 120 volts with a 30 ampere rated power supply assembly is now in question as the revised panel text only permits a panelboard rated 120/240 volts maximum for the 30 ampere power supply assembly.
Some may argue that 120-volt is less than 120/240 volts, which is stated as a maximum, thus allowing a 120-volt rated panelboard, but that is not clearly defined by this new language. In addition, the current title of Part IV of Article 551 is "Nominal 120-volt or 120/240-volt systems," which clearly indicates that there are two systems.
Therefore, to be consistent with the title of Part IV the proposal should be accepted because it is adding a new sentence to address 120/240 volt applications and retains the current second sentence to address 120 volt applications, thus eliminating any possibility for confusion.

19-79 Log #1094 NEC-P19 **Final Action: Accept in Principle in Part**
(551.42(C) and (D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second sentence of (C):
Such recreational vehicles shall be equipped with a distribution panelboard rated at 120 volts, maximum and minimum 30 amperes , with a 30-ampere rated main power supply assembly.
(D) A 50-ampere 120/240 volt power supply assembly and a minimum 50-ampere rated distribution panelboard shall be used where six or more circuits are employed.
Substantiation: Edit. The definition of power supply assembly does not include the distribution panelboard, therefore, no ampere rating is specified for the panelboard.
Panel Meeting Action: Accept in Principle in Part
The panel Accepts in Principle the proposed wording in (C).
The panel Accepts the revised wording in (D) of the proposal.
Panel Statement: The panel notes that the action taken on Proposal 19-78 modifies the wording in (C) of this proposal.
The revised wording of (C) clarifies the intent of the panel and addresses the issues brought up in the submitter's proposal.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-80 Log #1110 NEC-P19 **Final Action: Reject**
(551.43(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Branch circuit overcurrent devices shall be ~~rated as follows~~ in accordance with the applicable provisions of 240.4.
Delete (1), (2), and (3).
Substantiation: Edit. 240.4 adequately covers conductor overcurrent protection and (G) of that section covers air conditioning equipment, motors, etc. (A)(1) is a limiting requirement and not mitigated by (2) or (3) which are ADDITIONAL requirements. If the 150 percent rating of (2) or the rating permitted by (3) is used, the ampacity of the branch circuit conductors has to be not less than the overcurrent device rating.
Panel Meeting Action: Reject
Panel Statement: The submitter's second sentence explains how the provisions are to be used, but does not substantiate a change. There are no documented instances of problems caused due to the current requirements in this section. This language parallels language used in mobile homes (550.11(B)).
Requirements in 551 are permitted to modify those in Chapter 4, which apply generally.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-81 Log #1111 NEC-P19 **Final Action: Reject**
(551.44(A), (B) an (C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete the phrase "or larger."
Substantiation: The definition of Power-Supply Assembly in 555.2 includes attachment plug caps, which permits a plug cap rated higher than the conductors with the possibility of connection to a higher rated receptacle with overcurrent protection exceeding the cord ampacity. 551.46(C) specifies 15- 20- and 30 ampere attachment plugs respectively, for (A,)(B), an (C) of this section.
Panel Meeting Action: Reject
Panel Statement: Section 551.40(B) provides that the attachment plug caps and mating components of a power supply assembly be compatible according to their listing and intended use.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-82 Log #2306 NEC-P19 **Final Action: Accept in Part**
(551.45(A))

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Revise (A) title and 1st and last sentence as follows:
551.45 Distribution Panelboard.
(A) Listed and Appropriately Identified ~~Rated~~ . A listed enclosed and appropriately ~~rated~~ identified distribution panelboard or other equipment specifically listed for this purpose shall be used. The grounded conductor termination bar shall be insulated from the enclosure as provided in 551.54(C). An equipment grounding terminal bar shall be attached inside the ~~metal~~ enclosure of the panelboard.
Substantiation: This clarifies distribution panelboards must be of the enclosed type and are not required to be metal. Also the term "identified" is a defined term within the NEC Article 100.
Panel Meeting Action: Accept in Part
The panel Accepts the deletion of the word "metal" and Rejects the remainder of the proposal.
Panel Statement: The term "enclosed" type panelboard is not definined within the NEC. The word "identified" adds confusion when used in conjunction with the word "listed".
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-83 Log #2307 NEC-P19 **Final Action: Accept**
(551.45(B))

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Change first sentence as follows:...readily accessible location with the RV in the setup mode.
Change second sentence as follows:...for the panelboard with the RV in the setup mode shall be not less...
Substantiation: Access and working clearance for a distribution panelboard should only be required with the RV in the setup mode.
Panel Meeting Action: Accept
Panel Statement:
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-84 Log #2308 NEC-P19 **Final Action: Reject**
(551.45(D) (New))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 9 for comment relative to the question raised by Code-Making Panel 19 regarding the definition of "factory installed".
Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Add a new section as follows:
(D) Back Fed-Devices. A backfed main circuit breaker shall not be required to be secured in place by a fastener that is in addition to its panelboard mounting means, providing the panelboard's front cover prevents all circuits breakers from being removed when the cover is in place.
Substantiation: Recreational vehicles unlike residential applications provide the option of complete disconnection of the power supply during service of the distribution panelboard. This allows service personal a safe option to perform panelboard service without the presence of live conductors. Therefore, the main breaker hold down requirement is unnecessary.
Panel Meeting Action: Reject
Panel Statement: If the panelboard is designed so that the front cover can be removed while the back fed main circuit breaker is energized, the breaker should be secured by the additional fastener required in 408.36(F).
This is a safety issue.
The panel requests that the Technical Correlating Committee refer this Proposal to Code-Making Panel 9 for Comment relative to a definition of "field installed" versus "factory installed" as shown in 408.36(F) and as it relates to recreational vehicles.
For example, where a distribution panelboard, with a plug-in-type back-fed main breaker, is installed in a recreational vehicle at a factory assembly production facility, is this type of installation considered to be "field-installed" as this term is used in 408.36(F)?
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-85 Log #923 NEC-P19 **Final Action: Reject**
(551.47(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "boxes" to "enclosures."
Substantiation: Edit. Boxes may be perceived as not including other enclosures such as cabinets. Conduit bodies, etc.
Panel Meeting Action: Reject
Panel Statement: Section 551.47(C) overrides the exceptions in 314.3 and does not pertain to the broader scope of all enclosures.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-86 Log #1546 NEC-P19 **Final Action: Accept in Principle**
(551.47(M))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to the Technical Correlating Committee Grounding and Bonding Task Group for comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 551 and revise text as shown for the affected NEC sections.
551.47(M): (M) Metal Faceplates ~~Effectively~~ Grounded. Where metal faceplates are used, they shall be ~~effectively~~ grounded by contact with the grounded mounting strap of the device ~~grounded~~ .
Substantiation: 551.47(M): The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." This section has been revised to prescribe the connection of the faceplate to the equipment grounding conductor by contact with the device mounting strap connected to the equipment grounding conductor.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.
The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."
The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.
This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.
The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read:
"551.47(M) Metal Faceplates Grounded. Where metal faceplates are used, they shall be grounded."
Panel Statement: This is identical to the language used in 406.5(B). There is no need to be more prescriptive as to the method of grounding.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-87 Log #2309 NEC-P19 **Final Action: Accept in Part**
(551.47(P)(2))

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Revise (P)(2) by adding to the end of the existing sentence :...551.47(P)(2)(a) through 551.47(P)(2)(d) or other wiring methods acceptable under this standard as applicable.
Change existing (P)(2)b. to read:
b. The flexible cord shall be permitted to be routed within ~~pass through~~ the interior of a wall or ~~through a~~ floor in lengths not to exceed 600 mm (24 in.) before terminating at an outlet.
Delete all of c. and d. and replace with new c. and d. below:
c. The flexible cord shall be protected by bushings or fittings where entering walls or floors.
d. The outer jacket of the flexible cord shall be continuous to the outlet box.
Substantiation: This new language is based on requirements from 400.14 that should apply. This application is also permitted under 400.7(A)9 for connection of moving parts. Also this new language under (P)(2) allows other wiring methods that are in compliance with the NEC.
Panel Meeting Action: Accept in Part
The panel Accepts the new language in 551.47(P)(2)(d) and Rejects the remainder of the proposal.
Panel Statement: The broad "or other wiring methods..." is unacceptable because of the installation techniques used in 551.47(P)(2) that are typically violations but, are permitted under this section because of issues with expandable units.
Allowing a flexible cord to be routed within a wall or floor is in clear violation of 400.8(5) which does not allow the cord to be concealed by walls or floors.
Section 400.8(2) does not permit flexible cords to be run through holes in walls or floors. The panel (in an earlier cycle) accepted 551.47(P)(2)(b) when the installation is in compliance with all the provisions in 551.47(P)(2)(a) through 551.47(P)(2)(d) because of the issues with expandable units.
The provisions in 551.47(P)(2)(c) should not be deleted. They are necessary if the cord is not allowed to be routed within interior walls and floors.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

HOPKINS, B.: In the past several years, the industry has added expandable room sections at a rate that today, finds nearly 80 percent of all RV having expandable room sections. This includes all RV types including folding camping trailers, Class B motor homes (those built on van type chassis) and truck campers. Expandable room sections, room sections that move in and out of the main portion of the RV itself, often contain electrical systems, propane systems and plumbing systems.

The technology and approach to safely wiring these rooms have moved very quickly. With the conductors used for these rooms being equal to that of the power supply assembly (ref 551.47(P)(2)) allowing the cord to pass though walls and floors has been permitted by all AHJ, including state agencies. For a time, the cords were installed within walls and floors for short distances permitting flexible cord conductors to be connected with the minimum number of connections. This practice was proposed as an acceptable use in the 2005 NEC, but was rejected because of the prohibitions of Article 400. In an attempt to assist industry, the cord was permitted within the exterior wall, providing it was installed inside a conduit. It is industry's contention that no additional protection is provided beyond what is inherently provided by the wall or floor, particularly to a cord that is listed for hard usage and for wet locations.

The 2008 proposal to allow cord inside the wall without conduit was again rejected. In addition, other wiring methods acceptable under the NEC, such as following the permitted practice of running the cord through walls and floors as stated in 551.47(P)(2), was also rejected. Now, the NEC ONLY allows the use of the flex cord inside a conduit, inside the wall as the direct wiring method.

Article 551 exists to allow exceptions to the base requirements of Chapters 1 through 4. Addressing the general use of flexible cords addressed in Article 400 cannot take every possible usage into account, but general rules, nevertheless, have been established.

Wiring the expandable room is an area that needs exceptions permitted within Article 551.

We do not expect the panel to reverse its position during the letter ballot process. Instead, a new, revised proposal, in the form of a comment, will be submitted to address the direct wiring of expandable rooms. It is our hope that extensive consideration be given to this topic as there is a need to reduce the connections of the conductors while providing the protection of the conductors.

MIKEL, J.: The flexible cord described in P.551.47(P)(2) is equivalent to the power cords utilized in manufactured homes, recreational vehicles and park trailers. HUD, state and local authorities have for many years permitted these power cords to pass through floors and walls for connecting to the panel board. When done correctly, we are not aware of any incident attributable to this long standing practice.

We agree that the placement of this cord within the floor or wall cavity would not be in compliance with Section 400.8(2). With the two (2) feet limitation placed upon this practice, we believe that safety would not be sacrificed. As it has been previously stated, requirements in Article 551 can modify those in Chapters 1 through 4.

MILLER, T.: In the past several years, the industry has added expandable room sections at a rate that today, finds nearly 80% of all RV having expandable room sections. This includes all RV types including folding camping trailers, Class B motor homes (those built on van type chassis) and truck campers. Expandable room sections, room sections that move in and out of the main portion of the RV itself, often contain electrical systems, propane systems and plumbing systems.

The technology and approach to safely wiring these rooms have moved very quickly. With the conductors used for these rooms being equal to that of the power supply assembly, (ref 551.47(P)(2)) allowing the cord to pass through walls and floors has been permitted by all AHJ, including state agencies. For a time, the cords were installed within walls and floors for short distances permitting flexible cord conductors to be connected with the minimum number of connections. This practice was proposed as an acceptable use in the 2005 NEC, but was rejected because of the prohibitions of Article 400. In an attempt to assist industry, the cord was permitted within the exterior wall, providing it was installed inside a conduit. It is industry's intention that no additional protection is provided beyond what is inherently provided by the wall or floor particularly to a cord that is listed for hard usage and for wet locations.

The 2008 proposal to allow cord inside the wall without conduit was again rejected. In addition, other wiring methods acceptable under the NEC, such as following the permitted practice of running the cord through walls and floors as stated in 551.47(P)(2), was also rejected. Now, the NEC ONLY allows the use of the flex cord inside a conduit, inside the wall as the direct wiring method.

Article 551 exists to allow exceptions to the base requirements of Chapters 1 through 4. Addressing the general use of flexible cords addressed in Article 400 cannot take every possible usage into account, but general rules nevertheless have been established.

Wiring the expandable room is an area that needs exceptions permitted within Article 551.

We do not expect the panel to reverse its position during the letter ballot process. Instead, a new, revised proposal, in the form of a comment, will be submitted to address the direct wiring of expandable rooms. It is our hope that extensive consideration be given to this topic as there is a need to reduce the connections of the conductors while providing the protection of the conductors.

19-88 Log #2310 NEC-P19 **Final Action: Accept in Principle**
(551.47(R)(1))

TCC Action: The Technical Correlating Committee directs that the meeting action text be revised as follows to comply with the NEC Style Manual:

"Where the generator provides overcurrent protection for the conductors, additional overcurrent protection shall not be required."

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA

Recommendation: Revise text to read as follows:

(1) Circuit conductors shall be appropriately sized in relation to the anticipated load . ~~and shall be protected by an overcurrent device in accordance with their ampacities.~~

Substantiation: RV Generator Listing Standards ANSI/EGS-1 and UL 1484, require overcurrent protection to be on the generators for supply conductors. Installation of additional circuit breakers for generator preps is unnecessary because of this listing standard requirements.

Panel Meeting Action: Accept in Principle

In the existing Code, add a new sentence at the end of the existing requirement of 551.47(R)(1) to read as follows:

"Where the generator provides overcurrent protection for the conductors, additional overcurrent protection is not required."

Panel Statement: The panel agrees with the intent of the proposal, however, chooses to retain the requirement for overcurrent protection when the generator is installed.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

LICHTENSTEIN, T.: The RV generator Listing standards ANSI/RVIA EGS-1 2003, Engine Generator Sets for Recreational Vehicle Safety Requirements and UL 1248, the Standard for Safety for Engine Generator Assemblies for use in Recreational Vehicles require suitable overcurrent protection to protect the generator and conductors to the junction box for connection to the load. This overcurrent protection is intended to protect the generator and generator wiring only. These overcurrent devices when required are not intended to provide overcurrent protection to the wiring in the recreational vehicle and should not be relied upon to remove overcurrent protection requirements for circuit conductors in the recreational vehicle from the Code. See excerpt from the RV generator standards detailed below.

UL1248

14 Generator Protection

14.1 The generator and field conductors to the junction box for connection to the load shall be protected by an appropriately rated overcurrent protective device, except that this overcurrent protection need not be provided for generators having a collapsible field or other built-in overcurrent protection if field conductors are adequately sized for the maximum sustained current available. See Overload Test, Section 30.

ANSI/RVIA EGS-1

5.12 Overload or Short Circuit Protection.

5.12.1 The generator and feeder conductors to the junction box for connection to the load shall be protected by an appropriately rated overcurrent protective device, except that this overcurrent protection need not be provided for generators having a collapsible field or other built-in overcurrent protection if feeder conductors are sized for the maximum sustained current available.

ZIEMAN, M.: I change my vote to Negative. If I understand this matter correctly, I concur with the concerns raised in the other Explanation of Negative Vote.

A further concern: The code addresses "conductors appropriately sized in relation to the anticipated load." What if a generator larger than originally anticipated is installed? If no overcurrent protection is provided, would this not result in a potentially hazardous condition?

19-88a Log #CP1902 NEC-P19 **Final Action: Accept**
(551.47(R)(4))

Submitter: Code-Making Panel 19,

Recommendation: In the existing Code, 551.47(R)(4), revise the two labels as follows:

ONLY INSTALL A GENERATOR LISTED SPECIFICALLY FOR RV USE
GENERATOR CIRCUIT. THIS CONNECTION IS FOR GENERATORS RATED 110-125-VOLT AC, 60 HZ,________AMPERES MAXIMUM.

Or

ONLY INSTALL A GENERATOR LISTED SPECIFICALLY FOR RV USE
GENERATOR CIRCUIT. THIS CONNECTION IS FOR GENERATORS RATED 120/240-VOLT AC, 60 HZ,________AMPERES MAXIMUM.

Substantiation: Adding the suggested language provides added guidance to the installer of the generator in RVs where the RV manufacturer has pre-wired the RV for the future installation of a generator set.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-89 Log #2311 NEC-P19 **Final Action: Accept**
(551.47(S) (New))

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Add text to read as follows:
(S) Prewiring for Other Circuits
Prewiring installed for the purpose of installing other appliances or devices shall conform to the applicable portions of this article and the following:
(1) An overcurrent protection device with a rating compatible with the circuit conductors shall be installed in the distribution panelboard with wiring connections completed.
(2) The load end of the circuit shall terminate in a junction box with a blank cover or a device listed for the purpose. Where a junction box with blank cover is used, the free ends of the conductors shall be adequately capped or tapped.
(3) A label conforming to 551.46(D) shall be placed on or adjacent to the junction box or device listed for the purpose and shall read:
This connection is for ______ rated ______ Volt AC, 60Hz, amperes maximum. Do not exceed circuit rating.
An ampere rating compatible with the device shall be legibly marked in the blank space.
Substantiation: This requirement adds safety if additional circuits for future appliances are installed. Currently, these circuits are often not connected to circuit breakers or installed in a junction box at the load end.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
ZIEMAN, M.: The wording of the label proposed at new 551.47(S)(3) does not make sense. See 550.20(B) for a label for a similar application with wording which does make sense.

19-90 Log #1615 NEC-P19 **Final Action: Accept**
(551.54(C))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 551.54(C):
Change "neutral" to "grounded conductor." Delete "(neutral)"
The revised text would appear as follows:
(C) Insulated ~~Neutral~~ Grounded Conductor . The grounded circuit conductor ~~(neutral)~~ shall be insulated from the equipment grounding conductors and from equipment enclosures and other grounded parts. The grounded ~~(neutral)~~ circuit conductor terminals in the distribution panelboard and in ranges, clothes dryers, counter-mounted cooking units, and wall-mounted ovens shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panelboard or in appliances shall be removed and discarded. Connection of electric ranges and electric clothes dryers utilizing a grounded ~~(neutral)~~ conductor, if cord-connected, shall be made with 4-conductor cord and 3-pole, 4-wire grounding-type plug caps and receptacles.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.
This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals
● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.
● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.
Additional information is available in the Task Group report.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-91 Log #1043 NEC-P19 **Final Action: Reject**
(551.55(D) and (E))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
(D) A connection between the one or more equipment grounding or bonding conductors brought into a nonmetallic ~~box~~ enclosure shall be so arranged that a connection can be made to any ~~fitting or device~~ equipment supported by or supplied from the enclosure that ~~requires grounding~~ is to be grounded or bonded .
(E) Where more than one equipment grounding or bonding conductor enters ~~a box~~ an enclosure all such conductors shall be in good electrical contact with each other, and the arrangement shall be that the disconnection or removal of ~~a receptacle, luminaire (fixture), or other device~~ any equipment supported by, or supplied from the enclosure will not interfere with or interrupt the grounding or bonding continuity.
Substantiation: Edit. Bonding conductors and enclosures other than boxes should be included. "Equipment" includes more than fittings or devices; proposal includes equipment supplied from the enclosure, but not in the enclosure. The rule should apply where grounding or bonding is done by choice, but not required. 250.1(1) indicates Article 250 applies to equipment "permitted" to be grounded.
Panel Meeting Action: Reject
Panel Statement: The definition in Article 100 for "Enclosure" does not pertain to boxes, cabinets or conduit bodies. A "box" pertains only to products described in Article 314. (See 19-85).
Adding the terms "and bonding" throughout 551.55 creates language that is not consistent with other Articles of the Code and does nothing to improve clarity of the section.
The requirement in 250.1(1) does apply here where grounding or bonding is done by choice.
No substantiation is given to include equipment other than fittings and devices.
In 551.55(D), "equipment supported by or supplied from the enclosure" is unnecessary language. The present language includes "any device or fitting in that box that requires grounding."
In 551.55(E), any device in the box is also fed from the box.
As for the submitter's last two sentences, it is unclear what part of 551.55(D)and(E) are being discussed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-92 Log #2312 NEC-P19 **Final Action: Accept**
(551.60)

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Add text to the first sentence as follows:
Each recreational vehicle designed with a 120-volt or a 120/240-volt electrical system shall withstand the applied potential without electrical breakdown of a 1-minute, 900-volt AC or 1280 Volt DC dielectric strength test, or a 1-second, 1080 volt AC or 1530 volt DC dielectric strength test, with all switches closed between ungrounded and grounded conductors and the recreational vehicles ground.
Substantiation: DC dielectric test equipment is capable of testing AC circuits without disconnecting electric equipment before applying dielectric test voltage. This test equipment provides a safer test for workers in the area of a dielectric test because electrical equipment does not have to be disconnected and reconnected. This additional language provides a code reference allowing the use of this equipment.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-93 Log #2313 NEC-P19 **Final Action: Accept**
(551.60(4) (New))

Submitter: Kent Perkins, Recreation Vehicle Industry Association / Rep. RVIA
Recommendation: Add text to read as follows:
(4) GFCI test to demonstrate that the ground fault protection device(s) installed on the recreational vehicle are operating properly.
Substantiation: Currently, there is no requirement to assure that the GFCI protection device(s) is functioning properly.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-94 Log #1139 NEC-P19 **Final Action: Reject**
(Table 551.73)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
DEMAND FACTORS FOR SITE FEEDERS AND SERVICE- ~~ENTRANCE~~ CONDUCTORS

Substantiation: Edit. The FPN for the definition of service-entrance conductors, underground system indicates there may be no service-entrance conductors.
Panel Meeting Action: Reject
Panel Statement: Based on definitions in Article 100, all service-entrance conductors are service conductors. Inclusion of the word "entrance" in the title is not incorrect and it does not create confusion. Removal of the word "entrance" does not to add clarity to applicability of the table.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-95 Log #1131 NEC-P19 **Final Action: Accept in Principle in Part (551.73(A) and (C))**

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Electrical services and feeders shall be calculated on the basis of not less than 9600 volt-amperes per site equipped with 50 ampere 120/208 volt or 120/240 volt supply facilities...(remainder unchanged).
The demand factors set forth in Table 551.73 shall be the minimum allowable demand factor that shall be permitted for calculating load for services and feeders. Where the electrical supply for a recreational vehicle site has more than one receptacle supplied by the same feeder the calculated load shall ~~only be calculated for~~ be permitted to be determined by the highest ampere rated receptacle.
Where the electrical is in a location that serves two recreational vehicles, the equipment for both sites ~~must~~ shall comply with 551.77 and the calculated load shall ~~only~~ be ~~computed for~~ permitted to be determined by the receptacle with the highest ampere rating.
Add to (C): Where the demand factors of Table 551.73 are applied the demand factors specified in 220.61(B) shall not be permitted.
Substantiation: Edit. Some recreational vehicle parks may have a 120/208 volt 3-phase service (see 551.40(A). Present wording prohibits a load calculation higher than the minimum required, which should be an option. "Highest rated" is not specific; is it volts, amperes, or volt-amperes? There is no apparent prohibition of use of demand factors in Table 551.73 and 220.6(B) which if applied could result in an undersized neutral.
Panel Meeting Action: Accept in Principle in Part
The panel Accepts in Principle"120/208 volt or", however, it revises it to read as follows:
"208Y/120-volt or".
The panel Accepts use of the word "shall" rather than the word "must."
The remainder of the Proposal is Rejected.
Panel Statement: The revision to "208/120-volt or" and "shall" is editorial in nature and correlates with language used elsewhere in the Code.
When the load is calculated for two RVs in the same location, the calculated load must include the two largest receptacles at that location.
The panel rejects additional language to 551.73(C) because 551.73(A) clarifies that the demand factors set forth in Table 551.73 shall be the minimum allowable demand factors permitted.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
WEAKLEY, K.: See my explanation of negative vote on Proposal 19-74.

19-96 Log #1187 NEC-P19 **Final Action: Accept in Principle in Part (551.73(A) and (C))**

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Electrical services and feeders shall be calculated on the basis of not less than 9600 volt-amperes per site equipped with 50 ampere 120/208 volt or 120/240 volt supply facilities...(remainder unchanged) The demand factors set forth in Table 551.73 shall be the minimum allowable demand factor that shall be permitted for calculating load for services and feeders. Where the electrical supply for a recreational vehicle site has more than one receptacle supplied by the same feeder the calculated load shall only ~~be calculated fo~~ r be permitted to be determined by the highest ampere rated receptacle.
Where the electrical is in a location that serves two recreational vehicles, the equipment for both sites shall comply with 551.77 and the calculated load shall ~~only~~ be ~~computed for~~ permitted to be determined by the receptacle with the highest ampere rating.
Add to (C): Where the demand factors of Table 551.73 are applied the demand factors specified in 220.61(B) shall not be permitted.
Substantiation: Edit. Some recreational vehicle parks may have a 120/208 volt 3-phase service (see 551.40(A)). Present wording prohibits a load calculation higher than the minimum required, which should be an option. "Highest rated" is not specific; is it volts, amperes, or volt-amperes? There is no apparent prohibition of use of demand factors in Table 551.73 and 220.6(B) which if applied could result in an undersized neutral.
Panel Meeting Action: Accept in Principle in Part
Panel Statement: See the panel action and statement on Proposal 19-95.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
WEAKLEY, K.: See my explanation of negative vote on Proposal 19-74.

19-97 Log #1104 NEC-P19 **Final Action: Accept in Principle in Part (551.73(D) and Exception (New))**

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Recreational vehicle site feeder conductors shall have ~~adequate~~ an ampacity ~~for~~ not less than the calculated loads supplied and shall be rated not less than 30 amperes. The ~~grounded~~ neutral conductors shall have ~~the same~~ an ampacity not less than the ungrounded conductors.
Exception: (no change).
Loads for other amenities such as, but not limited to, service buildings, recreational buildings, and swimming pools, shall be ~~sized~~ calculated separately, and then be added to the value calculated for the recreational vehicle sites where they are all supplied by ~~one~~ a common service.
Exception: A reduction in neutral ampacity shall be permitted in accordance with 220.22 for that portion of the calculated load permanently connected line-to-line to each ungrounded conductor, provided the demand factors in Table 551.73 have not been applied.
Substantiation: Edit. "Adequate" is to be avoided per Style Manual. Present wording does not permit a grounded conductor to have an ampacity greater than the ungrounded conductors. The phrase "not less than" is preferred terminology. "Calculated" is preferable to "sized" relating to ampacity. "One" service can be inferred as one (separate) service for each amenity listed. There doesn't seem to be a safety reason to not permit a reduction in neutral ampacity for permanently connected line-to-line loads (no neutral) associated with the "amenities".
Panel Meeting Action: Accept in Principle in Part
The panel accepts in principle the first and second sentence of the proposed wording to read as follows:
"Recreational vehicle site feeder-circuit conductors shall have an ampacity not less than the loads supplied and shall be rated not less than 30 amperes. The neutral conductors shall have an ampacity not less than the ungrounded conductors."
The panel accepts the changes submitted for the paragraph following Table 551.73, but rejects the proposed exception.
Panel Statement: The recommended language provides clearer sentence structure by removing "calculated" and "shall be rated."
The panel notes, there is no exception, only a fine print note.
Article 551 provides guidelines for load calculations in RV parks. Requirements in Article 551 modify those in Article 220. Article 220 is not applicable to 551.73. Any permitted reductions are given in Table 551.73.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-98 Log #1135 NEC-P19 **Final Action: Reject (551.75)**

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
All ~~electrical equipment and installation for vehicle parks~~ exposed noncurrent-carrying metal parts shall be grounded as required by 250.10 ~~Article 250~~ .**Substantiation:** Edit. Electrical equipment includes such devices as fuses, circuit berakers, and other parts which are energized. 250.10 is more comprehensive and has exceptions which should be applicable.
Panel Meeting Action: Reject
Panel Statement: The recommended wording "All exposed noncurrent-carrying metal parts shall be grounded..." would indicate metal railings, fences, mail boxes and any other 'metal part' would need to be grounded. The submitter wants it grounded as in 250.10, but 250.10 is titled Protection of Ground Clamps and Fittings.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-99 Log #1621 NEC-P19 **Final Action: Reject (551.75 & 551.76, FPN)**

Submitter: John Powell, Independence, OR
Recommendation: Add new text as follows:
551.75 FPN: The use of a grounding electrode as provided in Article 250, Section 250.52, shall not be required for RV pedestals that are supplied by a common feeder.
Substantiation: The definition of structure in Article 100 and current requirement of 551.75, lead to the conclusion that RV pedestals that comply with 551.71, are to be treated as separate structures and therefore require grounding electrodes per 250.32. If this is truly the intent of the code making body, clarification of the requirement is needed. 551.76 seems to contradict 551.75.

Panel Meeting Action: Reject
Panel Statement: The panel agrees with the Submitter's conclusion that RV pedestals are to be treated as separate structures, and, therefore, require grounding electrodes per 250.32. 250.4(A)(1) provides the reasons for the use of a grounding electrode at each structure.
The addition of the FPN would conflict with the present requirements of the Article.
Section 551.76 restates some of the basic grounding requirements for clarification purposes. It also specifies that the exceptions in Article 250 for load side grounding or neutral connection to the equipment grounding conductor are not permitted in RV parks. This does not appear to be in conflict with 551.75.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-100 Log #1132 NEC-P19 **Final Action: Accept**
(551.76(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "continuous" in the first sentence.
Substantiation: "Continuous" in many code context means unbroken; the last sentence permits splicing. Proposal removes ambiguity.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-101 Log #1084 NEC-P19 **Final Action: Accept**
(551.76(C) and (D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "neutral" to "grounded" in the heading and text.
Substantiation: Edit. Sites equipped with only a 20 ampere 125-volt receptacle may be supplied by a 2-wire circuit without a "neutral". This section should also apply in that case.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-102 Log #2413 NEC-P19 **Final Action: Accept**
(551.76(D))

TCC Action: It was the action of the Technical Correlating Committee that the proposal be reconsidered and the panel consider correlating with the Code-Making Panel 5 action on Proposal 5-119 relative to an exception for existing installations. This action will be considered by the panel as a public comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Revise text to read:
551.76 Grounding – Recreational Vehicle Site Supply Equipment.
(A) Exposed Non-Current-Carrying Metal Parts. Exposed non-current-carrying metal parts of fixed equipment, metal boxes, cabinets, and fittings that are not electrically connected to grounded equipment shall be grounded by a continuous equipment grounding conductor run with the circuit conductors from the service equipment or from the transformer of a secondary distribution system. Equipment grounding conductors shall be sized in accordance with 250.122 and shall be permitted to be spliced by listed means.
The arrangement of equipment grounding connections shall be such that the disconnection or removal of a receptacle or other device will not interfere with, or interrupt, the grounding continuity.
(B) Secondary Distribution System. Each secondary distribution system shall be grounded at the transformer.
(C) Neutral Conductor Not to Be Used as an Equipment Ground. The neutral conductor shall not be used as an equipment ground for recreational vehicles or equipment within the recreational vehicle park.
(D) No Connection on the Load Side. No connection to a grounding electrode shall be made to the neutral conductor on the load side of the service disconnecting means except as covered in 250.30(A) for separately derived systems. ~~and 250.32(B)(2) for separate buildings.~~
Substantiation: This is a companion proposal to my proposal to delete 250.32(B)(2). If 250.32(B)(2) is deleted as I am requesting, this section will need to be revised as well.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-103 Log #943 NEC-P19 **Final Action: Accept in Part**
(551.78(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:
All switches, circuit breakers receptacles, ~~control~~ <u>electrical</u> equpment and metering devices located in wet locations ~~or outside of a building~~ shall be ~~rainproof~~ <u>weatherproof</u> ~~equipment~~ .
Substantiation: Edit. Equipment should not be limited to control type. "Weatherproof" is more encompassing. The FPN to the definition of weatherproof indicates rainproof is suitable where snow, ice, dust, or temperature extremes are NOT a problem. All locations outside of a building are not wet locations. Present wording doesn't include structures which are not "buildings."
Panel Meeting Action: Accept in Part
The panel Rejects replacing "control equipment" with "electrical equipment", and Accepts the remainder of proposal.
Panel Statement: The term "electrical equipment" would expand the requirement beyond that which is intended by this section.
The definition of "weatherproof" adequately addresses the deletion of the term "rainproof equipment" in accordance with the definition in Article 100.
The deletion of "outside of a building" is acceptable as the section title is evident to this location.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-104 Log #3435 NEC-P19 **Final Action: Reject**
(551.79)

Submitter: Aaron Richter, Saranac, MI
Recommendation: Revise text to read:
Clearance for Overhead Conductors. Open conductors of not over 600 volts, ~~nominal,~~ <u>measured from phase to ground</u> .
Substantiation: What is nominal? Nominal is mentioned all over the code and yet there is no definition for it. Therefore, I am suggesting that we change the wording so we know how the 600 volts is to be measured.
Panel Meeting Action: Reject
Panel Statement: The current language parallels language used in other sections of the code such as 230.24 for services and 215.18 and 215.19 for feeders.
"Voltage, nominal" is defined in Article 100.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-105 Log #1934 NEC-P19 **Final Action: Accept**
(551.80(B))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 8 for comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise 551.80(B) as follows:
(B) Protection Against Physical Damage. Direct-buried conductors and cables entering or leaving a trench shall be protected by rigid metal conduit, intermediate metal conduit, electrical metallic tubing with supplementary corrosion protection, rigid nonmetallic conduit, liquid tight flexible nonmetallic conduit, liquid tight flexible metal conduit, or other approved raceways or enclosures. Where subject to physical damage, the conductors or cables shall be protected by rigid metal conduit, intermediate metal conduit, or Schedule 80 rigid ~~nonmetallic~~ <u>PVC</u> conduit. All such protection shall extend at least 450 mm (18 in.) into the trench from finished grade.
Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC Conduit. It clarifies that rigid polyvinyl chloride conduit is designated as Type PVC, rather than the broader designation of rigid nonmetallic conduit (Type RNC) which includes PVC, HDPE and RTRC. It will also result in consistent terminology for this product throughout the code.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 552 — PARK TRAILERS

19-105a Log #CP1900 NEC-P19 **Final Action: Accept**
(552.44(D))

Submitter: Code-Making Panel 19,
Recommendation: Make the following revision to 552.44(D)
"THIS CONNECTION IS FOR <u>208Y/120-VOLT OR</u> 120/240-VOLT AC, 3-POLE, 4-WIRE, 60 HZ, ______ AMPERE SUPPLY.
The correct ampere rating shall be marked in the blank space."
Substantiation: The revision was made to correlate with the changes made in Proposal 19-74.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
WEAKLEY, K.: See my explanation of negative vote on Proposal 19-74.

19-106 Log #1508 NEC-P19 **Final Action: Accept in Principle**
(552.10(C)(4))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence:
In the event where the ~~power~~ unbonded lead from the battery exceeds 8 AWG the bonding conductor shall be of an equal or greater larger size.
Substantiation: Edit. All leads supply power. The bonding conductor should be permitted to be a larger size, not limited to equal.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
"In the event the unbonded lead from the battery exceeds 8 AWG, the bonding conductor size shall be not less than that of the unbonded lead."
Panel Statement: The new language maintains the intent of the change while using the types of wording recommended in 3.2.2 of the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-106a Log #CP1901 NEC-P19 **Final Action: Accept**
(552.47)

Submitter: Code-Making Panel 19,
Recommendation: Make the following revisions to 552.47 Calculations to read as follows:
"The following method shall be employed in computing the supply-cord and distribution-panelboard load for each feeder assembly for each park trailer in lieu of the procedure shown in Article 220 and shall be based on a 3-wire, 208Y/120-volt or 120/240-volt supply with 120-volt loads balanced between the two phases of the 3-wire system."

Substantiation: The revision was made to correlate with the changes made in Proposal 19-74.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
WEAKLEY, K.: See my explanation of negative vote on Proposal 19-74.

19-107 Log #1547 NEC-P19 **Final Action: Accept in Principle**
(552.48(L))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to the Technical Correlating Committee Grounding and Bonding Task Group for comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 552 and revise text as shown for the affected NEC sections.
552.48(L): (L) Metal Faceplates Effectively Grounded. Where metal faceplates are used, they shall be grounded by contact with the grounded mounting strap of the device ~~effectively grounded~~ .
Substantiation: 552.48(L): The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." This section has been revised to prescribe the connection of the faceplate to the equipment grounding conductor by contact with the device mounting strap connected to the equipment grounding conductor.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.
The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.
The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."
The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.
This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.
The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read:
"552.48(L) Metal Faceplates Grounded. Where metal faceplates are used, they shall be grounded."
Panel Statement: This is identical to the language used in 406.5(B). There is no need to be more prescriptive as to the method of grounding.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-108 Log #1045 NEC-P19 **Final Action: Accept**
(552.48(M))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add "or Type MI cable" after "rigid nonmetallic conduit".
Substantiation: Type MI cable is a suitable wiring method and permitted by 552.48(A) and 551.47(A), and noted in 552.56(C). It is resistant to damage and corrosion, and not restricted to number of bends (which may require pull points), proposal clarifies that it is a cable identified for the application. It is permitted for mobile homes by the exception for 550.15(H).
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-109 Log #951 NEC-P19 **Final Action: Accept in Part**
(552.54(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Outdoor luminaires (fixtures) and other utilization equipment shall be listed for outdoor use or wet locations.
Substantiation: Edit. "Other equipment" is not specific and includes wiring methods covered in 552.48(M) which are not specifically listed for "outdoor" use. Outdoor fixtures are generally listed for wet locations.
Panel Meeting Action: Accept in Part
The panel Rejects changing "other equipment" to "other utilization equipment".
The panel Accepts in Principle adding "wet locations". The revised wording will now read as follows:
"Outdoor luminaires (fixtures) and other equipment shall be listed for outdoor use or wet locations."
Panel Statement: The deletion of the term utilization would expand the requirement beyond that which is intended by this section.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

19-110 Log #1616 NEC-P19 **Final Action: Accept**
(552.55(C))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 552.55(C):
Change "neutral" to "grounded conductor." Delete "(neutral)"
The revised text would appear as follows:
(C) Insulated ~~Neutral~~ Grounded Conductor . The grounded circuit conductor ~~(neutral)~~ shall be insulated from the equipment grounding conductors and from equipment enclosures and other grounded parts. The grounded ~~(neutral)~~ circuit conductor terminals in the distribution panelboard and in ranges, clothes dryers, counter-mounted cooking units, and wall-mounted ovens shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panelboard or in appliances shall be removed and discarded. Connection of electric ranges and electric clothes dryers utilizing a grounded ~~(neutral)~~ conductor, if cord-connected, shall be made with 4-conductor cord and 3-pole, 4-wire, grounding-type plug caps and receptacles.
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).
The Task Group has proposed the following definitions to be added to Article 100:
● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

19-111 Log #1159 NEC-P19 **Final Action: Accept in Principle in Part**
(552.56(B), (C), (D), and (E))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete present text of (B) and substitute:

EQUIPMENT GROUNDING and BONDING CONDUCTORS. Equipment grounding and bonding conductors shall comply with 250.119 and other applicable provisions of this code.

Revise (C):

GROUNDING and BONDING ~~of ELECTRICAL EQUIPMENT~~ Where grounding or bonding ~~of electrical equipment~~ is done ~~specified~~ it shall be permitted as follows:

(1) Connection of metal raceway approved for grounding (~~conduit or electrical metallic tubing~~), the sheath of Type MI ~~MC~~ cable, and Type MC cable where the ~~sheath~~ covering is identified for grounding or the armor of Type AC cable, to metal enclosures.

(2) A connection between ~~the one or more~~ wire type grounding or bonding conductor s by means of a grounding screw which shall be used for no other purpose, or a listed grounding device. Sheet metal screws shall not be used for this purpose . The equipment grounding conductor ~~in nonmetallic sheathed cable~~ shall be permitted to be secured under a screw threaded into the luminaire (fixture) canopy, other than a mounting screw or cover screw, or shall be attached to a listed grounding means (plate) in a nonmetallic outlet box for luminaire (fixture) mounting... Sheet metal screws shall not be used for this purpose.

(3) The equipment grounding conductor in ~~nonmetallic sheathed cable~~ shall be permitted to be secured under a screw threaded into the luminaire (fixture) canopy, other than a mounting screw or cover screws, or shall be attached to a listed grounding means (plate) in a nonmetallic box for luminaire (fixture) mounting. Sheet metal screws shall not be used for this purpose . (~~grounding means shall also be permitted for luminaire (fixture) attachment screws.)~~

Revise (D):

GROUNDING CONNECTION in NONMETALLIC ENCLOSURE ~~BOX~~ A connection between the ~~one or more~~ grounding or bonding conductors brought into a nonmetallic enclosure ~~outlet box~~ shall be arranged so that a connection can be made to any ~~fitting or device~~ equipment ~~in~~ supported by, or supplied from the enclosure ~~required~~ that is to be grounded.

Revise (E):

GROUNDING and BONDING CONTINUITY. Where more than one equipment grounding or bonding conductor of a branch circuit enters ~~a box~~ an enclosure all such conductors shall be in good electrical contact with each other, and the arrangement shall be such that the disconnection or removal of ~~a receptacle, fixture, including a luminaire or other device~~ equipment supported by the enclosure or supplied from the enclosure ~~box~~ , will not interfere with, or disrupt the grounding or bonding continuity.

Substantiation: Edit. Bonding should also be covered and not limited to electrical equipment (see 552.47). The requirements should apply where grounding and bonding are done by choice and not required. 250.1 indicates Article 250 covers equipment permitted to be grounded. In (C)(3), wiring methods other than NMSC as permitted in 552.48(A) should be included. In (C)(1), metal raceways other than conduit and EMT are permitted for grounding. Sheet metal screws should be excluded for grounding. The proposal for (D) is more comprehensive. In (B), wires are only green when corroded, covering is usually what may be green.

Panel Meeting Action: Accept in Principle in Part

The Panel Accepts in Principle the wording in the proposal revised to read as follows:

"552.56(B) Equipment Grounding Conductors. Bare conductors or conductors with insulation or individual covering that is green or green with one or more yellow stripes shall be used for equipment grounding conductors only."

The panel Rejects the remainder of the proposed changes.

Panel Statement: The panel agrees with the submitter that the wires are not green or green wires with a yellow stripe(s) (552.56(B)), but prefers language parallel to similar Code sections as recommended by 3.3.5 in the NEC Style Manual.

Adding the terms "and bonding" throughout 552.56 creates language that is not consistent with other articles of the code and does nothing to improve clarity of the section. In addition, 552.47 in no way limits bonding to electrical equipment, as the submitter suggests.

The language referring to 250.119 and the language restricting use of sheet metal screws already applies unless modified in Article 552 as per 90.3.

Addition of the words "approved for grounding" in 552.56(C)(1) is redundant and does not improve clarity of the section.

The remainder of the changes in 552.56(C)(1) and those in 552.56(C)(2) and 552.56(E) are unsubstantiated.

"More comprehensive" language is not a technical substantiation to warrant the changes in 552.56(D).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

19-112 Log #599 NEC-P19 **Final Action: Reject**
(552.60(B))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Joel Creek, Skyline Corporation

Recommendation: Revise text to read as follows:

(B) Low-Voltage Circuits. ~~Low-voltage circuit conductors in each park trailer shall withstand the applied potential without electrical breakdown of a 1 minute, 500 volt or a 1 second, 600 volt dielectric strength test. The potential shall be applied between the ungrounded and grounded conductors.~~

~~The test shall be permitted on running light circuits before the lights are installed, provided the unit's outer covering and cabinetry have secured. The braking circuit shall be permitted to be tested before being connected to the brakes, provided the wiring has been completely secured.~~

An operational test of low-voltage circuits shall be conducted to demonstrate that all equipment is connected and in electrical working order. This test shall be performed in the final stages of production after all outer coverings and cabinetry have been secured.

Substantiation: The low-voltage testing requirement for recreational vehicles and park trailers are not consistent with each other. Recreational vehicles require an operational test of all low-voltage circuits per 8-1 of the ANSI/RVIA 12V 2005 edition and park trailers require a dielectric test of low-voltage circuit conductors per 552.60(B) of NFPA 70 2005 edition. The low-voltage dielectric test requirement for recreational vehicles was removed and replaced with an operational test in 551.60(B) in the 2002 edition of NFPA 70 but the low-voltage dielectric test was not removed and replaced with an operational test in 552.60(B).

Panel Meeting Action: Reject

Panel Statement: While the panel is sympathetic to the submitter's desire for consistent requirements, the proposal is too broad and does not represent the same prescriptive detail to ensure consistency and repeatability of the test method.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 7 Negative: 5

Explanation of Negative:

FINCH, J.: The proposal submitted by Joel Creek would make the testing procedure of low voltage systems for Park Trailer consistent with the testing procedure for recreational vehicles. The testing procedure for Recreational Vehicles was changed in the NEC 1999 to the wording that was used by Mr. Creek and that method was used through the NEC 2002 cycle (6 years).

Article 552 Park Trailers was added to the NEC in 1996. Until that time, Park Trailers fell under the jurisdiction of Article 551. Article 552 was modeled after Article 551 when it was written into the National Electrical Code. Why the wording for low voltage testing in Article 552 was not changed in 1999 to be consistent with Article 551, I do not know.

In the NEC 2005, 551.60(B) was removed from the National Electrical Code and it was deferred to the "ANSI/RVIA Standard for Low Voltage Systems in Conversion and Recreational Vehicles." The wording, in this document, for low voltage testing, 8-1 Operational Test, is as follows:

8-1 Operational Test. An operational test of all low voltage circuits shall be conducted to demonstrate that all equipment is connected and in electrical working order. This test shall be performed after all production activities that may damage conductors such as installation of fasteners or hole cutting, have been completed.

This is consistent with the wording of 551.60(B) in the NEC 1999 and NEC 2002 which is the wording used in Mr. Creek's proposal.

There are manufacturers who build both Recreational Vehicles and Park Trailers and to require these manufacturers to use different tests for similar products is inconsistent and confusing. I would ask members of Panel 19 to reconsider Proposal 19-112 and accept it.

HOPKINS, B.: This proposal should be accepted considering the proposed change is identical to the language approved by CMP-19 for recreational vehicles, 551.60(B) in the 1999 edition of the NEC. (Ref. 19-117-log #660, page 50 of the A98 ROP). The change was permitted on the bases that many of the low-voltage DC components must be removed from the system prior to testing to prevent component damage. Further, this test is not required by the automotive manufacturers, or in housing for the 120-volt systems. Additionally, the small number of faults that are detectable by high potential testing in reality cause no safety threat. High potential testing can only detect faults that may occur, but may never manifest themselves. If they do, there is the required over current protection in place for protection.

Additionally, the Panel statement indicates that this proposal is too broad and does not represent the same prescriptive detail to ensure consistency and repeatability of the test method. This requirement covers and “operational test” that means it is strictly a test to demonstrate if all equipment is in working order. In other words, the test is to determine if everything is operational, which should address the concern of “consistency and repeatability.” In addressing this change for RVs under the 1999 NEC, CMP-19 referenced the language of 550-12(b)(2) [now 550.17(B)(2)].

There are many recreational vehicle manufacturers who also build park trailers and they should not be required to conduct two different tests on 12 volts systems that are virtually the same.

MIKEL, J.: This proposal should be accepted. The exact wording for this proposal was contained within 551.60(B) of the 1999 and 2002 editions of NFPA 70. The high-voltage conductor insulation resistance test was removed from earlier editions of the standard because many of the components of the 12 volt system had to be removed prior to testing to prevent damage. The 2005 edition of the NEC removed the low-voltage requirements for recreational vehicles and replaced them by referencing ANSI/RVIA 12V-2005 which specifies an operational test rather than a dielectric test.

We cannot agree with the panel statement that “The proposal is too broad and does not represent the same prescriptive detail to ensure consistency and repeatability of the test method”. We believe that an “operational test” is very simple and should need no additional definition or explanation. It is as simple as turning it off or on and determining whether it performs as intended.

MILLER, T.: This proposal should be accepted considering the proposed change is identical to the language approved by CMP-19 for recreational vehicles, Section 551.60(B) in the 1999 edition of the NEC (Ref. 19-117-Log #660, page 50 of the A98 ROP). The change was permitted on the bases that many of the low-voltage DC components must be removed from the system prior to testing to prevent component damage. Further, this test is not required by the automotive manufacturers, or in housing for the 120-volt systems. Additionally, the small number of faults that are detectable by high potential testing in reality cause no safety threat. High potential testing can only detect faults that may occur, but may never manifest themselves. If they do, there is the required overcurrent protection in place for protection.

Additionally, the panel statement indicates that this proposal is too broad and does not represent the same prescriptive detail to ensure consistency and repeatability of the test method. This requirement covers an “operational test” that means it is strictly a test to demonstrate if all equipment is in working order. In other words, the test is to determine if everything is operational, which should address the concern of “consistency and repeatability.” In addressing this change for RVs under the 1999 NEC, CMP 19 referenced the language of 550-12(b)(2) [now 550.17(B)(2)].

There are many recreational vehicle manufacturers who also build park trailers and they should not be required to conduct two different tests on 12 volts systems that are virtually the same.

ZIEMAN, M.: I change my vote to negative. As stated in the other four Explanations of Negative Vote, the original proposal should be accepted.

ARTICLE 553 — FLOATING BUILDINGS

19-113 Log #1074 NEC-P19 **Final Action: Reject**
(553.6)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:

Each floating building shall be supplied by not more than one set of feeder conductors from each of the services specified or permitted in 230.2 ~~its service equipment.~~

Substantiation: Edit “service equipment” is singular implying only one service. Large floating buildings such as casinos may have different classes of service.

Panel Meeting Action: Reject

Panel Statement: No technical substantiation has been provided to indicate a need for different classes of service in a floating building. The exception to 553.6 does allow for multiple services where the floating building has multiple occupancy. 553.6 intentionally modifies 230.2 providing a stricter requirement due to the nature of floating buildings.

Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-114 Log #961 NEC-P19 **Final Action: Accept**
(553.9)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal relative to its action on Proposal 19-115. This action will be considered by the Panel as a Public Comment.
Submitter: Daniel Leaf, Seneca, SC
Recommendation: In the last sentence change “circuit” to “conductor.”
Substantiation: Edit. Neutral circuit is not defined.
Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-115 Log #1617 NEC-P19 **Final Action: Accept**
(553.9)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal relative to its action on Proposal 19-114. This action will be considered by the Panel as a Public Comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 553.9:

Change “neutral” to “grounded conductor” in title. Delete “(neutral).” Replace “neutral” with “grounded” and add “conductor” in the last sentence.

The revised text would appear as follows:

553.9 Insulated ~~Neutral~~ Grounded Conductor . The grounded circuit conductor ~~(neutral)~~ shall be an insulated conductor identified in conformance with 200.6. The neutral conductor shall be connected to the equipment grounding terminal in the service equipment, and, except for that connection, it shall be insulated from the equipment grounding conductors, equipment enclosures, and all other grounded parts. The ~~neutral~~ grounded circuit conductor terminals in the panelboard and in ranges, clothes dryers, counter-mounted cooking units, and the like shall be insulated from the enclosures.

Substantiation: This proposal was developed by the TCC Task Group on the definition of “Neutral Conductor.” Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

- **Neutral conductor.** A circuit conductor connected to the neutral point of a system.
- **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

- The use of the word ”neutral” as a noun should be avoided. The terms “neutral conductor” or “neutral point” should be used wherever grammatically possible.
- The phrase “grounded circuit conductor (neutral)” should be avoided. The phrases “grounded circuit conductor” or “grounded circuit conductor or neutral conductor” should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

ARTICLE 555 — MARINAS AND BOATYARDS

19-116 Log #817 NEC-P19 **Final Action: Reject**
(555.1)

TCC Action: The Technical Correlating Committee directs the panel to reconsider the proposal at the public comment phase based on its technical merits. Although the Scope of NFPA 303 is limited to other than single family applications, there is no procedural reason why Code-Making Panel 19 cannot develop or apply electrical rules to single family applications if they desire to do so. This action will be considered by the panel as a public comment.
Submitter: Vincent Metallo, Sr., Baltimore County Government
Recommendation: Revise text to read as follows:

Private, noncommercial docking facilities constructed or occupied for the use of the owner or residents of the associated single family dwelling are (~~not~~) covered by (~~this article~~)

Private noncommercial docking facilities constructed or occupied for the use of the owners or residents of the associated single family dwelling are covered by (555.9, 555.13(A)(1), 555.15(A), (B), (C), (D), (E) and 555.19(B)(1)) .

Substantiation: There is a need for code requirements for single family dwellings at pier locations. These articles to be included in the proposal would add a needed level of safety for pier wiring and wiring methods. There are no height requirements for connections, receptacles, and wiring methods to ensure safety on piers. There have been several installations in our area that problems have occurred with corrosive connections and electrical problems. The level of safety exists out on piers whether the pier is for commercial or dwelling use. The change made to exclude these occupancies have created an enforcement problem.

Panel Meeting Action: Reject

Panel Statement: The scope of Article 555 is based on NFPA 303, which is written for other than single-family dwelling docks.

The panel recognizes that the Scope is established by the NEC Technical Correlating Committee.

The panel suggests that the Technical Correlating Committee refer this proposal to the NFPA 303 Technical Committee for comment.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-117 Log #134 NEC-P19 **Final Action: Accept in Principle**
(555.9)

Submitter: David Fecitt, P.E., Anchor Engineering Consultants, Inc. / Rep. Bellingham Marine Industries, Inc.

Recommendation: Revise as follows:

555.9 Electrical connections. All electrical connections shall be located at least 305 mm (12 in.) above the deck of a floating pier. All electrical connections shall be located at least 305 mm (12 in.) above the deck of a fixed pier but not below the electrical datum plane. <u>Wire-to-wire splices utilizing sealed, waterproof connections and insulation shall be acceptable for use in pullboxes located above the waterline but below the electrical datum field for engineered, concrete floating docks and piers.</u>

Substantiation: The use of sealed, waterproof wire-to-wire splices in wet locations is common practice and allowable under the NFPA 70 110.14 (B). The exclusion of utilizing wire-to-wire splices for engineered concrete floating docks is impractical in many instances and places undue hardship on the owner and installing contractor with no additional safety benefit. Corrosion and insulation degradation is not an issue if the splice is designed and installed for marine environments. By limiting the use of wire-to-wire splices to engineered concrete floating piers and docks, substandard wood and other nonengineered type floating docks would be excluded. Engineered concrete floating docks and piers are designed to respond to wave action that limits or eliminates water splashing on the deck and junction boxes located in the dock sections, even in storm conditions. They are typically not located in areas that would have high surf as that would damage the connection system and dock/pier.

Panel Meeting Action: Accept in Principle

Revise the proposed wording to read as follows:

"555.9 Electrical Connections. Electrical connections shall be located at least 305 mm (12 in.) above the deck of a floating pier.

Conductor splices, within Type 6P junction boxes, utilizing sealed wire connector systems listed for this application shall be permitted where located above the waterline, but below the electrical datum field for floating piers.

All electrical connections shall be located at least 305 mm (12 in.) above the deck of a fixed pier, but not below the electrical datum plane."

Panel Statement: The revised wording addresses the submitter's recommendations and more fully addresses the system components.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-118 Log #1100 NEC-P19 **Final Action: Reject**
(555.10(A) Exception (New))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete: "Independent of any conduit connecte to them."

Add:

Exception: Conduit bodies shall be permitted to be supported in accordance with 314.23(E), Exception.

Substantiation: Edit. "Substantially supported by structural members" makes the proposed to be deleted phrase superfluous. This section modifies 314.23(E) and since conduit bodies don't generally have external lugs or ears infers that holes must be drilled in them for internal screws.

Panel Meeting Action: Reject

Panel Statement: No technical substantiation has been provided to justify allowing conduit to support electrical equipment enclosures. A general installation as covered in 314.23(E) is not as likely to be subject to damage as are installations in marinas and boatyards. The Exception to 314.23(E) should not be allowed for these installations.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-119 Log #931 NEC-P19 **Final Action: Reject**
(555.12)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add:

<u>Where demand factors are applied there shall be no reduction of neutral ampacity as permitted in 220.22</u> .

Revise Note 1:

Where shore power accommodations provide two or more receptacles for an individual boat slip and these receptacles have different <u>ratings</u> ~~voltages (for example one 30 ampere, 125 volt and one 50 ampere 125/250 volt)~~ <u>and supplied from a common feeder or service,</u> only the receptacle with the largest ~~kilowatt~~ <u>volt-ampere load capacity</u> shall be required to be calculated.

Substantiation: Edit. There is no prohibition against use of Table 555.12 demand factors in conjunction with 220.22, which in essence allows a demand factor applied to a demand factor (neutral reduced ampacity). The exemption from load calculation should be predicated on receptacles being supplied by the same source. Where supplied by two or more services, this provision should not apply. There is no feasible way for an AHJ to determine the larger kilowatt demand without evaluating the equipment, load and power factor of the boat to be connected, which may be a transient vessel.

Panel Meeting Action: Reject

Panel Statement: The panel recognizes that 220.22 is the incorrect section (See action on Proposal 19-120).

The general requirement in 555.12 already specifies "for each service and/or feeder" so this language does not need to be repeated in the Notes.

The AHJ does not need to evaluate the equipment, load and power factor of the boat to determine which of two receptacles allows the larger kilowatt demand if performing the calculations based on Article 220.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-120 Log #1058 NEC-P19 **Final Action: Accept**
(555.12)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Insert "Part III" ahead of "Article 220".

Add: Where demand factors of Table 555.12 are applied, the demand factor specified in 220.61(B) shall not be permitted.

Substantiation: Edit. Application of Table 555.12 and 220.61(B) essentially results in a double application of demand factors which could result in an undersized neutral.

Panel Meeting Action: Accept

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-121 Log #686 NEC-P19 **Final Action: Reject**
(555.13(A)(2)(1)(2))

Submitter: Vincent Metallo, Sr., Baltimore County Government

Recommendation: Delete the following:

~~(1) As permanent wiring on the undesired of piers (floating or fixed).~~

~~(2) Where flexibility is necessary an on piers compressed of floating sections.~~

Substantiation: Portable power cables are listed by Underwriters Laboratories to be used to "supply power to mobile equipment and machinery" and to be "used in accordance with Article 400 of the National electrical Code." I received product data sheets from several manufacturers that were providing portable power cables to contractors that were to be installed for permanent power to piers. These product data sheets state for application use: for portable power supply for various types of portable equipment. (See data sheets and listing information). The problem is that portable power cables are only intended to be used for portable power for various types of machinery and not as a permanent power feeder connected to a panelboard overcurrent device feeding a marina pedestal panelboard. Underwriters Laboratories has a cable listed specifically as flexible branch circuit and feeder wiring in marinas and boatyards in accordance with Article 555 of the National Electrical Code. I feel this change should be made for safety reasons and a reference to a specific type of cable should not be made as its use would be in accordance with listing and manufacturers' installation instructions and recommendations.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The substantiation provided by the submitter would seem to infer that he wants to delete all of the text in 555.13(A)(2) Portable Power Cables.

This is not, however, what is recommended by the submitter. The panel is, therefore, unclear as to the submitter's actual intent and does not support the elimination of this wiring method.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-122 Log #955 NEC-P19 **Final Action: Accept in Principle**
(555.17(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete "permitted to."

Substantiation: Edit. The provision should be mandatory, not permissive; other types are not excluded.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel action on Proposal 19-123 addresses the concerns of the submitter.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-123 Log #1059 NEC-P19 **Final Action: Accept**
(555.17(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "be permitted to".
Substantiation: Edit. Present wording does not require any specific disconnecting means, only "permits" a circuit breaker or switch. Definition of disconnecting means in Article 100 covers many devices; plug/receptacle, links, wire connectors, relays, etc. Most Code sections specify disconnect types. Differences between sections pertaining to the same thing may be confusing.
Panel Meeting Action: Accept
Number Eligible to Vote: 8
Ballot Results: Affirmative: 8

19-124 Log #152 NEC-P19 **Final Action: Reject**
(555.19(A)(4))

Submitter: Donald Spencer, Bainbridge, WA
Recommendation: Revise as follows:
Receptacles that provide shore power for boats shall be rated not less than 30 amps and shall be single outlet type <u>and shall be ground fault protected with a trip current rating of 100 mo.</u>
Substantiation: New circuit breakers suggested for marinas in salt water.
There is a significant problem in marinas with regard to corrosion. If a boat has been wired properly with no equipment malfunctions, there should be no inordinate corrosion of propellers, rudders, out drives, etc. In the past several years several of my fellow boaters have been victims of other peoples electrical grounding problems to the tune of $4000 plus each, in the form of dissolved propellers, shafts, underwater fittings, etc. After measuring the direction of voltage drops in the water, the source of the stray current was found. This is both time consuming and requires experienced people. In talking with other professionals who have encountered similar problems in other marinas, I found this problem is endemic and very expensive for the marinas, boat owners and the insurance companies. Divers who clean the boat bottoms and change zincs in marinas have all experienced the effect of fault currents in the water (not pleasant). I know of no fatalities so far.
The problem occurs in a boat when 120 volt power is drawn from shore power and returned to shore power via the salt water, which in turn gets back to the shore power grid via another boat or boats. When the electrical current leaves or enters a boat it does so via the boats metal parts in the water. Where this occurs the metal is eaten up at a rate proportional to the products of current and time. Hence a boat, which has no electrical faults and is properly, wired could fall victim to another boats ground currents. The nasty part of this occurs when the weather gets cold and boat owners install heaters, battery chargers etc. and don't visit their boat regularly. This results in sunken and extensively damaged boats. Further compounding the problem for people who locate the source of an offending heater (improperly wired by the owner), the thermostat will be off during the day because its warmer and less heat is required, therefore it emits no current in the water. Just as frustrating is the current cycling on and off while trying to locate it.
In an attempt to protect themselves from faults on neighboring boats, boat owners disconnect the green wire from the shore power entrance after verifying that they do not have any ground faults. Not only is this a very dangerous method, but it also does not totally solve the problem. When an electrical current flows in salt water there is a voltage drop in the direction the current is going. For an electrically isolated boat adjacent to the source boat, the current will enter one propeller and exit the other casing both propellers on that boat to be damaged because the water is at a different potential for each propeller causing a current to flow from propeller to propeller. The electrical resistance between the propellers via the boat's shafting and grounding system is considerably less than the salt water, causing the electrical current to flow from propeller to propeller within the boat. It also becomes obvious here, even a very expensive isolation transformer on the power input of the adjacent boat, will not protect it from this problem of propeller-to-propeller or propeller-to-rudder etc. corrosion. The best solution to this problem is to automatically turn off the power to the boat generating the fault current.
At first glance there is an obvious solution to this vexing problem. One that was tried years ago by a number of marinas without success; install a GFCI circuit breaker for each shore power receptacle. To understand the reason for the failure we must look at how they work and what they are designed to do. A GFI circuit breaker measures the current going to the load and subtracts the current returning from the load. If the difference is equal to or greater than 5 mllliamps the circuit breaker will trip. The tripping problem occurs on boats that have electric hot water tanks and electric stove surface units including ovens and some space heaters. This family of heating elements has a resistance wire core surrounded by a solid metal jacket with ceramic insulation between. The outer metal tube insulates the core and provides oxidation protection, but when the core gets red hot the ceramic insulation leaks a small amount of current to the outer metal tube. Normally this does not cause problems because the appliance it is installed in is grounded and the leakage current is returned via the green wire. Empirical measurements have shown this leakage current can be up to 25 milliamp per element. With that in mind it is easily seen why the early experiments failed when the hot water and/or the stovetop was turned on. The trip current should be in the neighborhood of 100 milliamp. This would allow the hot water heater and electric range and space heaters to operate normally, while tripping when miswired loads are applied.
The 30 amp circuit breakers for shore power receptacles are not the GFI protection kind because of the previously mentioned leakage problem on the boats and they could be chained to the ground fault protection kind provided the ground fault trip current is appropriate. The 100-milliamps fault current trip would drop the offender off line immediately, spare the innocent boater much expense, reduce marina personnel trouble shooting time and improve diver safety. The interesting point here is the offending boat owner would become aware there is a problem with the wiring immediately, because shore power would not stay on. This usually results in calling for help from knowledgeable people to correct the problem. Unless every boat in a marina is served by one of these breakers, innocent boats are still vulnerable because a fault current can enter the boat, via its through the hull equipment, and return to the power grid via the green wire, which does not go through the circuit breaker.
When I tried to purchase 30 amp circuit breakers with a 100 milliamp ground fault trip from two different manufacturers for my yacht club the reply was; This is a good idea and an easy task, how many thousand would you like? Without industry wide recognition of the problem and a set of standards accepted to solve it, no manufacturer will produce them given its commodity pricing and total market size. Please consider this as a marina ground fault standard for 30 amp shore power services. Manufacturers will then be willing to produce them.
Panel Meeting Action: Reject
Panel Statement: The panel does not believe that the proposed device will resolve the submitter's concern. Electrolysis caused from the flow of direct current causes the corrosion of the metal, not the flow of alternating current.
Number Eligible to Vote: 8
Ballot Results: Affirmative: 8

19-125 Log #944 NEC-P19 **Final Action: Accept in Principle**
(555.19(A)(4)(a))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:
Receptacles rated <u>not less than</u> 30 amperes or ~~more than~~ 50 amperes shall be of the locking and grounding type.
Substantiation: Edit. "More than 50 amperes" includes the receptacles of (b) which are required to be pin and sleeve type.
Panel Meeting Action: Accept in Principle
Revise the proposed wording to read as follows:
"(a) 30 ampere and 50 ampere receptacles shall be of the locking and grounding type."
(b) 60 ampere and 100 ampere receptacles shall be of the pin and sleeve type."
Panel Statement: "Not less than 30 amperes or 50 amperes..." is unclear. The revised language meets the Submitter's intent.
The wording in (b) was revised to correlate with the revised wording of (a).
Number Eligible to Vote: 8
Ballot Results: Affirmative: 8

19-126 Log #223 NEC-P19 **Final Action: Accept in Principle**
(555.21)

NOTE: The following proposal consists of Comment 19-52 on Proposal 19-143 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 19-143 was:
Revise existing Section 555.21 as follows:
555.21 Gasoline Dispensing Stations Ñ Hazardous (Classified) Locations.
<u>(A) General.</u> Electrical wiring and equipment located at or serving gasoline dispensing <u>equipment</u> ~~stations~~ <u>located on shore</u> shall comply with Article 514 ~~in addition to the requirements of this article~~ . <u>For other than the classification of Class I, Division 1 and 2 areas, electrical wiring and equipment for gasoline dispensing equipment located on fixed or floating portions of docks or piers shall comply with Article 514.</u>
<u>(B) Classification of Class I, Division 1 and 2 Areas.</u>
<u>(1) Closed Construction. Where the construction of floating docks or piers is closed, such as concrete enclosed expanded foam or similar construction, and having integral service boxes with supply chases, the following shall be used for the purpose of applying Table 514.3(B)(1).</u>
<u>Exception: Where space between dock sections does not permit gasoline liquid or vapor to dissipate, the entire length of the assembled dock sections shall be classified Class I, Division 2.</u>
<u>(a) The space above the surface of the deck shall be a Class I, Division 2 location.</u>
<u>(b) The space below the surface of the deck shall be a Class I, Division 1location that shall extend to the surface of the water.</u>
<u>(2) Open Construction. Where the construction of floating docks or piers is open, such as decks built on stringers supported by floats or pontoons or similar construction, the following shall be used for the purpose of applying Table 514.3(B)(1)</u>

(a) The space below the surface of the deck down to the water level shall be a Class I, Division 2 location.

Submitter: J. Philip Simmons, Simmons Electrical Services / Rep. National Armored Cable Manufacturers Association

Recommendation: Accept the Proposal in Principle with the changes indicated in the Panel Meeting Action.

Substantiation: The proposal brings improvements to the section that are sorely needed for making safe installations of motor fuel dispensing equipment at marinas and boatyards. The indication is that the proposal was accepted in principle but the language does not appear in the 2005 NEC ROP Draft.

Panel Meeting Action: Accept in Principle

Panel Statement: This proposal was Held during the previous code cycle, and resubmitted as a proposal this cycle. The original submitter also submitted Proposal19-127 which supersedes the original proposal. See action on Proposal 19-127.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-127 Log #2950 NEC-P19 **Final Action: Accept**
(555.21)

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Revise existing 555.21 as follows:

555.21 Motor Fuel Dispensing Stations — Hazardous (Classified) Locations.

(A) General. Electrical wiring and equipment located at or serving motor fuel dispensing equipment ~~stations~~ located on shore shall comply with Article 514 ~~in addition to the requirements of this article~~ . The determination of Class I, Division 1 and 2 areas for motor fuel dispensing on floating or fixed docks or piers shall comply with (B) . All electrical wiring for power and lighting shall be installed on the side of the wharf, pier, or dock opposite from the liquid piping system.

(B) Classification of Class I, Division 1 and 2 Areas.

(1) Closed Construction. Where the construction of floating docks or piers is closed, such as concrete enclosed expanded foam or similar construction, and having integral service boxes with supply chases, the following shall be used for the purpose of applying Tables 514.3(B)(1) and 514.3(B)(2).

Exception: Where space between dock sections does not permit flammable liquids or vapors to dissipate, the entire length of the assembled dock sections shall be classified Class I, Division 2.

(a) The space above the surface of the deck shall be a Class I, Division 2 location.

(b) The space below the surface of the deck having enclosures such as deck boxes where gasoline liquid or vapor can accumulate shall be a Class I, Division 1 location.

(2) Open Construction. Where the construction of floating docks or piers is open, such as decks built on stringers supported by floats or pontoons or similar construction, the following shall be used for the purpose of applying Table 514.3(B)(1)

(a) Enclosures such as flush deck boxes or tubs installed within 20 ft of the dispenser where flammable liquids or vapors can accumulate shall be a Class I, Division 1 location.

(b) The space below the surface of the deck down to the water level shall be a Class I, Division 2 location.

Retain the existing FPN.

Substantiation: CMP-19 stated in its Panel Statement for the 2005 NEC ROC that it recognized that the hazardous locations associated with motor fuel dispensing should be addressed in the Code but did not take action to do so due to the extensive work that would be required to address all the issues involved in motor fuel dispensing. This proposal is being submitted in case the Task Group recommended by the Panel in its Panel Statement did not take action for the 2008 NEC.

Changes made to this section for the 2005 NEC fail to address the hazards associated with the unique installation practices of gasoline dispensers at marinas or boatyards, This proposal intends to expand and clarify the requirements for installing electrical wiring to and in the vicinity of gasoline dispensing equipment installed at marinas and boatyards. It also intends to bring the requirements in this section up to date with actual construction practices.

Floating docks are commonly manufactured with expanded foam cores that are encapsulated in concrete. Flush-mounted deck boxes are cast in place. One or more 4 in. PVC chases are installed between deck boxes and from the deck boxes to the end of the dock sections. This is done to accommodate installation of gasoline pipes, diesel fuel lines, water and waste disposal piping as well as for installation of power, communications, television and other wiring.

Note that this construction provides boxes at deck level that can easily collect gasoline liquid and vapors that are heavier than air. Gasoline spills can occur at marinas for all the same reasons they do at land-based fuel dispensing facilities. The PVC chases then allow gasoline liquid and vapor to travel throughout the length of the dock sections. As a result, the surface of the deck should be designated equivalent to the surface of the earth with the Class I, Division 2 space above the deck and Class I, Division 1 below the surface of the deck where gasoline liquid or vapors can accumulate in enclosures or travel through the PVC chases. Gasoline dispensers are typically installed over a large deck box designed to allow conduits to enter the bottom of dispensers from the PVC chases.

Depending on assembly of the dock sections, there may be from 1 inch to no air space between sections. Where adequate ventilation to atmosphere cannot be assured by design and assembly of the float sections, the Class I, Division 1 area should extend the full length of the dock sections as the PVC chases easily transmit the gasoline liquid or vapor from one dock section to another.

Where docks are constructed in this manner, additional clarification of the extent of hazardous locations is required since Table 514.3(B)(1) and 514.8 clearly apply to land-based gasoline dispensing locations but not to dispensing equipment installed at marinas. Yet, 551.21 simply requires compliance with Article 514 except for separation of fuel and other services. Some of these requirements are difficult to apply to dock construction of the concrete encapsulated constructions.

For open dock construction, a framework of stringers or beams are installed on floats with a variety of flooring materials installed. This construction typically has fuel lines and electrical wiring installed under the decking. Like closed construction, gasoline dispensers are installed over fiberglass tubs. For this open type of construction, gasoline vapors can easily dissipate so the Class I, Division 2 area from the deck surface to the water surface seems appropriate. There would be no Class I, Division 1 area for this type of construction unless a tub or similar enclosure is installed below the dispenser.

The following is the Panel Statement from Comment 19-52 for the 2005 NEC ROC. I have inserted a number in brackets where a question is found that is addressed below the Statement.

"Hold Panel Statement: The panel notes that this hold action is on Comment 19-52 and Proposal 19-143. The panel agrees that the concept of the proposal (19-143) is valid and the submitter's concerns that current construction techniques for docks and piers need to be addressed in the Code have merit. However, upon reviewing the proposal, the panel concludes that extensive revisions would be necessary in order to adequately cover all requirements. The comment recommends that the proposal be accepted in principle with the changes indicated in the panel action which were to simply change the term "gasoline dispensing" to "Motor Fuel Dispensing". If this were to be done, the original substantiation, which speaks only to gasoline liquid and vapor, would have to be restudied and the text would possibly have to be changed to account for fuels other than gasoline. CNG for example is lighter than air and the language of proposed 555.21(B)(1) and (2) may have to be modified [1]. Additionally, the proposed language in (B)(1)(a) should be modified to set an upper limit. As written, the text reads, "The space above the surface of the deck shall be a Class I, Division 2 location". How far above the deck does the space extend? Five feet, ten feet, one hundred feet? [2]

Both proposed (B)(1) and (2) reference Table 514.3(B)(1) and since this section now applies to motor fuels not just gasoline, a reference to Table 514.3(B)(2) would need to be made. [3] The panel recommends to the TCC that a task group comprised of members from CMP 19, CMP 14 and the NFPA 303 technical committee be established to study this issue." [4]

Panel statement: "CNG for example is lighter than air and the language of proposed 555.21(B)(1) and (2) may have to be modified" [1].

Response: This proposal adds a reference to Table 514.3(B)(2) where motor vehicle fuels other than gasoline are addressed. Gasoline is the most frequent flammable motor fuel dispensed from marinas and boatyards. One has to wonder if delaying implementation of the protections offered by the previous proposal was justified. Diesel fuel is also frequently dispensed but due to the flash point being typically above 100 degrees F, these installations are often treated as dispensing of combustible liquids rather than flammable liquids.

For the vast majority of fuel dispensing, lighter than air fuel vapors will simply dissipate but it is recognized that there can be structures that could trap these vapors so the reference to Table 514.3(B)(2) is appropriate.

Panel statement: "Additionally, the proposed language in (B)(1)(a) should be modified to set an upper limit. As written, the text reads, "The space above the surface of the deck shall be a Class I, Division 2 location". How far above the deck does the space extend? Five feet, ten feet, one hundred feet?" [2]

Response: Perhaps the Panel missed the concept that the proposal was not to repeat all the information in Tables 514.3(B)(1) and (2) but to interface the area classifications for marinas and boatyards with the tables. The big issue here is Tables 514.3(B)(1) and (B)(2) specifically apply to land-based fuel dispensing.

For example, the proposed language for application of the information in 555.21(B)(1)(a) for the 2005 NEC proposal states, " the following shall be used for the purpose of applying Table 514.3(B)(1)." Table 514.3(B)(1) indicates the extension of the Class I, Division 2 area is 18 in. vertically and 20 ft horizontally. The language in the Proposal simply states the space above the deck near gasoline dispensing was a Class I, Division 2 area and relies on Table 514.3(B)(1) for the dimensions of the space. Without the statement in 555.21, it is not clear how to apply the area classifications from the tables in Article 514.

Panel statement: "Both proposed (B)(1) and (2) reference Table 514.3(B)(1) and since this section now applies to motor fuels not just gasoline, a reference to Table 514.3(B)(2) would need to be made." [3]

Response: Done.

Panel statement: "The panel recommends to the TCC that a task group comprised of members from CMP 19, CMP 14 and the NFPA 303 Technical Committee be established to study this issue." [4]

Response: Let's hope this was accomplished between the 2005 and 2008 NEC cycles.

Panel Meeting Action: Accept

Panel Statement: The chair of Code-Making Panel 19 will form a task group to address the technical merits of the proposal. Code-Making Panel14 and the NFPA 303 Technical Committee will be asked to participate in the task group.

The panel recognizes the need for requirements and that Code-Making Panel 19 does not have the collective expertise to verify if the Submitter's proposal is technically correct on all requirements.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

19-128 Log #1028 NEC-P19 **Final Action: Reject**
(555.23)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete "and be provided with an outer jacket of distinctive color for safety."

Substantiation: Edit. "Distinctive" is not defined. Orange, red, yellow, black, etc., are all distinctive. No one color is specified, therefore, a myriad of these colors could be used and indicate no special purpose. "Distinctive" is subjective and, therefore, meaningless. Other color requirements in this code are specific. There is no similar requirement in Article 610 for cranes and hoists.

Panel Meeting Action: Reject

Panel Statement: "Distinctive" is not meaningless as it indicates a clear differentiation for the portable power cable. A specific color is not necessary. The Submitter claims that other color requirements in the Code are specific, but conductor identification in 310.12(C) requires conductors to be clearly distinguishable or to have distinguishing markings.

Number Eligible to Vote: 8

Ballot Results: Affirmative: 8

20-1 Log #3497 NEC-P20 **Final Action: Accept in Principle in Part**
(585 and Annex H (New))

TCC Action: The Technical Correlating Committee advises that article scope statements and titles are the responsibilty of the Technical Correlating Committee and the Technical Correlating Committee accepts the panel action. The Technical Correlating Committee requests that those who wish to submit comments on this proposal do so by submitting separate comments for individual sections of the new Article.

Submitter: Alan Manche, Square D Co.

Recommendation: Add a new Article 585 and Annex H as follows:

Article 585 Critical Operations Power Systems

FPN: Rules that are followed by a reference in brackets contain text that has been extracted from NFPA 110, *Standard for Emergency and Standby Power Systems*, 2005 edition, NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 2005 Edition and NFPA 1600, *Standard on*

Disaster/Emergency Management and Business Continuity Programs, 2004 edition. Only editorial changes were made to the extracted text to make it consistent with this Code.

I. General

585.1 Scope. The provisions of this article apply to the electrical installation, operation, supervision, and maintenance of critical operations power systems consisting of circuits and equipment intended to automatically supply, distribute and control electricity to designated operations in the event of disruption to elements of the normal system intended to supply, distribute, and control power essential for continuity of vital operations..

Critical operations power systems are those systems classed as critical by municipal, state, federal, other governmental agency having jurisdiction or by facility engineering documentation establishing the necessity for such a system.

FPN No. 1: Critical Operations Power systems are generally installed in vital infrastructure facilities that if destroyed or incapacitated would disrupt national security, the economy, public health or safety; and where enhanced electrical infrastructure for continuity of operation has been deemed necessary by governmental authority.

FPN No. 2: Types of facilities where mission critical power systems may be deemed necessary include:

Air traffic control centers

Central station service facilities (fire and security system monitoring)

Chemical, petrochemical, and hazardous material (including biohazard) handling facilities

Communications centers, telephone exchanges, cellular tower sites

Emergency evacuation centers

Financial, banking, business data processing facilities

Fuel supply pumping stations (i.e. natural gas distribution and delivery infrastructure)

Hospitals and associated support facilities

Municipal infrastructure – water and sewer treatment facilities

911 centers

Offices and facilities deemed critical to continuity of government

Police, fire, civil defense facilities including power for radio repeater operations

Radio and television stations

Transportation infrastructure – airports, rail stations, seaports

FPN No. 3: For further information regarding performance of emergency and standby power systems, see NFPA 110-2005, *Standard for Emergency and Standby Power Systems.*

FPN No. 4: For further information regarding performance and maintenance of emergency systems in health care facilities, see NFPA 99-2005, *Standard for Health Care Facilities.*

FPN No. 5: For specification of locations where emergency lighting is considered essential to life safety, see NFPA 101®-2006, *Life Safety Code®.*

FPN No. 6: Threats to facility that may require transfer of operation to the critical systems include, but not limited to:

Naturally occurring events:

Geological Hazards

Meteorological Hazards

Biological Hazards

Human caused events:

Accidental

Intentional

Electromagnetic Pulse

Explosion

Fire

Firearm discharge

Flood

Hurricanes & Tornados

Icing

Infectious agent (biohazard)

Ionizing (radiological)

Seismic

Software intrusion

Toxic gas or liquid

See also Section A.5.3.2, NFPA 1600-2004

585.2 Definitions.

Commissioning. The acceptance testing, integrated system testing, operational tune-up, and start-up testing, is the process by which baseline tests results verify the proper operation and sequence of operation of electrical equipment, in addition to developing baseline criteria by which future trend analysis can identify equipment deterioration.

Critical Operations Power System. Includes three different levels or sizes of facilities or parts of facilities that require uninterruptible operation for the reasons of public safety, emergency management, national security, and business continuity:

Critical Operations Power System, Small. A remote system may include a single service transformer, single standby transformer, local annunciation of alarms and control; up to 100kVA.

Critical Operations Power System, Medium. A main system may include multiple service transformers and standby generator with paralleling switchgear, SCADA with redundant distributed architecture systems, greater than 100kVA and up to 500kVA.

Critical Operations Power System, Large. A multi-system consisting of several installations with a central control networked used to distributed control within individual systems necessary to the reliability criteria of each system, greater than 1000kVA. A control network will typically be located at each central power plant that is required for such a system which can be accessed from other locations distributed along the network. Redundant and segregated pathways are required for the communication network.

The reliability, availability, and maintainability of the critical system shall be matched to the importance of the operation related its function.

Emergency Power Supply (EPS). The source of electric power of the required capacity and quality for an emergency power supply system (EPSS). **[NFPA 110, 3.3.4]**

Emergency Power Supply System (EPSS). A complete functioning EPS system coupled to a system of conductors, disconnecting means and overcurrent protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a safe and reliable source of electric power. **[NFPA 110, 3.3.5]**

Emergency Power Supply System, Level 1. Systems installed where failure of the equipment to perform could result in loss of human life or serious injuries. **[NFPA 110, 4.4.1]**

Emergency Power Supply System, Level 2. Systems installed where failure of the EPSS to perform is less critical to human life and safety and where the authority having jurisdiction permits a higher degree of flexibility than that provided by a Level 1 EPSS system. **[NFPA 110, 4.4.2]**

Supervisory Control and Data Acquisition (SCADA). An electronic system that provides monitoring and controls for the operation of the critical system. This includes the fire alarm system, security system, control of the HVAC, the start/stop/monitoring of the power supplies and electrical distribution system, annunciation and communication equipment to emergency personnel, facility occupants and remote operators.

585.3 Application of Other Articles. Except as modified by this article, all applicable articles of this Code shall apply.

585.4 Risk Assessment. Risk assessment for critical operations power systems shall be conducted in accordance with 585.4(A) through 585.4(D).

(A) Conducting Risk Assessment. In critical operations power systems, risk assessment shall be performed to identify hazards, the likelihood of their occurrence, and the vulnerability of the electrical system to those hazards.

(B) Identification of Hazards. Hazards to be considered at a minimum shall include, but shall not be limited to:

1) natural hazards (geological, meteorological, and biological)

2) human-caused events (accidental and intentional) [**NFPA 1600, 5.3.2]**

(C) Developing Mitigation Strategy. Based on the results of the risk assessment, a strategy shall be developed and implemented to mitigate the hazards that have not been sufficiently mitigated by the prescriptive requirements of the Code.

(D) Mitigation Strategy Components. The mitigation strategy shall consider, but not be limited to:

(1) The use of applicable building construction standards

(2) Hazard avoidance through appropriate land-use practices

(3) Relocation, retrofitting, or removal of structures at risk

(4) Removal or elimination of the hazard

(5) Reduction or limitation of the amount or size of the hazard

(6) Segregation of the hazard from that which is to be protected

(7) Modification of the basic characteristics of the hazard

(8) Control of the rate of release of the hazard

(9) Provision of protective systems or equipment for both cyber or physical risks

(10) Establishment of hazard warning and communication procedures

(11) Redundancy or duplication of essential personnel, critical systems, equipment, information, operations, or materials **[NFPA 1600, 5.4.3]**

FPN: Section 5.3 of NFPA 1600-2004, *Standard on Disaster/Emergency Management and Business Continuity Programs*, provides additional guidance concerning risk assessment and hazard analysis.

(E) Physical Security. Physical security shall be provided for critical operations in accordance with (E)(1) and (E)(2).

(1) Based on the results of the risk assessment, a strategy for providing physical security for a critical operation shall be developed and implement.

(2) Electrical circuits and equipment for critical operations shall be accessible to qualified personnel only.

585.6 Testing and Maintenance.

(A) Conduct or Witness Test. The authority having jurisdiction shall conduct or witness a test of the complete system upon installation and periodically afterward.

(B) Tested Periodically. Systems shall be tested periodically on a schedule acceptable to the authority having jurisdiction to ensure the systems are maintained in proper operating condition.

(C) Battery Systems Maintenance. Where battery systems or unit equipments are involved, including batteries used for starting, control, or ignition in auxiliary engines, the authority having jurisdiction shall require periodic maintenance.

(D) Written Record. A written record shall be kept of such tests and maintenance.

(E) Testing Under Load. Means for testing all critical power systems during maximum anticipated load conditions shall be provided.

FPN: For testing and maintenance procedures of emergency power supply systems (EPSSs), see NFPA 110-2005, *Standard for Emergency and Standby Power Systems.*

(F) Supervisory Control and Data Acquisition (SCADA) System. SCADA systems shall be maintained and tested in accordance with 585.6(F)(1) and 585.6(F)(2)

(1) Maintenance. The maintenance program for SCADA systems shall consist of the following components:

1. Shall have a documented Preventive Maintenance program.

2. Shall have concurrent maintenance capabilities, so that the testing, troubleshooting, repair, and/or replacement of a component or subsystem while redundant component(s) or subsystem(s) are serving the load.

3.Operational data shall be retained – the deleted material goes well beyond requirements to ensure proper maintenance and operation.

(2) Testing. SCADA systems shall be tested periodically under actual or simulated contingency conditions.

FPN: Periodic system testing procedures can duplicate or be derived from the recommended functional performance testing procedures of individual components, as provided by the manufacturers.

FPN: For more information on Maintenance and Testing of SCADA, see NFPA 70B-2002, *Recommended Practice for Electrical Equipment Maintenance.*

585.8 Commissioning.

(A) Commissioning Plan. A commissioning plan shall be developed and documented.

FPN: For further information on developing a commissioning program see NFPA 70B-2002, *Recommended Practice for Electrical Equipment Maintenance*

(B) Component and System Tests. The installation of the equipment shall undergo component and system tests to ensure that, when energized the system will function properly.

(C) Baseline Test Results. Develop a set of baseline test results for comparison in future maintenance testing to identify equipment deterioration.

FPN: This process or tests is usually performed by independent contractors, installation contractors, or the equipment manufacturer.

(D) Functional Performance Tests: A functional performance test program shall be established, documented and executed upon complete installation of the critical system in order to establish a baseline reference for future performance requirements.

FPN: See Annex X for more information on developing and implementing a functional performance test program.

II. Circuit Wiring

585.10 Feeder and Branch Circuit Wiring,

(A) Identification. All boxes and enclosures (including transfer switches, generators, and power panels) for critical circuits shall be permanently marked so they will be readily identified as a component of a critical circuit or system.

(B) Wiring. Wiring of two or more critical circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from a critical source or critical source distribution overcurrent protection to critical loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in (1) through (4):

(1) Wiring from the normal power source located in transfer equipment enclosures

(2) Wiring supplied from two sources in exit, emergency, or critical luminaires (lighting fixtures)

(3) Wiring from two sources in a common junction box, attached to luminaires designated for the critical power system (lighting fixtures)

(4) Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the critical circuit supplied by the unit equipment

(C) Wiring Design and Location. Critical system wiring circuits shall be designed and located such that the hazards of the system might experience are minimized.

(D) Fire Protection. Critical systems shall meet the additional requirements in 585.9(D)(1) and (D)(2).

(1) Feeder and Branch Circuit Wiring. Feeder-circuit wiring shall meet one of the following conditions:

(1) Be a listed electrical circuit protective system with a minimum 1-hour fire rating

(2) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 1 hour

(3) Be embedded in not less than 50 mm (2 in.) of concrete

(4) Be a cable listed to maintain circuit integrity for not less than 1 hour when installed in accordance with the listing requirement.

(2) Feeder Circuit Equipment. Equipment for feeder circuits in critical systems (including transfer equipment, transformers, and panelboards) shall meet all of the following conditions:

(1) Be located in spaces with a 1-hour fire resistance rating

(2) Be located above the 100 year flood level plane.

FPN: For information regarding occupancy classification, see Section 6.1 of NFPA 101-2006, *Life Safety Code*®.

585.12 Wiring of HVAC, Fire Alarm, Security, Emergency Communications and Signal Systems. The wiring of heating, ventilation, and air-conditioning remote-control and signaling circuits; fire alarm circuits; circuits for security; circuits for emergency communications; and signal systems shall comply with (1) through (9) as applicable.

(1) Signal and communication wires shall use shielded twisted pairs in continuous metallic conduit.

(2) Shields of signal and communication wiring should be continuous and follow manufacturer's installation requirements.

(3) Where a potential ground difference exists between two locations, fiber optic cables shall be used instead of copper wires.

(4) Properly installed TVSS shall be provided at the terminals of the communication circuits and shall have a direct low impedance path to ground.

(5) Communications, fire alarm, and signaling circuits shall be verified at rated full speed under worst case traffic level.

(6) Conductors for all control circuits rated above 50V shall be installed with wire rated not less than 600V.

(7) Communications, fire alarm, and signaling circuits shall use relays with contact ratings that exceed circuit voltage and current ratings in power circuits.

(8) Riser communication cables shall be 2-hour fire rated cable.

(9) Control, monitoring, and power wiring to HVAC systems shall be 2-hour fire rated cable.

III. Power Sources and Connection

585.20 Sources of Power.

(A) General Requirements. Current supply shall be such that, in the event of failure of the normal supply to the critical operation, emergency lighting, emergency power, critical power, or all shall be available within the time required for the application but not to exceed 10 seconds. The supply system for critical power purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 585.20(D) through 585.20(H)

In selecting a critical source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying critical power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

Equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing, vandalism or other identified means in a risk analysis.

Equipment for sources of power as described in 585.10(D) through 585.10(H) where located within assembly occupancies for greater than 1000 persons or in buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile —shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-hour fire rating.

FPN No. 1: For the definition of occupancy classification, see Section 6.1 of NFPA *101*-2006, *Life Safety Code*®.

FPN No. 2: Assignment of degree of reliability of the recognized critical supply system depends on the careful evaluation of the variables at each particular installation.

(B) Grounding. All sources of power shall be grounded as a separately derived source in accordance with 250.30.

(C) Transient Voltage Surge Suppression. TVSS shall be proved at all facility distribution voltage levels.

(D) Storage Battery. Storage batteries used as a source of power for critical systems shall be of suitable rating and capacity to supply and maintain the total load for a minimum period of 1 1⁄2 hours, without the voltage applied to the load falling below 87 1⁄2 percent of normal. Storage batteries shall not be the sole critical system power source.

Batteries, whether of the acid or alkali type, shall be designed and constructed to meet the requirements of emergency service and shall be compatible with the charger for that particular installation.

For a sealed battery, the container shall not be required to be transparent. However, for the lead acid battery that requires water additions, transparent or translucent jars shall be furnished. Automotive-type batteries shall not be used.

An automatic battery charging means shall be provided.

(E) Generator Set.

(1) Prime Mover-Driven. For a generator set driven by a prime mover acceptable to the authority having jurisdiction and sized in accordance with 585.30, means shall be provided for automatically starting the prime mover on failure of the normal service and for automatic transfer and operation of all required critical system electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time reestablishment of the normal source.

(2) Power for fuel transfer pumps. Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the critical power system.

(3) Dual Supplies. Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems. Means shall be provided for automatically transferring from one fuel supply to another where dual fuel supplies are used.

Exception: Where acceptable to the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

(4) Battery Power and Dampers. Where a storage battery is used for control or signal power or as the means of starting the prime mover, it shall be suitable for the purpose and shall be equipped with an automatic charging means independent of the generator set. Where the battery charger is required for the operation of the generator set, it shall be connected to the critical system. Where power is required for the operation of dampers used to ventilate the generator set, the dampers shall be connected to the critical system.

(5) Auxiliary Power Supply. Generator sets that require more than 10 seconds to develop power shall be permitted if an auxiliary power supply energizes the emergency system until the generator can pick up the load.

(6) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.

(F) Uninterruptible Power Supplies. Uninterruptible power supplies used to provide power for critical systems shall comply with the applicable provisions of 585.20(D) and 585.20(E).

(G) Separate Service. Where acceptable to the authority having jurisdiction as suitable for use as a critical source of power, an additional service shall be permitted. This service shall be in accordance with the applicable provisions of Article 230 and the following additional requirements:

(1) Separate service drop or service lateral

(2) Service conductors sufficiently remote electrically and physically from any other service conductors to minimize the possibility of simultaneous interruption of supply

(H) Fuel Cell System. Fuel cell systems used as a source of power for critical operation systems shall be of suitable rating and capacity to supply and maintain the total load for not less than 2 hours of full-demand operation or as deemed appropriate in the risk assessment and operation demand. Installation of a fuel cell system shall meet the requirements of Parts II through VIII of Article 692. Where a single fuel cell system serves as the normal supply for the building or group of buildings concerned, it shall not serve as the sole source of power for the emergency standby system.

585.22 Capacity of Power Sources.

(A) Capacity and Rating. A critical operations power system shall have adequate capacity and rating for all loads to be operated simultaneously for continuous operation with variable load for an unlimited number of hours, except for required maintenance of the power source. A portable, temporary or redundant alternate power source shall be available for use whenever the critical operations power source is out of service for maintenance or repair.

(B) Selective Load Pickup, Load Shedding, and Peak Load Sharing. The alternate power source shall be permitted to supply critical, emergency, legally required standby loads where the source has adequate capacity or where automatic selective load pickup and load shedding is provided as needed to ensure adequate power to (1) critical operations circuits (2) the emergency circuits, (3) the legally required standby circuits, and (4) the optional standby circuits, in that order of priority. The alternate power source shall be permitted to be used for peak load shaving, provided these conditions are met.

Peak load-shaving operation shall be permitted for satisfying the test requirement of 585.6(B), provided all other conditions of 585.6 are met.

(C) Fuel Supply. Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with on on-premise fuel supply sufficient for not less than 96 hours full demand operation of the system.

(D) Ventilation. Adequate ventilation shall be provided for the alternate power source for continued operation under maximum anticipated ambient temperatures.

FPN: NFPA 110-2005, *Standard for Emergency and Standby Power Systems* includes additional information on ventilation air for combustion and cooling.

585.24 Transfer Equipment.

(A) General. Transfer equipment, including automatic transfer switches, shall be automatic, identified for emergency use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and critical operations sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

(B) Bypass Isolation Switches. Means shall be permitted to bypass and isolate the transfer equipment. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.

(C) Automatic Transfer Switches. Automatic transfer switches shall be electrically operated and mechanically held.

(D) Use. Transfer equipment shall supply only critical operations loads.

XXX. Critical System Circuits for Lighting and Power

585.30 Loads on Critical Branch Circuits. Critical operations branch circuits shall only supply equipment specified as required for critical operations use.

585.32 Critical Operations Illumination. Critical operations illumination shall be in addition to all required means of egress lighting, illuminated exit signs, and all other luminaires required.

Lighting systems shall be designed and installed so that the failure of any individual lighting element, such as the burning out of a lamp, cannot leave in total darkness any space that requires illumination.

Where high-intensity discharge lighting, such as high- and low-pressure sodium, mercury vapor, and metal halide, is used as the sole source of normal illumination, the critical operations lighting system shall be required to operate until normal illumination has been restored.

Exception: Alternative means that ensures the lighting illumination level is maintained shall be permitted.

585.34 Circuits for Critical Operations Illumination Branch circuits that supply critical operations lighting shall be installed to provide supply from a source complying with 585.20 in addition to the normal supply for lighting. Unit equipment shall provide for tertiary egress illumination only.

585.36 Circuits for Critical Operations Power Feeder and branch circuits that supply critical operations equipment shall be installed to provide supply from a source complying with 585.20 in addition to the normal supply.

585.40 Egress Illumination Switch Location. All manual switches for controlling illumination circuits shall be in locations convenient to authorized persons responsible for their actuation.

Exception: Where multiple switches are provided, one such switch shall be permitted in such locations where arranged so that it can only energize the circuit, but cannot de-energize the circuit.

585.42 Exterior Lights. Those lights located outside that are not required for illumination when there is sufficient daylight shall be permitted to be controlled by an automatic light-actuated device that fails in a closed position.

IV. Overcurrent Protection

585.50 Accessibility. The feeder- and branch-circuit overcurrent devices shall be accessible to authorized persons only.

585.52 Ground-Fault Protection of Equipment.

(A) Applicability. The requirements of 585.52 shall apply to critical operations (including multiple occupancy buildings) with critical operation areas.

(B) Feeders. Where ground-fault protection is provided for operation of the service disconnecting means or feeder disconnecting means as specified by 230.95 or 215.10, an additional step of ground-fault protection shall be provided in all next level feeder disconnecting means downstream toward the load. Such protection shall consist of overcurrent devices and current transformers or other equivalent protective equipment that shall cause the feeder disconnecting means to open.

The additional levels of ground-fault protection shall not be installed on electrical systems that are not solidly grounded wye systems with greater than 150 volts to ground but not exceeding 600 volts phase-to-phase

(C) Testing. When equipment ground-fault protection is first installed, each level shall be tested to ensure ground fault protection is operational.

FPN: Testing is intended to verify the ground fault function is operational. The performance test is not intended to verify selectivity in 585.52(D) as this is often coordinated similar to circuit breakers by reviewing tie and current curves and properly setting the equipment. (selectivity of fuses and circuit breakers are not performance tested for overload and short circuit)

(D) Selectivity. Ground-fault protection for operation of the service and feeder disconnecting means shall be fully selective such that the feeder device, but not the service device, shall open on ground faults on the load side of the feeder device. A six-cycle minimum separation between the service and feeder ground-fault tripping bands shall be provided. Operating time of the disconnecting devices shall be considered in selecting the time spread between these two bands to achieve 100 percent selectivity.

FPN: See 230.95, Fine Print Note No.4, for transfer of alternate source where ground-fault protection is applied.

V. System Performance and Analysis

585.60 Supervisory Control and Data Acquisition (SCADA).

(A) General. The general requirements in (A)(1) through (A)(11) shall apply to SCADA systems.

(1) The SCADA system for the mission critical loads shall be separate from the building management SCADA system.

(2) No single point failure shall be able to disable the SCADA system.

(3) The SCADA system shall provide control and monitor electrical and mechanical utility systems relate to mission critical loads, including:

a. Fire alarm system

b. Security system

c. Power distribution

d. Power generation

e. HVAC and Ventilation (damper position, air flow speed

and direction)

f. Load shedding

g. Fuel levels or hours of operation

(4) Before installing or employing a SCADA system, an O&M analysis and vulnerability assessment shall be performed to provide the maintenance parameter data

(5) Redundant system shall be provided in either warm or hot standby.

(6) The controller shall be a programmable logic controller (PLC).

(7) The SCADA system shall utilize open, not proprietary protocols.

(8) The SCADA system shall be able to assess the damage and determining system integrity after the "event"

(9) The monitor display shall provide graphical user interface for all major components monitored and controlled by the SCADA system, with color schemes readily recognized by typical user.

(10) The SCADA system shall have the capability to provide storage of critical system parameters at a 15 minute rate or more often when out-of-limit conditions exist.

(11) The SCADA system shall have a separate data storage facility not located in same vicinity.

(B) Power supply. The SCADA system power supply shall comply with (B)(1) through (B)(3).

(1) The power supply shall be provided with direct current station battery system, rated between 24 and 125V dc with a 96-hour capacity.

(2) The batteries of the SCADA system shall be separate from batteries for other electrical systems.

(3) The power supply shall be provided with properly installed TVSS at its terminals with direct low impedance path to ground. Protected and unprotected circuits shall be physically separated to prevent coupling.

(C) Security against hazards. Security against hazards shall be provided in accordance with (C)(1) through (C)(6).

(1) Controlled physical access by authorized personnel to only the system operational controls and software shall be provided.

(2) The SCADA system shall be protected against dust, dirt, water, and other contaminates by specifying enclosures appropriate for the environment.

(3) Conduit and tubing shall not violate the integrity of the SCADA system enclosure.

(4) The SCADA system shall be located in the same secure locations as the secured systems that they monitor and control.

(5) The SCADA system shall be provided with, dry agent fire protection systems or double interlocked pre-action sprinkler systems using cross-zoned detection, to minimize the threat of accidental water discharge into unprotected equipment. The fire protection systems shall be monitored by the fire alarm system in accordance with NFPA 72-2007, *National Fire Alarm Code®*.

(6) The SCADA system shall not be connected to other network communications outside the secure locations without encryption or use of fiber optics.

585.64 Disaster Recovery.

(A) Emergency Facilities Plan. A critical operations system shall have documented an emergency facilities plan. The plan shall consider emergency operations and response, recovery, and continuity of operations.

FPN: NFPA 1600-2004, *Standard on Disaster/Emergency Management and Business Continuity Programs* Section 5.7 provides guidance for the development and implementation of emergency plans.

(B) Fuel supply. Facilities shall establish a plan for securing the availability of fuel for critical operations power supplies in the event of a prolonged power outage.

(C) Power Recovery. A critical operations facility shall establish a procedure for restoring power in the event of an outage. The procedure shall include, but not be limited to: sequence of equipment restoration, prioritization of equipment restoration, safety procedures, notification, and verification of functionality of critical systems following power restoration.

(D) Training. Personnel shall be designated for power recovery procedures and shall be trained in the procedures.

(E) Restoration of Power. Following restoration of power, all critical operations power systems shall be restored to full operational readiness.

IV. Special Construction Requirements

585.70 Power Supply System Protective Techniques.

(A) General Considerations. When installing the EPSS equipment and related auxiliaries, environmental considerations shall be given, particularly with regard to the installation of the fuel tanks and exhaust lines, or the EPS building, or both.

FPN No. 1: The following are examples of external influences:

(1) Natural conditions:

(a) Storms

(b) Floods

(c) Earthquakes

(d) Tornadoes

(e) Hurricanes

(f) Lightning

(g) Ice storms

(h) Wind

(i) Fire

(2) Human-caused conditions:

(a) Vandalism

(b) Sabotage

(c) Other similar occurrences

(3) Material and equipment failures

FPN No. 2: For natural conditions, EPSS design should consider the "100-year storm" flooding level or the flooding level predicted by the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) models for a Class 4 hurricane.

(B) Fire Protection. The room containing the EPSS equipment shall have a minimum 2-hour fire rating or be located in an adequate enclosure located outside the building capable of resisting the entrance of snow or rain at a maximum wind velocity required by local building codes. **[NFPA 110: 7.2.1.1]**

(C) Seismic Bracing. Seismic bracing shall be provided in accordance with (C)(1) through (C)(4).

(1) Operational Component Protection. In recognized seismic risk areas, EPS and EPSS components, such as electrical distribution lines, water distribution lines, fuel distribution lines, and other components that serve the EPS, shall be designed to minimize damage from earthquakes and to facilitate repairs if an earthquake occurs.**[NFPA 110: 7.11.5]**

(2) Electrical Component Protection. For systems in seismic risk areas, the EPS, transfer switches, distribution panels, circuit breakers, and associated controls shall be capable of performing their intended function during and after being subjected to the anticipated seismic shock. **[NFPA 110: 7.11.6]**

(3) Fuel Supply for Specific Seismic Design Categories. Seismic design category C, D, E, or F, as determined in accordance with ASCE 7, shall be provided with not less than 96 hours of fuel supply. **[NFPA 110: 5.1.2]**

(4) Batteries Installations. The installation of storage batteries for emergency and standby power shall comply with (1) and (2).

(1) In seismic design categories C, D, E, and F, as determined in accordance with ASCE 7, Minimum Design Loads for Buildings and Other Structures, the equipment shall be designed to reduce the risk of failure caused by the anticipated seismic ground motion. **[NFPA 111: 7.4.5.1]**

(2) The batteries shall be restrained in position, and the cables braced, to limit the chance of spillage or cable breakage due to the anticipated seismic ground movement. **[NFPA 111: 7.4.5.2]**

(D) Flood Protection. The rooms, shelters, or separate buildings housing Level 1 or Level 2 EPSS equipment shall be designed and located to minimize the damage from flooding, including that caused by the following:

(1) Flooding resulting from fire fighting

(2) Sewer water backup

(3) Causes identified in the documented risk analysis

(E) Lightning Protection. Power sources located outdoors shall be protected from lightning in accordance with recognized standards. **[NFPA 110: 7.11.4]**

FPN: This may include an listed lighting protection system or a documented protection system that can be provided upon request to the authority having jurisdiction for review.

(F) Freezing Protection. Protection against freezing shall be provided in accordance with (F)(1) through (F)(5).

(1) The prime mover for the power supply shall be heated as necessary to maintain the water jacket and battery temperature determined by the EPS manufacturer for cold start and load acceptance for the type of EPSS. **[NFPA 110: 5.3.1]**

(2) All prime mover heaters shall be automatically deactivated while the prime mover is running. Air-cooled prime movers shall be permitted to employ a heater to maintain lubricating oil temperature as recommended by the prime mover manufacturer. **[NFPA 110: 5.3.2]**

(3) Antifreeze protection shall be provided according to the manufacturer's recommendations. **[NFPA 110: 5.3.3]**

(4) Ether-type starting aids shall not be permitted. **[NFPA 110: 5.3.4]**

(5) The ambient air temperature in the power source equipment room or outdoor housing containing rotating equipment shall be not less than 4.5°C (40°F). **[NFPA 110: 7.7.6]**

(G) High Temperature Protection. The installed power source cooling system shall be designed to cool the prime mover at full rated load while operating in the particular installation circumstances of each power source. **[NFPA 110: 7.8.1]**

(H) Heating, Cooling, Ventilating, and Humidity Control for Storage Batteries. Environmental control for storage batteries shall be provided in accordance with (H)(1) through (H)(4).

(1) Storage batteries shall be located in an area provided with heating and cooling capable of ensuring, both during the time that normal power is available and during an emergency, that the equipment is operated within the manufacturer's ambient temperature specifications. **[NFPA 111: 7.3.1]**

(2) Provisions shall be made for sufficient diffusion and ventilation of the gases from the battery to limit the concentration of hydrogen. **[NFPA 111: 7.3.2]**

(3) For power source equipment using free electrolyte batteries with vents that allow the free evolution of gases, ventilation openings or airflow shall be situated to limit the possibility of the buildup of gas pockets. **[NFPA 111: 7.3.3.1]**

(4) Where needed, fans used to circulate and exhaust air shall use explosionproof motors designed for the application. **[NFPA 111: 7.3.3.2]**

585.71 Wind Protection. Where the critical operations system is subject to wind, provisions shall be documented in order to demonstrate design consideration are in place.

585.72 Illumination in Power Source Equipment Rooms. Illumination in power source equipment rooms while the critical operations system is in demand shall comply with 585.72(A) through 585.72(C).

(A) Installation of Battery-Powered Lighting. The power source equipment location(s) shall be provided with battery-powered lighting in addition to the normal lighting source. This requirement shall not apply to units located outdoors in enclosures that do not include walk-in access. **[NFPA 110: 7.3.1]**

(B) Supply Circuit for Charging Equipment. The lighting charging system and the normal service room lighting shall be supplied from the load side of the power transfer point. **[NFPA 110: 7.3.2]**

(C) Illumination Level. The intensity of illumination in the separate building or room housing the power source equipment shall be 32.3 lux (3.0 ft-candles), unless otherwise specified by a requirement recognized by the authority having jurisdiction.

Annex H: Availability and Reliability for Critical Operations Power Systems; and Development and Implementation of Functional Performance Tests (FPT's) for Critical Operations Power Systems

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

I. Availability and Reliability for Critical Operations Power Systems. Critical operations power systems may support facilities with a variety of objectives that are vital to public safety. Often these objectives are of such critical importance that system downtime is costly in terms of economic losses, loss of security, or loss of mission. For those reasons the availability of the Critical Operations Power System, the percentage of time that the system is in service, is important to those facilities. Given a specified level of availability the reliability and maintainability requirements are then derived based on that availability requirement.

<u>Availability</u>

Availability is defined as the percentage of time that a system is available to perform its function(s). Availability is measured in a variety of ways, including:

MTBF/ (MTBF+MTTR)

Where, MTBF is mean time between failures
MTTF is mean time to failure
MTTR is mean time to repair

See table below for an example to establish required availability for critical operation power systems:

Availability	Hours of Down Time*
0.9	876
0.99	87.6
0.999	8.76
0.9999	0.876
0.99999	0.0876
0.999999	0.00876
0.9999999	0.000876

* Based on a year of 8760 hours.

Availability of a system in actual operations is determined by the following:

(1) The frequency of occurrence of failures. Failures may prevent the system from performing its function or cause a degraded effect on system operation. Frequency of failures is directly related to the system's level of reliability.

(2) The time required restoring operations following a system failure or the time required to perform maintenance to prevent a failure. These times are determined in part by the system's level of maintainability.

(3) The logistics provided to support maintenance of the system. The number and availability of spares, maintenance personnel, and other logistics resources (refueling, etc.) combined with the system's level of maintainability determine the total downtime following a system failure.

Reliability

Reliability is concerned with the probability and frequency of failures (or lack of failures). A commonly used measure of reliability for repairable systems is MTBF. The equivalent measure for non-repairable items is MTTF. Reliability is more accurately expressed as a probability over a given duration of time, cycles etc. For example, the reliability of a power plant might be stated as 95% probability of no failure over a 1000-hour operating period while generating a certain level of power. Reliability is usually defined in two ways (the electrical power industry has historically not used these definitions):

(1) The duration or probability of failure-free performance under stated conditions

(2) The probability that an item can perform its intended function for a specified interval under stated conditions. (For non-redundant items this is equivalent to the preceding definition (1). For redundant items this is equivalent to the definition of mission reliability).

Maintainability

Maintainability is a measure of how quickly and economically failures can be prevented through preventive maintenance, or system operation can be restored following failure through corrective maintenance. A commonly used measure of maintainability in terms of corrective maintenance is the mean time to repair (MTTR). Maintainability is not the same thing as maintenance. Maintainability is a design parameter, while maintenance consists of actions to correct or prevent a failure event.

Improving Availability

The appropriate methods to use for improving availability depend on whether the facility is being designed or is already in use. For both cases a reliability/availability analysis should be performed to determine the availability of the old system or proposed new system in order to ascertain the hours of downtime (see table above). The AHJ or government agency should dictate how much downtime is acceptable.

Existing facilities: For a facility that is being operated, two basic methods are available for improving availability when the current level of availability is unacceptable:

(1) Selectively adding redundant units (e.g., generators, chillers, fuel supply, etc) to eliminate sources of single-point failure, and

(2) Optimizing maintenance using a reliability-centered maintenance (RCM) approach to minimize downtime. [Refer to NFPA70B**]**

A combination of the previous two methods can also be implemented. A third very expensive method is to redesign subsystems or to replace components and subsystems with higher reliability items. [Refer to NFPA70B**]**

New facilities: The opportunity for high availability and reliability is greatest when designing a new facility. By applying an effective reliability strategy, designing for maintainability, and ensuring that manufacturing and commissioning do not negatively affect the inherent levels of reliability and maintainability, a highly available facility will result. The approach should be as follows:

(1) Develop and determine a reliability strategy (establish goals, develop system model, design for reliability, conduct reliability development testing, conduct reliability acceptance testing, system delivery, maintain design reliability, maintain design reliability in operation).

(2) Develop a reliability program. This is the application of the reliability strategy to a specific system, process or function. Each step in the strategy above requires the selection and use of specific methods and tools. For example, various tools can be used to develop requirements or evaluating potential failures. To derive requirements analytical models can be used like Quality Function Development (a technique for deriving more detailed, lower-level requirements from one level to another, beginning with mission requirements i.e. customer needs). This was developed as part of the Total Quality Management movement. Parametric models can also be used to derive design values of reliability from operational values and vice versa. Analytical methods include things like thermal analysis, durability analysis, predictions etc. Finally, one should evaluate possible failures. A Failure Modes and Effects Criticality Analysis (FMECA and Fault Tree Analysis (FTA) are two different methods for evaluating possible failures. The mission facility engineer should determine which method to use or whether to use both.

(3) The entire effort for designing for reliability begins with identifying the mission critical facility's reliability requirements. These requirements are stated in a variety of ways, depending on the customer and the specific system. For a mission critical facility it would be the Mission Success Probability.

II. Development and Implementation of Functional Performance Tests (FPT's) for Critical Operations Power Systems

Development of FPT:

(1) Submit functional performance tests (FPTs). System/component tests or FPTs shall be developed from submitted drawings, SODs and SOMMs, including large component testing (i.e. transformers, cable, generators, UPS), and how components operate as part of the total system. The commissioning authority shall develop the test and shall not be the installation contractor (or sub-contractor).
As the equipment/components/systems are installed quality assurance procedures shall be administered to verify components are installed in-accordance with minimum manufacturers recommendations, safety codes, and acceptable installation practices. Quality assurance discrepancies shall be identified and added to a "commissioning action list" that must be rectified as past of the commissioning program. These items would usually be discussed during commissioning meetings. Discrepancies are usually identified initially by visual inspection.

(2) Review FPTs. The tests shall be reviewed by the customer, electrical contractors, quality assurance personnel, maintenance personnel, etc (the commissioning team). Areas of concern include: 1) all functions of the system being tested, 2) all major components included, 3) do the tests reflect the system operating documents, 4) verify the tests make sense, etc.:

(3) Make changes to FPTs as required. The commissioning authority shall implement the corrections, questions answered, and additions.

(4) FPT's approval. After the changes are made to the FPTs, they shall be submitted to the commissioning team. When it is acceptable the customer or his/her designated approval authority shall approve the FPTs. It should be noted that even though the FPT is approved, problems that arise during the test (or areas not covered) shall be addressed.

Testing Implementation for FPT's. The final step in the successful commissioning plan is testing and proper execution of system-integrated tests.

(1) **Systems ready to operate.** The FPTs can be implemented as various systems become operative (i.e. test the generator system) or when the entire system is installed. However the final "pull the plug" test shall be performed after all systems are completely installed. If the electrical contractor (or sub-contractor) implements the FPTs then a witness shall initial each step of the test. The electrical contractor shall not employ the witness directly or indirectly.

(2) **Perform tests (FPT's)**: If the system fails the test then the problem shall be resolved and equipment or system re-tested or testing requirements shall be re-analyzed until successful tests are witnessed. Once the system or equipment passes test it shall be verified by designated commissioning official.

(3) **Customer receives system**. After all tests are completed (including the "pull the plug" test) the system shall be turned over to the customer.

Substantiation: This proposal is submitted on behalf of the NEC Task Group on Emergency and Standby Power Systems for Homeland Security. Members of this Task Group are:

Donald Bliss, Chair NI 2 Center for Infrastructure Expertise
Tarry Baker Broward County Board of Rules & Appeals
Lawrence Bey Cummins Power Generation
Richard Bingham Dranetz-BMI
Jeffrey Boksiner Telcordia Technologies, Inc.
James Carroll Square D Company
Palmer Hickman NJATC
Alan Manche Square D Company
Gil Moniz NEMA
Wayne Moore Hughes Associates, Inc.
Timothy Owens City of Santa Clara
Angie Stoyas US Army Corp of Engineers
Timothy P. Zgonena Underwriters Laboratories, Inc.

At their October 2005 meeting, the National Electrical Code Technical Correlating Committee voted to recommend to the NFPA Standard Council that a new Code-Making Panel 20 be created for the 2008 NEC revision cycle. This CMP will be responsible for proposals and comments related to critical operations power systems and the development of a new article covering this topic. At their October meeting, the NFPA Standards Council accepted the recommendation of the NEC TCC and CMP-20 was established. The members of the original task group will serve on this new CMP.

Recent terrorist events and natural disasters, including the World Trade Center attack 2005 hurricane season, most notably Hurricane Katrina have brought to light the need to assess the adequacy of current requirements in the National Electrical Code relating to electrical infrastructure protection and reliability. The mission of this task group from their first meeting in August 2005 was to review current requirements in the NEC and other pertinent NFPA codes and standards covering emergency and standby power systems and sources, and signaling systems for the purpose of identifying where the current minimum requirements do not adequately address the level of integrity and quality for power sources, power distribution, and signaling systems required due to threats and/or acts of terrorism, manmade disasters and natural disasters.

The result of the task group's work at their August 2005 meeting and subsequent conference call in October was to develop a new Article 585 entitled, Critical Operations Power Systems. Such systems may be installed throughout an entire facility or may be limited to specific areas depending upon the nature of the operations and where they are to be conducted within a specific facility. The task group reviewed the following considerations in developing the proposed new article.

Types of facilities where enhanced electrical infrastructure for continuity of operation may be deemed necessary:

Air traffic control centers
Chemical, petrochemical, and hazardous material (including biohazard) handling facilities
Communications centers, telephone exchanges, cellular tower sites
911 centers
Central station service facilities (fire and security system monitoring)
Financial, banking, business data processing facilities
Hospitals and associated support facilities
Police, fire, civil defense facilities including power for radio repeater operations
Emergency evacuation centers
Transportation infrastructure – airports, rail stations, seaports
Municipal infrastructure – water and sewer treatment facilities
Fuel supply pumping stations (i.e. natural gas distribution and delivery infrastructure
Offices and facilities deemed critical to continuity of government
Radio and television stations

Types of hazards that directly threaten electrical infrastructure or require continuity of operation:

Natural:
Earthquakes
Floods
Wind (hurricane, tornado)
Ice and freezing
Lightning
Accidental fire and explosion
Human initiated events:
Terrorist acts
Malicious mischief/vandalism

Electrical infrastructure exposures:

Utility power supply
On-site power supply including fuel for on-site EPS equipment
Power distribution system (feeders and branch circuits)
Signaling, fire alarm and communications systems

Reasons for continuity of electrical, signaling, fire alarm, and communications systems operation:

Evacuation
Relocation
Hazard mitigation
Critical operations continuity (communications, alarm and monitoring of alarm systems)
Business continuity

How should electrical infrastructure be protected/designed for reliability and survivability?

Hardening of wiring systems within buildings
Location – limiting access to critical equipment
Location – mitigating effects of natural disasters
Redundancy

Risk assessment considerations

Which facilities are most critical?
Which systems are most critical?
Development of risk assessment criteria.

The task group's work provides new minimum requirements for those electrical systems where continuity of power and operation of systems is paramount. These new requirements go beyond the scopes of the requirements of Articles 700 and 701 as those systems were developed primarily to allow for safe building egress for and to aid firefighters under emergency conditions. The requirements of Article 585 are designed to maintain power continuity and protect wiring systems against natural disasters and terrorist acts in those facilities where the continuity of operation is critical to public and occupant safety. These systems are not intended to get people out of buildings. The need for the types of enhanced electrical systems covered in the new Article 585 has been dramatically illustrated by recent manmade and natural disasters and the continuing threat of such events occurring in the future.

Panel Meeting Action: Accept in Principle in Part

Article 585 Critical Operations Power Systems (COPS)

FPN: Rules that are followed by a reference in brackets contain text that has been extracted from NFPA 110, *Standard for Emergency and Standby Power Systems*, 2005 edition, NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 2005 Edition and NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs*, 2004 edition. Only editorial changes were made to the extracted text to make it consistent with this Code.

I. General

585.1 Scope. The provisions of this article apply to the electrical installation, operation, monitoring, control, and maintenance of critical operations power systems consisting of circuits and equipment intended to supply, distribute and control electricity to designated vital operations in the event of disruption to elements of the normal system.

Critical operations power systems are those systems so classed by municipal, state, federal, or other codes, by any governmental agency having jurisdiction or by facility engineering documentation establishing the necessity for such a system.

FPN No. 1: Critical Operations Power Systems are generally installed in vital infrastructure facilities that, if destroyed or incapacitated, would disrupt national security, the economy, public health or safety; and where enhanced electrical infrastructure for continuity of operation has been deemed necessary by governmental authority.

FPN No. 2: For further information on disaster and emergency management see NFPA 1600-2004 edition, *Standard on Disaster/Emergency Management and Business Continuity Programs*.

FPN No. 3: For further information regarding performance of emergency and standby power systems, see NFPA 110-2005, *Standard for Emergency and Standby Power Systems.*

FPN No. 4: For further information regarding performance and maintenance of emergency systems in health care facilities, see NFPA 99-2005, *Standard for Health Care Facilities.*

FPN No. 5: For specification of locations where emergency lighting is considered essential to life safety, see NFPA 101®-2006, *Life Safety Code®.*

FPN No. 6: Threats to facilities that may require transfer of operation to the critical systems include both naturally occurring hazards and human caused events.

See also Section A.5.3.2, NFPA 1600-2004

585.2 Definitions.

Commissioning. The acceptance testing, integrated system testing, operational tune-up, and start-up testing, is the process by which baseline tests results verify the proper operation and sequence of operation of electrical equipment, in addition to developing baseline criteria by which future trend analysis can identify equipment deterioration.

Critical Operations Power Systems (COPS). Power systems for facilities or parts of facilities that require continuous operation for the reasons of public safety, emergency management, national security, or business continuity.

Designated Critical Operations Areas (DCOA). Areas within a facility or site designated as requiring critical operations power.

Supervisory Control and Data Acquisition (SCADA). An electronic system that provides monitoring and controls for the operation of the critical operations power system. This can include the fire alarm system, security system, control of the HVAC, the start/stop/monitoring of the power supplies and electrical distribution system, annunciation and communication equipment to emergency personnel, facility occupants and remote operators.

585.3 Application of Other Articles. Except as modified by this article, all applicable articles of this Code shall apply.

585.4 Risk Assessment. Risk assessment for critical operations power systems shall be documented and shall be conducted in accordance with 585.4(A) through 585.4(D).

FPN: Chapter 5 of NFPA 1600-2004, *Standard on Disaster/Emergency Management and Business Continuity Programs*, provides additional guidance concerning risk assessment and hazard analysis. **(A) Conducting Risk Assessment.** In critical operations power systems, risk assessment shall be performed to identify hazards, the likelihood of their occurrence, and the vulnerability of the electrical system to those hazards.

(B) Identification of Hazards. Hazards to be considered at a minimum shall include, but shall not be limited to:

1) naturally occurring hazards (geological, meteorological, and biological)

2) human-caused events (accidental and intentional) [**NFPA 1600, 5.3.2]**

(C) Developing Mitigation Strategy. Based on the results of the risk assessment, a strategy shall be developed and implemented to mitigate the hazards that have not been sufficiently mitigated by the prescriptive requirements of this Code.

585.5 Physical Security. Physical security shall be provided for critical operations power systems in accordance with (1) and (2).

(1) Based on the results of the risk assessment, a strategy for providing physical security for - critical operations power systems shall be developed and implemented.

(2) Electrical circuits and equipment for critical operations power systems shall be accessible to qualified personnel only.

585.6 Testing and Maintenance.

(A) Conduct or Witness Test. The authority having jurisdiction shall conduct or witness a test of the complete system upon installation and periodically afterward.

(B) Tested Periodically. Systems shall be tested periodically on a schedule acceptable to the authority having jurisdiction to ensure the systems are maintained in proper operating condition.

(C) Maintenance. The authority having jurisdiction shall require a documented preventive maintenance program for critical operations power systems. **FPN:** For testing and maintenance procedures, see NFPA 70B-2002 *Recommended Practice for Electrical Equipment Maintenance.*

(D) Written Record. A written record shall be kept of such tests and maintenance.

(E) Testing Under Load. Means for testing all critical power systems during maximum anticipated load conditions shall be provided.

FPN: For testing and maintenance procedures of emergency power supply systems (EPSSs) that are also applicable to COPS, see NFPA 110-2005, *Standard for Emergency and Standby Power Systems.*

585.8 Commissioning.

(A) Commissioning Plan. A commissioning plan shall be developed and documented.

FPN: For further information on developing a commissioning program see NFPA 70B-2002, *Recommended Practice for Electrical Equipment Maintenance*

(B) Component and System Tests. The installation of the equipment shall undergo component and system tests to ensure that, when energized the system will function properly.

(C) Baseline Test Results. Document a set of baseline test results for comparison in future periodic maintenance testing to identify equipment deterioration.

(D) Functional Performance Tests: A functional performance test program shall be established, documented and executed upon complete installation of the critical system in order to establish a baseline reference for future performance requirements.

FPN: See Annex X for more information on developing and implementing a functional performance test program.

II. Circuit Wiring and Equipment

585.10 Feeder and Branch Circuit Wiring.

(A) Identification.

(1)Boxes and Enclosures.All boxes and enclosures (including transfer switches, generators, and power panels) for critical operations power system circuits shall be permanently marked so they will be readily identified as a component of the system. (2) Receptacle Identification. The cover plates for the electrical receptacles or the electrical receptacles themselves supplied from the COPS shall have a distinctive color or marking so as to be readily identifiable.

(B) Wiring. Wiring of two or more COPS circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from a COPS source or COPS source distribution overcurrent protection to critical loads shall be kept entirely independent of all other wiring and equipment.

Exception: Where the COPS feeder is installed in transfer equipment enclosures.

(C) COPS Feeder Wiring Requirements. COPS feeders shall comply with 585.10(C)(1) through (C)(3).

(1) Protection Against Physical Damage. The wiring of the COPS system shall be protected against physical damage. The following wiring methods shall be permitted to be installed in accordance with the following:

(1) Rigid Metal Conduit, Intermediate Metal Conduit, Type MI cable, or Schedule 80 rigid nonmetallic conduit.

(2) Where encased in not less than 50 mm (2 in.) of concrete, Schedule 40 rigid nonmetallic conduit, flexible nonmetallic or jacketed metallic raceways, or jacketed metallic cable assemblies listed for installation in concrete.

(3) Where provisions must be made for flexibility at equipment connection, one or more of the following shall also be permitted:
(1) Flexible metal fittings
(2) Flexible metal conduit with listed fittings
(3) Liquidtight flexible metal conduit with listed fittings

(2) Fire Protection for Feeders. Feeders shall meet one of the following conditions:

(1) Be a listed electrical circuit protective system with a minimum 1-hour fire rating

(2) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 1 hour

(3) Be embedded in not less than 50 mm (2 in.) of concrete

(4) Be a cable listed to maintain circuit integrity for not less than 1 hour when installed in accordance with the listing requirement

(3) Floodplain Protection. Where COPS feeders are installed below the level of the 100-year floodplain, the wiring method and contained circuit conductors shall be listed for use in a wet location.

(D) **COPS Branch Circuit Wiring .** COPS branch circuits installed outside the DCOA shall comply with the physical and fire protection requirements of 585.10(C)(1) through (3).

585.11 Branch Circuit and Feeder Distribution Equipment.

(A) Branch Circuit Distribution Equipment. COPS branch circuit distribution equipment shall be located within the same DCOA as the branch circuits it supplies.

(B) Feeder Distribution Equipment. Equipment for COPS feeder circuits in (including transfer equipment, transformers, and panelboards) shall comply with (1) and (2).

(1) Be located in spaces with a 2-hour fire resistance rating

(2) Be located above the 100 year floodplain.

585.12 Feeders and Branch Circuits Supplied by COPS. Feeders and branch circuits supplied by the COPS shall only supply equipment specified as required for critical operations use.

585.14 Wiring of HVAC, Fire Alarm, Security, Emergency Communications, and Signaling Systems. The wiring of heating, ventilation, and air-conditioning remote-control and signaling circuits; fire alarm circuits; circuits for security; circuits for emergency communications; and signal systems shall comply with (1) through (9) as applicable.

(1) Signal and communication wires shall use shielded twisted pairs in any of the metal conduits installed in accordance with 585.10(C).

(2) Shields of signal and communication wiring shall be continuous. (3)Fiber optic cables shall be used for connections between two or more buildings on the property and under single management. (4) Listed secondary protectors shall be provided at the terminals of the communication circuits.

(5) Conductors for all control circuits rated above 50V shall be installed with wire rated not less than 600V.

(6) Communications, fire alarm, and signaling circuits shall use relays with contact ratings that exceed circuit voltage and current ratings in the controlled circuit.

(7) Riser communication cables shall be 2-hour fire rated cable or a listed 2-hour electrical circuit protective system.

(8) Control, monitoring, and power wiring to HVAC systems shall be 2-hour fire rated cable or a listed 2-hour electrical circuit protective system.

III. Power Sources and Connection

585.20 Sources of Power.

(A) General Requirements. Current supply shall be such that, in the event of failure of the normal supply to the DCOA,critical operations power shall be available within the time required for the application. . The supply system for critical operations power, in addition to the normal services to the building and meeting the general requirements of this section, shall be oneor more of the types of systems described in 585.20(D) through 585.20(H).**FPN:** Assignment of degree of reliability of the recognized critical operations power system depends on the careful evaluation in accordance with the risk assessment.

(B) Fire Protection. Where located within a building,equipment for sources of power as described in 585.10(D) through 585.10(H) shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-hour fire rating.

(C) Grounding. All sources of power shall be grounded as a separately derived source in accordance with 250.30.

Exception: Where the equipment containing the main bonding jumper or system bonding jumper for the normal source and the feeder wiring to the transfer equipment are installed in accordance with 585.10(C) and 585.11(B).

(D) Surge Protection Devices. Surge protection devices shall be provided at all facility distribution voltage levels.

(E) Storage Battery.

An automatic battery charging means shall be provided. Batteries shall be compatible with the charger for that particular installation. For a sealed battery, the container shall not be required to be transparent. However, for the lead acid battery that requires water additions, transparent or translucent jars shall be furnished. Automotive-type batteries shall not be used.

(F) Generator Set.

(1) Prime Mover-Driven. Generator sets driven by a prime mover shall be provided with means for automatically starting the prime mover on failure of the normal service. A time-delay feature permitting a minimum 15-minute setting shall be provided to avoid retransfer in case of short-time reestablishment of the normal source.

(2) Power for fuel transfer pumps. Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the COPS.

(3) Dual Supplies. Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems. Means shall be provided for automatically transferring from one fuel supply to another where dual fuel supplies are used.

(4) Battery Power and Dampers. Where a storage battery is used for control or signal power or as the means of starting the prime mover, it shall be suitable for the purpose and shall be equipped with an automatic charging means independent of the generator set. Where the battery charger is required for the operation of the generator set, it shall be connected to the COPS. Where power is required for the operation of dampers used to ventilate the generator set, the dampers shall be connected to the COPS.

(5) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.

(6) Mean for Connecting Portable or Vehicle-Mounted Generator. Where the COPS is supplied by a single generator, a means to connect a portable or vehicle-mounted generator shall be provided.

(7) On-Site Fuel Supply. Where internal combustion engines are used as the prime mover, a on-site fuel supply shall be provided. The on-site fuel supply shall be secured and protected in accordance with the risk assessment.

(G) Uninterruptible Power Supplies. Uninterruptible power supplies used as the sole source of power for COPS shall comply with the applicable provisions of 585.20(E) and 585.20(F).

(H) Fuel Cell System.. Installation of a fuel cell system shall meet the requirements of Parts II through VIII of Article 692.

585.22 Capacity of Power Sources.

(A) Capacity and Rating. A COPS shall have capacity and rating for all loads to be operated simultaneously for continuous operation with variable load for an unlimited number of hours, except for required maintenance of the power source. A portable, temporary or redundant alternate power source shall be available for use whenever the COPS power source is out of service for maintenance or repair.

(B) Selective Load Pickup, Load Shedding, and Peak Load Sharing. The alternate power source shall be permitted to supply COPS , emergency, legally required standby and optional loads where the source has adequate capacity or where automatic selective load pickup and load shedding is provided as needed to ensure adequate power to (1) the COPS and emergency circuits, (2) the legally required standby circuits, and (3) the optional standby circuits, in that order of priority. The alternate power source shall be permitted to be used for peak load shaving, provided these conditions are met.

Peak load-shaving operation shall be permitted for satisfying the test requirement of 585.6(B), provided all other conditions of 585.6 are met.

(C)Duration of COPS Operation. The alternate power source shall be capable of operating the COPS for a minimum of 72 hours at full load of DCOA with a steady state voltage within ± 10% of nominal utilization voltage.

(D) Ventilation. Adequate ventilation shall be provided for the alternate power source for continued operation under maximum anticipated ambient temperatures.

FPN: NFPA 110-2005, *Standard for Emergency and Standby Power Systems* and NFPA 111-2005, *Standard for Stored Energy Emergency and Standby Power Systems* include additional information on ventilation air for combustion and cooling.

585.24 Transfer Equipment.

(A) General. Transfer equipment including automatic transfer switches, shall be automatic and identified for emergency use. ,Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and critical operations sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.**(B) Bypass Isolation Switches.** Means shall be permitted to bypass and isolate the transfer equipment. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.

(C) Automatic Transfer Switches. Automatic transfer switches shall comply with (C)(1) and (C)(2).

(1) Automatic transfer switches shall be listed for emergency use.

(2) Automatic transfer switches shall be electrically operated and mechanically held.

(D) Use. Transfer equipment shall supply only COPS loads.

585.30 Branch Circuits Supplied by COPS. Branch circuits supplied by the COPS shall only supply equipment specified as required for critical operations use.

III. Overcurrent Protection

585.50 Accessibility. The feeder- and branch-circuit overcurrent devices shall be accessible to authorized persons only.

585.52 Ground-Fault Protection of Equipment.

(A) Applicability. The requirements of 585.52 shall apply to critical operations (including multiple occupancy buildings) with critical operation areas.

(B) Feeders. Where ground-fault protection is provided for operation of the service disconnecting means or feeder disconnecting means as specified by 230.95 or 215.10, an additional step of ground-fault protection shall be provided in all next level feeder disconnecting means downstream toward the load. Such protection shall consist of overcurrent devices and current transformers or other equivalent protective equipment that shall cause the feeder disconnecting means to open.

The additional levels of ground-fault protection shall not be installed on electrical systems that are not solidly grounded wye systems with greater than 150 volts to ground but not exceeding 600 volts phase-to-phase

(C) Testing. When equipment ground-fault protection is first installed, each level shall be tested to ensure ground fault protection is operational.

FPN: Testing is intended to verify the ground fault function is operational. The performance test is not intended to verify selectivity in 585.52(D) as this is often coordinated similar to circuit breakers by reviewing tie and current curves and properly setting the equipment. (selectivity of fuses and circuit breakers are not performance tested for overload and short circuit)

(D) Selectivity. Ground-fault protection for operation of the service and feeder disconnecting means shall be fully selective such that the feeder device, but not the service device, shall open on ground faults on the load side of the feeder device. A six-cycle minimum separation between the service and feeder ground-fault tripping bands shall be provided. Operating time of the disconnecting devices shall be considered in selecting the time spread between these two bands to achieve 100 percent selectivity.

FPN: See 230.95, Fine Print Note No.4, for transfer of alternate source where ground-fault protection is applied.

585.54 Coordination. Critical operations power system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.

IV. System Performance and Analysis

585.64 Emergency Operations Plan. A facilities with a COPS shall have documented an emergency operations plan. The plan shall consider emergency operations and response, recovery, and continuity of operations.

FPN: NFPA 1600-2004, *Standard on Disaster/Emergency Management and Business Continuity Programs* Section 5.7 provides guidance for the development and implementation of emergency plans.

Annex H: Availability and Reliability for Critical Operations Power Systems; and Development and Implementation of Functional Performance Tests (FPT's) for Critical Operations Power Systems

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

I. Availability and Reliability for Critical Operations Power Systems. Critical operations power systems may support facilities with a variety of objectives that are vital to public safety. Often these objectives are of such critical importance that system downtime is costly in terms of economic losses, loss of security, or loss of mission. For those reasons the availability of the Critical Operations Power System, the percentage of time that the system is in service, is important to those facilities. Given a specified level of availability the reliability and maintainability requirements are then derived based on that availability requirement.

Availability

Availability is defined as the percentage of time that a system is available to perform its function(s). Availability is measured in a variety of ways, including:

MTBF/ (MTBF+MTTR)

Where, MTBF is mean time between failures
MTTF is mean time to failure
MTTR is mean time to repair

See table below for an example to establish required availability for critical operation power systems:

Availability	Hours of Down Time*
0.9	876
0.99	87.6
0.999	8.76
0.9999	0.876
0.99999	0.0876
0.999999	0.00876
0.9999999	0.000876

* Based on a year of 8760 hours.

Availability of a system in actual operations is determined by the following:

(1) The frequency of occurrence of failures. Failures may prevent the system from performing its function or cause a degraded effect on system operation. Frequency of failures is directly related to the system's level of reliability.

(2) The time required restoring operations following a system failure or the time required to perform maintenance to prevent a failure. These times are determined in part by the system's level of maintainability.

(3) The logistics provided to support maintenance of the system. The number and availability of spares, maintenance personnel, and other logistics resources (refueling, etc.) combined with the system's level of maintainability determine the total downtime following a system failure.

Reliability

Reliability is concerned with the probability and frequency of failures (or lack of failures). A commonly used measure of reliability for repairable systems is MTBF. The equivalent measure for non-repairable items is MTTF. Reliability is more accurately expressed as a probability over a given duration of time, cycles etc. For example, the reliability of a power plant might be stated as 95% probability of no failure over a 1000-hour operating period while generating a certain level of power. Reliability is usually defined in two ways (the electrical power industry has historically not used these definitions):

(1) The duration or probability of failure-free performance under stated conditions

(2) The probability that an item can perform its intended function for a specified interval under stated conditions. (For non-redundant items this is equivalent to the preceding definition (1). For redundant items this is equivalent to the definition of mission reliability).

Maintainability

Maintainability is a measure of how quickly and economically failures can be prevented through preventive maintenance, or system operation can be restored following failure through corrective maintenance. A commonly used measure of maintainability in terms of corrective maintenance is the mean time to repair (MTTR). Maintainability is not the same thing as maintenance. Maintainability is a design parameter, while maintenance consists of actions to correct or prevent a failure event.

Improving Availability

The appropriate methods to use for improving availability depend on whether the facility is being designed or is already in use. For both cases a reliability/availability analysis should be performed to determine the availability of the old system or proposed new system in order to ascertain the hours of downtime (see table above). The AHJ or government agency should dictate how much downtime is acceptable.

Existing facilities: For a facility that is being operated, two basic methods are available for improving availability when the current level of availability is unacceptable:

(1) Selectively adding redundant units (e.g., generators, chillers, fuel supply, etc) to eliminate sources of single-point failure, and

(2) Optimizing maintenance using a reliability-centered maintenance (RCM) approach to minimize downtime. [Refer to NFPA70B**]**

A combination of the previous two methods can also be implemented. A third very expensive method is to redesign subsystems or to replace components and subsystems with higher reliability items. [Refer to NFPA70B**]**

New facilities: The opportunity for high availability and reliability is greatest when designing a new facility. By applying an effective reliability strategy, designing for maintainability, and ensuring that manufacturing and commissioning do not negatively affect the inherent levels of reliability and maintainability, a highly available facility will result. The approach should be as follows:

(1) Develop and determine a reliability strategy (establish goals, develop system model, design for reliability, conduct reliability development testing, conduct reliability acceptance testing, system delivery, maintain design reliability, maintain design reliability in operation).

(2) Develop a reliability program. This is the application of the reliability strategy to a specific system, process or function. Each step in the strategy above requires the selection and use of specific methods and tools. For example, various tools can be used to develop requirements or evaluating potential failures. To derive requirements analytical models can be used like Quality Function Development (a technique for deriving more detailed, lower-level requirements from one level to another, beginning with mission requirements i.e. customer needs). This was developed as part of the Total Quality Management movement. Parametric models can also be used to derive design values of reliability from operational values and vice versa. Analytical methods include things like thermal analysis, durability analysis, predictions etc. Finally, one should evaluate possible failures. A Failure Modes and Effects Criticality Analysis (FMECA and Fault Tree Analysis (FTA) are two different methods for evaluating possible failures. The mission facility engineer should determine which method to use or whether to use both.

(3) The entire effort for designing for reliability begins with identifying the mission critical facility's reliability requirements. These requirements are stated in a variety of ways, depending on the customer and the specific system. For a mission critical facility it would be the Mission Success Probability.

II. Development and Implementation of Functional Performance Tests (FPT's) for Critical Operations Power Systems

Development of FPT:

(1) Submit functional performance tests (FPTs). System/component tests or FPTs shall be developed from submitted drawings, SODs and SOMMs, including large component testing (i.e. transformers, cable, generators, UPS), and how components operate as part of the total system. The commissioning authority shall develop the test and shall not be the installation contractor (or sub-contractor).
As the equipment/components/systems are installed quality assurance procedures shall be administered to verify components are installed in-accordance with minimum manufacturers recommendations, safety codes, and acceptable installation practices. Quality assurance discrepancies shall be identified and added to a "commissioning action list" that must be rectified as past of the commissioning program. These items would usually be discussed during commissioning meetings. Discrepancies are usually identified initially by visual inspection.

(2) Review FPTs. The tests shall be reviewed by the customer, electrical contractors, quality assurance personnel, maintenance personnel, etc (the commissioning team). Areas of concern include: 1) all functions of the system being tested, 2) all major components included, 3) do the tests reflect the system operating documents, 4) verify the tests make sense, etc.:

(3) Make changes to FPTs as required. The commissioning authority shall implement the corrections, questions answered, and additions.

(4) FPT's approval. After the changes are made to the FPTs, they shall be submitted to the commissioning team. When it is acceptable the customer or his/her designated approval authority shall approve the FPTs. It should be noted that even though the FPT is approved, problems that arise during the test (or areas not covered) shall be addressed.

Testing Implementation for FPT's. The final step in the successful commissioning plan is testing and proper execution of system-integrated tests.

(1) **Systems ready to operate.** The FPTs can be implemented as various systems become operative (i.e. test the generator system) or when the entire system is installed. However the final "pull the plug" test shall be performed after all systems are completely installed. If the electrical contractor (or sub-contractor) implements the FPTs then a witness shall initial each step of the test. The electrical contractor shall not employ the witness directly or indirectly.

(2) **Perform tests (FPT's)**: If the system fails the test then the problem shall be resolved and equipment or system re-tested or testing requirements shall be re-analyzed until successful tests are witnessed. Once the system or equipment passes test it shall be verified by designated commissioning official.

(3) Customer receives system. After all tests are completed (including the "pull the plug" test) the system shall be turned over to the customer.

Annex I

585.60 Supervisory Control and Data Acquisition (SCADA).

(A) General. Where provided, the general requirements in (A)(1) through (A)(11) shall apply to SCADA systems.

(1) The SCADA system for the COPS loads shall be separate from the building management SCADA system.

(2) No single point failure shall be able to disable the SCADA system.

(3) The SCADA system shall be permitted to provide control and monitor electrical and mechanical utility systems relate to mission critical loads, including, but not limited to:

a. Fire alarm system

b. Security system

c. Power distribution

d. Power generation

e. HVAC and Ventilation (damper position, air flow speed and direction)

f. Load shedding

g. Fuel levels or hours of operation

(4) Before installing or employing a SCADA system, an operations and maintenance analysis and risk assessment shall be performed to provide the maintenance parameter data

(5) Redundant system shall be provided in either warm or hot standby.

(6) The controller shall be a programmable logic controller (PLC).

(7) The SCADA system shall utilize open, not proprietary protocols.

(8) The SCADA system shall be able to assess the damage and determining system integrity after the "event"

(9) The monitor display shall provide graphical user interface for all major components monitored and controlled by the SCADA system, with color schemes readily recognized by typical user.

(10) The SCADA system shall have the capability to provide storage of critical system parameters at a 15 minute rate or more often when out-of-limit conditions exist.

(11) The SCADA system shall have a separate data storage facility not located in same vicinity.

(B) Power supply. The SCADA system power supply shall comply with (B)(1) through (B)(3).

(1) The power supply shall be provided with direct current station battery system, rated between 24 and 125V dc with a 72-hour capacity.

(2) The batteries of the SCADA system shall be separate from batteries for other electrical systems.

(3) The power supply shall be provided with properly installed surge protective device (TVSS) at its terminals with direct low impedance path to ground. Protected and unprotected circuits shall be physically separated to prevent coupling.

(C) Security against hazards. Security against hazards shall be provided in accordance with (C)(1) through (C)(6).

(1) Controlled physical access by authorized personnel to only the system operational controls and software shall be provided.

(2) The SCADA system shall be protected against dust, dirt, water, and other contaminates by specifying enclosures appropriate for the environment.

(3) Conduit and tubing shall not violate the integrity of the SCADA system enclosure.

(4) The SCADA system shall be located in the same secure locations as the secured systems that they monitor and control.

(5) The SCADA system shall be provided with, dry agent fire protection systems or double interlocked pre-action sprinkler systems using cross-zoned detection, to minimize the threat of accidental water discharge into unprotected equipment. The fire protection systems shall be monitored by the fire alarm system in accordance with NFPA 72-2002, *National Fire Alarm Code*®.

(6) The SCADA system shall not be connected to other network communications outside the secure locations without encryption or use of fiber optics.

Panel Statement: In addition to editorial changes, for clarity and style manual compliance, the panel has made technical revisions to the recommended text for the purposes of providing enforcable, prescriptive requirements for the installation and operation of a highly reliable power system for the operation of a mission critical facility. Additionally, there are two proposed annexes intended to provide useful design information. The following specific rationale is provided for technical changes made by the panel:
1) 585.1-the scope has been revised to include text that is similar to 700.1 in regard to who is responsible for classifying those facilities requiring mission critical power systems. The panel does not intend that the AHJ enforcing this Code be responsible for determining what facilities must have a critical operations power system. The panel understands that the scope, title and location of this article are under the purview of the TCC and recommend that

they accept the revised scope and title.

2) 585.1-Recommended Fine Print Note No.2 has been deleted because of concern that it could be misapplied in making the determination on which facilities fall within the scope of this article.

3) 585.1-A new fine print note has been added to reference NFPA 1600 for more information regarding disaster and emergency management.

4) 585.2-the definition of critical operations power systems has been revised to indicate that the system is to provide for continuous, rather than uninterruptable operation. The panel concludes that uninterruptable, operation is a matter of design and should not be the minimum requirement.

5) Definitions were deleted, modified, or added in keeping with the NEC Style Manual. A definition was developed for Designated Critical Operations Area to give clarity about the area covered by Article 585. The definitions for "small'',"medium", and "large" critical operations power systems have been deleted because they are not used in Article 585.

6)Section 585.4 is modified to provide guidance for clarity and in keeping with the NEC Style Manual.

7)Wiring methods was revised to enhance the requirements for physical protection and fire protection.

8)Sections were relocated and reordered to provide greater usability.

9)The duration of operation time of 72 hours was a compromise between the NFPA 110 duration of 96 hours and the current duration of emergency systems of 1½ hours. The 72 hour is the generally accepted minimum time frame recommended by the Army Corp of Engineers that allows for replenishment of fuel.

10)The Panel accepted an alternative to the separately derived power source requirement based on providing enhanced physical and fire protection of the normal supply grounded conductor wiring.

11) The proposed SCADA requirements were moved to an annex as the existing language is more informational than enforceable. Also, the SCADA system is optional and not mandatory.

12) The Panel agreed that a utility supplied second service to the building or facility does not meet the expectations for continuity of operations during the events Article 585 is designed to handle.

13) The panel provided language to differentiate the physical and fire protection requirements between branch circuits and feeders.

14) The panel agreed that the Critical Operations Power System (COPS) is separate and distinct from the Emergency System illumination covered in Article 700 and therefore deleted the proposed language concerning egress system illumination

15) The panel added language concerning the selective coordination of overcurrent devices in the critical operations power system for added reliability and to isolate faults to the lowest possible level and to parallel with similar requirements in Articles 700 and 701.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

SABIN-MERCADO, L.: We recognize the work of the technical committee however, we must vote against the Accept in Principle in Part for the following technical reasons.

1. **Material Outside the NEC Committee Scope** : The scope of Article 585 appears to cover material that is outside the Committee Scope of the National Electrical Code because it contains provisions for "operation, monitoring, control, and maintenance of critical operations power systems."

The Committee Scope of the National Electrical Code is printed on Page 22 of the 2005 NEC. The NEC Committee Scope (as a reference for discussion) is as follows:

Committee Scope: This Committee shall have primary responsibility for documents on minimizing the risk of electricity as a source of electric shock and as a potential ignition source of fires and explosions. It shall also be responsible for text to minimize the propagation of fire and explosions due to electrical installations.

In the past, the NEC Committee Scope has been interpreted to apply to only the **installation** portion of the electrical system and not the operation, monitoring, control and maintenance of such systems. Broadening the NEC Committee Scope or the proposed Scope of Article 585 will have unwanted applications and may make these provisions un-enforceable.

2. **Mandatory Requirements or Optional System:** The wording of the second paragraph of the Article Scope seems to indicate that Critical Operations Power Systems (COPS) are classed by either a government agency having jurisdiction or by facility engineering documentation establishing the necessity for such a system. The text of the paragraph is included for discussion purposes below:

Critical operations power systems are those systems so classed by municipal, state, federal, or other codes, by any governmental agency having jurisdiction or by facility engineering documentation establishing the necessity for such a system.

The issue is the identification of which governmental agency will actually class such systems. Also, can any engineer class their electrical system or facility as a Critical Operations Power System?

Typically, the term "authority having jurisdiction" is widely accepted in the NFPA documentation and used standards. In our opinion, this term should be the chosen term as the one to class such systems. The wording of this paragraph (paragraph 2 of the Scope) as currently written eliminates some authorities such as the non-governmental ones with statutory authority such as the investor owned electric utility companies.

Also, any engineering documentation for a facility can class the facility, or portion of such, as a critical operations power system. This action would further support the requirements of an optional system for those who choose to implement these requirements for their own use.

Article 585 is intended and written as a set of mandatory regulations. However in our opinion, the document may be best served as information in a Recommended Practice or an optional system. For example, section 585.4 Risk Assessment outlines a requirement for conducting a risk assessment for critical power operations power systems including identifying the hazards, their likelihood of occurrence and the vulnerability of the electrical system to those hazards. Hazards are to be identified as naturally occurring and human-caused events.

Once the hazards are known by completing the Risk Assessment, a mitigation strategy addressing the results of the risk assessment is to be developed. Much of the language that currently appears in Article 585 is not easily enforceable and is highly subjective for the engineer or individual conducting the Risk Assessment. Also, the section on mitigation strategy would be at best performance requirements of a standard.

We encourage the work of the technical committee and offer the following solution. We would support the document if the following changes were made to the Scope of Article 585 and editorial change to 585.20(F)(6) to add an s after Mean in the title.

Proposed Scope of 585

Critical Operations Power Systems (COPS)

585.1 Scope. The provisions of this article apply to the electrical installation ~~, operation, monitoring, control, and maintenance~~ of critical operations power systems consisting of circuits and equipment intended to supply, distribute and control electricity to designated vital operations in the event of disruption to elements of the normal system.

Critical operations power systems are those systems so classed by municipal, state, federal, or other codes, by ~~any governmental agency~~ <u>the authority</u> having jurisdiction or <u>as an optional system where</u> ~~by~~ facility engineering documentation establish <u>es</u> ~~ing~~ the necessity for such a system.

FPN No. 1: Critical Operations Power Systems are generally installed in vital infrastructure facilities that, if destroyed or incapacitated, would disrupt national security, the economy, public health or safety; and where enhanced electrical infrastructure for continuity of operation has been deemed necessary <u>.</u> ~~by governmental authority.~~

FPN No. 2: For further information on disaster and emergency management see NFPA 1600-2004 edition, *Standard on Disaster/Emergency Management and Business Continuity Programs* .

585.20(F)(6) revise to read: Mean <u>s</u> for Connecting Portable or Vehicle-Mounted Generator. Remainder unchanged.

3. Over Designing the Electrical System

Article 585 prescribes certain mandatory requirements for physical security, testing and maintenance, commissioning, protecting the power feeders and branch circuits, protecting the HVAC, Fire Alarm, Security, Emergency Communications and Signaling Systems, beefing up the sources of alternate power, providing uninterruptible power supplies, providing additional overcurrent protection and selective coordination, and completing an emergency operations plan. Many of these elements are costly and beyond the typically requirements for systems that are in current compliance with the Code.

Most of the requirements are subjective and difficult to enforce for a particular installation and may not be needed for all critical operations power systems. For example, the scope of the Article is to be able to operate in the event of disruption to elements of the normal "supply" system. There is no evidence that fire is a direct result of loss of the elements of the normal "supply" system. However, most of the feeders and branch circuits are beefed up for fire. The Risk Assessment should be used to determine the requirements necessary for each facility and/or operation. The electric utility industry supports reasonable additions for safety, however does not typically endorse additions in cost with minimal or no benefits in the performance of the system against the risks involved.

Comment on Affirmative:

BINGHAM, R.: Proposal 20-1 should also include new Annex I.

585.6 (F) SCADA (1) Maintenance and (2) Testing sections were deleted from the normative section, and I believe that the committee action should have been to add it to Annex I, the informative section, along with the other SCADA material, which was deemed "optional". Maintenance and testing isn't optional if it is installed.

585.8(D)FPN Editorial change: ~~Annex X~~ should be <u>Annex H, Section II</u> .

585.11(D)(A) Editorial change: ...as the branch circuit <u>that</u> it supplies.

585.14(3) no substantiation for the added restriction of "and under single management". This is a valid concern regardless of common ownership of the buildings.

Annex I SCADA - the definition of SCADA in 585.2 includes discussion of the HVAC, which is a critical component of many COPS. Where humans would be in the DCOA, there needs to be control of the ventilation system from within the DCOA to prevent degradation of the life-sustaining air quality as well as keeping the equipment operation within temperature range. This was covered when the SCADA section was in the normative portion of the Article. Now that is moved to the Annex, this concern is no longer addressed.

Unfortunately, I missed the opening discussion of the meeting (due to prior commitment) when this relocation was accepted by the committee, so I don't know if this concern was discussed and approved as is, or, overlooked.

BOKSINER, J.: The Panel made significant improvements to the scope. However, it seems that the scope does not reflect that the Panel intends critical operations power systems to be also survivable against various types of threats. Perhaps the scope can be modified as follows:

585.1 Scope. The provisions of this article apply to the electrical installation, operation, monitoring, control, and maintenance of critical operations power systems consisting of circuits and equipment intended to supply, distribute and control electricity to designated vital operations in the event of disruption to elements of the normal system. <u>Critical operations power systems are intended to be survivable against naturally-occurring and human-caused threats.</u>

Critical operations power systems are those systems so classed by municipal, state, federal, or other codes, by any governmental agency having jurisdiction or by facility engineering documentation establishing the necessity for such a system.

CARROLL, J.: I continue to support the addition of this article in the NEC with the following considerations:

1) I oppose the committee action which added a requirement for selective coordination. The addition of this requirement does not consider the overall impact of the system reliability. It is possible that selectivity will drive less reliability in specific system designs. Is centralizing an alternate power source on a campus more reliable than decentralization? That answer will differ depending upon the size of the facility and geographical challenges. Selectivity may drive your decision instead of making the appropriate decision based on load needs and impact. Selectivity also imposes unnecessary requirements in specific areas of the system that will impact electrical safety by unnecessarily increasing the arc-flash energy hazard. An example: Overcurrent protection arranged to protected the primary and secondary of a transformer would unnecessarily be required to be selectively coordinated, hereby increasing the size of the overcurrent devices without any additional isolation benefit. The engineering community must be left with the responsibility to ensure selectivity is optimized as one component of the design that will maximize the reliability of the system.

Propose 585.54 may be revised to read:

"585.54 Coordination. Selective Coordination of overcurrent protective devices shall be optimized."

2) The committee needs to consider adding a new 585.56 to address loss of a single phase on these systems:

"585.56 Phase Loss. All ungrounded conductors shall be automatically opened during an overcurrent condition."

System design can arrange the alternate power source as either centralized or distributed closest to each load. When a single phase is lost in the system, the alternate source may not identify that loss ahead of the transformer serving a particular transfer switch, therefore the transformer and other parts of the system and equipment are is subject to damage. Due to the critical nature of this system and the equipment connected to such as system, it is necessary to consider the loss of a single phase on the system and ensure such a condition does not place the reliability of the system at risk.

3) The committee accepted a requirement to list all transfer switches in 585.24(C)(1). There presently is no industry recognized standard to list a product over 600V. Revise the listing requirement to 600V and below transfer switches as proposed in article 700. "Automatic transfer switches, rated 600 VAC and below,shall be listed for emergency system use."

4) Specific items within text that need to be addressed: 585.8(D) FPN – Change "Annex X" to "Annex H"

585.20(B) The equipment is currently only required to be in a space with a 1-hr fire rating, however, 585.11(B)(1) requires the feeder to have a 2-hr fire rating. Propose the equipment be in a space with a fire suppression system or in a space with a "2hr" fire rating.

585.20(G) Uninterruptible Power Supplies – The text points to 585.20(E) and (F) which are extremely specific requirements for particular power sources and it does not appear that these requirement can all be applied to a UPS system. Do these references need to focus directly on specific requirements?

585.52(C) FPN- Change the word "tie" needs changed to "time".

DAUBERGER, G.: I concur with the work and the action taken by the panel, but I support Mr. Moniz's comments relative to 585.45 coordination.

HICKMAN, P.: We feel that the most robust protection available should be required. For example, we feel that a minimum 2-hour fire rating would have been more appropriate in 585.10(D)(1)(1), rather than a minimum 1-hour fire rating as accepted in the panel action.

MONIZ, G.: Acceptance of 585.54 raises a number of issues that must be addressed:

1) There is a material conflict between NFPA 110 and the NEC that creates a dilemma for the system designer. This design conflict within two NFPA documents is not acceptable.

2) A conflict between the text of 585.54 and the definition of selective coordination in Article 100.

3) Numerous industry standards that point to selectivity impacting reliability negatively or without benefit.

4) Unnecessary selective coordination increases overcurrent device size and can unnecessarily increase the arc-flash hazard on the electrical system.

NFPA 110 is a long-standing document, which recognizes the importance of selective coordination by requiring selective coordination of overcurrent devices to be "optimized". The International Building Code, adopted by many states, points to NFPA 110 for installing emergency system installations. The NFPA 110 Technical Committee recognizes selective coordination is prudent to enhance the performance of the electrical system, however, by adding the word "optimized" the committee permits the engineering community to provide the most reliable electrical system.

There is clearly a technical correlation issue between NFPA 110 and the NEC on selective coordination. Furthermore, the definition of selective coordination in Article 100 of the NEC requires the "localization of an overcurrent condition to restrict outages to the circuit or equipment affected". Proposed Section 585.54 will go well beyond the definition of localizing an overcurrent condition, by requiring "all" overcurrent devices to be selectively coordinated. No other industry document supports all overcurrent devices being selectively coordinated.

The proposed wording in Section 585.54 must be revised to align with NFPA 110, the definition of selective coordination, and IEEE standards, which recognize selective coordination as not being necessary for "all" overcurrent device as follows:

585.54 Coordination. Selective Coordination of critical Operations Power System(s) overcurrent protective devices shall be optimized.

ARTICLE 590 — TEMPORARY INSTALLATIONS

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3-109 Log #2586 NEC-P03 **Final Action: Reject**
(590)

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TCC Action: The Technical Correlating Committee advises that Article location is the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC

Recommendation: Relocate Article 590-Temporary Installations to Chapter 7-Special Conditions.

Substantiation: Temporary installations would be a special condition rather than occupancy, since this should just be a phase in a construction project, temporary lighting around the holidays, etc. When I think of a temp. occupancy, I think of something like a circus tent, as covered in Article 525.

Panel Meeting Action: Reject

Panel Statement: Relocating Article 590 is under the jurisdiction of the NEC Technical Correlating Committee (TCC), not Panel 3. The submitter should petition the NEC TCC for this proposed change.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

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3-110 Log #1301 NEC-P03 **Final Action: Reject**
(590.2(C) (New))

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Submitter: Ronald E. Maassen, Lemberg Electric Co., Inc. / Rep. National Electrical Contractors Association

Recommendation: Add new text to read:

590.xx Temporary electrical power and lighting installations shall be installed in a neat and workman-like manner.

FPN: Accepted industry practices are described in ANSI/NECA 200-2002, Recommended Practice for Installing and Maintaining Temporary Electrical Power at Construction Sites, and other ANSI-approved Installation standards.

Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment and systems covered by Article 590. However, safety would be improved by offering more detailed installation guidance for temporary power systems.

Panel Meeting Action: Reject

Panel Statement: Section 110.12 already provides requirements for electrical equipment to be installed in a neat and workmanlike manner with an accompanying Fine Print Note for accepted industry practices. Inserting this same requirement in Article 590 is not necessary since Chapters 1 through 4 are general requirements but anyone installing temporary wiring in accordance with Article 590 must adhere to 110.12.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

MAASSEN, R.: The Panel action to reject Recommended Practices for Installing and Maintaining Temporary Electrical Power at Construction Sites, and referring to 110-12 FPN, did not take into consideration the specifics of the document. The NECA 200-2002 is specific to temporary wiring and gives the contractor and AHJ a document to better understand the installation of temporary wiring on construction sites and holiday lighting. I believe this document should be included as a fine print note to Article 590.

3-111 Log #2273 NEC-P03 **Final Action: Reject**
(590.2(C))

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Add new text to read:
590.xx Temporary electrical power and lighting installations shall be installed in a neat and workmanlike manner.
FPN: Accepted industry practices are described in ANSI/NECA 200-2002, Recommended Practice for Installing and Maintaining Temporary Electrical Power at Construction Sites, and other ANSI-approved installation standards.
Substantiation: The general workmanship requirement of 110.12 applies to electrical equipment and systems covered by Article 590. However, safety would be improved by offering more detailed installation guidance for temporary power systems.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-110.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
MAASSEN, R.: See my Comment on Affirmative for Proposal 3-110.

3-112 Log #945 NEC-P03 **Final Action: Accept in Principle in Part**
(590.4(A) and (D))

TCC Action: It is the understanding of the Technical Correlating Committee that the Panel Action only accepted the text in the first sentence, as modified, and did not accept any of the recommended changes to the second sentence.
Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:
(A) Services shall be installed in conformance with <u>Parts I through VIII of</u> Article 230.
Revise second sentence of (D):
Unless installed in a continuous <u>ly</u> grounded metal raceway <u>approved for grounding</u> or a metal covered cable <u>approved for grounding</u> all branch circuit... (remainder unchanged).
Substantiation: Edit. Raceways and cables should be specified as a type approved for grounding so this section is not inferred as amending other code requirements. Continuous may be inferred as unbroken and not permitting junction points.
Panel Meeting Action: Accept in Principle in Part
Revise (A) to read as follows:
(A) Services shall be installed in conformance with Parts I through VIII of Article 230, as applicable.
Panel Statement: The change to (A) is made to comply with the NEC Manual of Style.
In Part (D) the word "continuous" was not changed since this word is not describing "grounded." It is requiring the metal raceway and the metal covered cables to be continuous. These raceways are not "approved" for grounding as indicated in the recommended text but must comply with 250.118.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-113 Log #1769 NEC-P03 **Final Action: Reject**
(590.4(B))

Submitter: Margarito Aragon, Jr., Santa Fe, NM
Recommendation: Add new text to read as follows: Add new fourth sentence:
<u>Conductors supplying temporary lighting circuits on construction sites shall not be connected to the load side of a ground-fault circuit interrupter and shall be protected in accordance with 240.4(D).</u>
Substantiation: The proposed change is to clarify that on construction sites temporary lighting is not to be installed on GFCI circuits or be cord and plug connected.
Article 590 does not adequately address the installation branch circuits and overcurrrent protection requirements for temporary lighting circuits. The only requirements for temporary lighting branch circuits is located in 590.4(D) which prohibits the installation of receptacles on temporary lighting circuit on construction sites. Therefore on construction sites, temporary lighting stingers cannot be cord and plug connected, due to the requirement of 590.4(D).
240.4(D) does cover overcurrent protection of conductors sizes 14, 12 and 10 AWG, which provide protection to the already used conductors on temporary lighting circuits.
Panel Meeting Action: Reject
Panel Statement: Conductors supplying temporary lighting circuits are already required to be protected in accordance with Article 240 and the size of the overcurrent protective device is based upon the conductor size and the type of lighting installed on the circuit. Section 240.4(D) provides size limitation of overcurrent protective devices on small conductors and has nothing to do with temporary lighting units. There was no technical substantiation provided to not require lighting circuits to be GFCI protected. Damage of these circuit conductors may be particularly common on a jobsite so GFCI protection may be warranted on some of these circuits. Given the choice between loss of lighting on a jobsite and an injury or fatality from electrical shock, all personnel will choose loss of lighting so GFCI protection of personnel is more critical than loss of lighting on a jobsite.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-114 Log #2841 NEC-P03 **Final Action: Reject**
(590.4(B))

Submitter: Ricky Massicott, Fiore Electric
Recommendation: Revise text to read as follows:
590.4(B) Feeders. Overcurrent protection shall be provided in accordance with 240.4, 240.5, 240.100, and 240.101. <u>Feeder overcurrent protective devices rated at 200 amperes and larger shall be limited to new circuit breakers, circuit breakers tested within one year prior to use or fused disconnects.</u> They shall originate in an approved distribution center. Conductors shall be permitted within cable assemblies or within multiconductor cords or cables of a type identified in Table 400.4 for hard usage or extra-hard usage. For the purpose of this section, Type NM and Type NMC cables shall be permitted to be used in any dwelling, building, or structure without any height limitation or limitation by building construction type and without concealment within walls, floors, or ceilings.
Substantiation: This proposal is intended to ensure that temporary wiring is provided with adequate protection.
I have witnessed multiple fires in temporary electrical equipment where older equipment was used for temporary and moved from jobsite to jobsite.
The problem occurs when a circuit breaker opens a ground fault or short circuit and is placed back in service and then sent to yet another job for temporary duty. The level of protection is unknown when used circuit breakers are installed as part of a temporary system. There is no rule allowing the inspector to refuse a circuit breaker, that has obviously been around on many jobs in temporary service from being used. I ask about the history of the device and the electricians have no idea.
Temporary wiring is subject to far more physical abuse than any other venue I inspect. Feeders and branch circuits are regularly damaged in the course of a construction project.
Several recent losses of power on jobsites and fires have been attributed to bad breakers not opening, starting a fire and then taking out the service. Circuit breakers in new condition work just fine but when they see physical abuse, are exposed to extreme environments or act on a ground fault or short circuit they need to be replaced or at the least tested. This is part of the UL standard.
UL says that when those faults occur the circuit breakers must be tested. Would UL take a truckload of circuit breakers in panelboards and switchboards that have seen use in temporary on five or six jobs and put new UL labels on them?
I picked the feeder devices because if a branch circuit device is bad at least the feeder device should open and clear the fault.
Panel Meeting Action: Reject
Panel Statement: The recommended text is almost impossible to enforce. Determining the age or condition of each and every feeder circuit breaker on a temporary installation would require testing and verification by a qualified factory technician. These fault currents may not be available at the temporary installation. Testing at elevated fault current should only be done with the safety procedures implemented in a certified test facility. The fault testing of a circuit breaker may often result in failure of the breaker, depending upon the fault current levels used in the testing. Field evaluation of a circuit breaker does not involve destructive testing since that would require replacement of the breaker. The age of the breaker is not necessarily a factor in its performance.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-115 Log #469 NEC-P03 **Final Action: Reject**
(590.4(C) Exception)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
Exception: Where the wiring is installed in accordance with 590.3(B), the voltage to ground shall not exceed 150 volts, the wiring shall not be subject to ~~physical~~ damage, and the conductors shall be supported on insulators at intervals of not more than 3.0 m (10 ft); or, for festoon lighting, the conductors shall be arranged so that excessive strain is not transmitted to the lampholders...
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent

opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-115a Log #CP302 NEC-P03 **Final Action: Accept**
(590.4(D))

Submitter: Code-Making Panel 3,
Recommendation: Change the second sentence in existing 590.4(D) to read as follows:
Unless installed in a continuous ~~grounded~~ metal raceway that qualifies as an equipment grounding conductor in accordance with 250.118 or a continuous metal-covered cable that qualifies as an equipment grounding conductor in accordance with 250.118 , all branch circuits shall contain a separate equipment grounding conductor, and all receptacles shall be electrically connected to the equipment grounding conductors.
Substantiation: The word "grounded" was deleted for the metal raceway. The phrase "that qualifies as an equipment grounding conductor in accordance with 250.118" was added to both metal raceway and cable. This change should clarify that the metal cables or raceways must be continuous and qualify as an equipment grounding conductor. If the metal raceway or metal cable is not continuous or does not qualify as an equipment grounding conductor then a separate equipment grounding conductor must be installed.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-116 Log #2780 NEC-P03 **Final Action: Reject**
(590.4(D)(1))

Submitter: Ted Smith, Ludvik Electric Co. / Rep. International Electrical Instructors & Students Assoc.
Recommendation: Add new text to read as follows:
590.4(D)(1) Safeguarding of Termination Screws. Receptacle outlets shall be installed in a manner that protects the termination screws of the receptacle from accidental contact with persons and tools after installation.
Substantiation: Receptacle cover plates are often removed during the construction phase for the purpose of wall finishing. The receptacles are very often energized at this phase of construction. The receptacle cover plates are often left off of the devices inadvertently for a period of time, until they are discovered and replaced. This circumstance causes a potential safety problem and exposes workers to possible electrical shock or arc blast. Requiring an approved method of covering the termination screws on the receptacle after installation will reduce this potential hazard.
Receptacles are also often times removed from their mounting during maintenance while in the energized state. This is not a recommended practice and power should be turned off to the receptacle before it is removed. However, we must recognize that some individuals will not take these necessary safety measures and will expose themselves to the risk of electrical shock or arc blast. Requiring a covering over the receptacle termination screws will reduce the potential of electrical shock and arc blast in these circumstances.
The required covering can be any of numerous methods available and will be left up to the AHJ to determine its effectiveness. There is available in inexpensive UL listed plastic snap over cover that will meet these requirements completely in addition to other methods.
Panel Meeting Action: Reject
Panel Statement: With the exception of any special permission and any requirements of Article 590, all electrical installations must follow the requirements in the remainder of the NEC. Section 110.3(B) requires listed and labeled equipment to be installed and used in accordance with any instructions included in the listing and labeling instructions. Receptacles must have a cover plate of some type covering any otherwise exposed live parts. Section 406.4(D) requires receptacles, after installation, to be mounted flush with or project from faceplates with two exceptions.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-117 Log #1359 NEC-P03 **Final Action: Accept**
(590.4(E))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Change "approved" to "identified"
590.4 General.
(E) Disconnecting Means. Suitable disconnecting switches or plug connectors shall be installed to permit the disconnection of all ungrounded conductors of each temporary circuit. Multiwire branch circuits shall be provided with a means to disconnect simultaneously all ungrounded conductors at the power outlet or panelboard where the branch circuit originated. ~~Approved~~ Identified handle ties shall be permitted.
Substantiation: This change is meant to provide correlation with the 2005 change to 240.20.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-118 Log #2041 NEC-P03 **Final Action: Accept**
(590.4(E))

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
590.4(E) Disconnecting Means Suitable disconnecting switches or plug connectors shall be installed to permit the disconnection of all ungrounded conductors of each temporary circuit. Multiwire branch circuits shall be provided with a means to disconnect simultaneously all ungrounded conductors at the power outlet or panelboard where the branch circuit originated. ~~Approved~~ Identified handle ties shall be permitted.
Substantiation: In the 2005 revision of the NEC the term "approved" has been revised to "identified" in order to require the use of hardware, for handle ties, that has been designed specifically to perform this common disconnecting means function. See 240.21(B)(1). This change in the 2005 NEC no longer permits finishing nails or pieces of 14 AWG copper as handle ties.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-119 Log #1478 NEC-P03 **Final Action: Accept**
(590.4(F))

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
590.4 General.
(F) Lamp Protection. All lamps for general illumination shall be protected from accidental contact or breakage by a suitable luminaire (fixture) or lampholder with a guard.
Brass shell, paper-lined sockets, or other metal-cased sockets shall not be used unless the shell is grounded.
Substantiation: Correlation with the rest of the code.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-120 Log #1122 NEC-P03 **Final Action: Reject**
(590.4(G), FPN (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
FPN: See 300.20(B) where metal boxes, conduit bodies or fittings are used.
Substantiation: Edit. The proposed FPN would be helpful to Code users and signify that this section does not modify 300.20(B) by lack of reference to metal.
Panel Meeting Action: Reject
Panel Statement: Section 590.2(A) already requires compliance with other requirements of the Code so inserting this Fine Print Note is not necessary.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-121 Log #468 NEC-P03 **Final Action: Reject**
(590.4(J))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text to read as follows:
Support. Cable assemblies and flexible cords and cables shall be supported in place at intervals that ensure that they will be protected from ~~physical~~ damage. Support shall be in the form of staples, cable ties, straps, or similar type fittings installed so as not to cause damage.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific instead, naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective, "physical," may strike people as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in

1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-122 Log #1765 NEC-P03 **Final Action: Reject**
(590.4(K))

Submitter: Margarito Aragon, Jr., Santa Fe, NM
Recommendation: Add new text to read as follows:
590.4 General.
(K) Construction Site Temporary Lighting Circuits. Temporary lighting circuits on construction sites shall not be connected to the load side of a ground-fault circuit interrupter. Temporary lighting circuit and conductors shall be protected in accordance with 240.4(D).
Substantiation: The proposed change is to clarify that on construction sites temporary lighting is not to be installed on GFCI circuits or be cord and plug connected.
Article 590 does not adequately address the installation and overcurrent protection requirements for temporary lighting circuits. The only requirements for temporary lighting is located in 590.4(D) which prohibits the installation of receptacles on temporary lighting circuit on construction sites. Therefore on construction sites, temporary lighting stingers cannot be cord and plug connected, due to the requirement of 590.4(D).
240.4(D) does cover overcurrent protection of conductors sizes 14, 12 and 10 AWG, which provide protection to the already used conductors on temporary lighting circuits.
Panel Meeting Action: Reject
Panel Statement: See the Panel Statement in Proposal 3-113.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-123 Log #864 NEC-P03 **Final Action: Reject**
(590.6)

Submitter: Grant Guymon, Comforce Technical Services
Recommendation: Revise as follows:
Temporary String Lighting shall not be connected to the load side of a ground-fault circuit interrupter.
This is a shorter version of a similar proposal I am submitting today.
Substantiation: Problem: Confusion and inconsistent enforcement. Make the language and intent clear and simple as in 620.22, 23 and 24.
Note: Please see my proposals for new definitions for "Temporary String Lighting" and "Task Lighting."
Panel Meeting Action: Reject
Panel Statement: There was no technical substantiation provided to not require lighting circuits to be GFCI protected. Damage of these circuit conductors may be particularly common on a jobsite so GFCI protection may be warranted on some of these circuits. Given the choice between loss of lighting on a jobsite and an injury or fatality from electrical shock, all personnel will choose loss of lighting so GFCI protection of personnel is more critical than loss of lighting on a jobsite.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-124 Log #865 NEC-P03 **Final Action: Reject**
(590.6)

Submitter: Grant Guymon, Comforce Technical Services
Recommendation: Revise as follows:
Temporary String Lighting used for construction and maintenance activities shall not be connected to the load side of a ground-fault circuit interrupter.
Substantiation: Problem: Confusion and inconsistent enforcement. Make the language and intent clear and simple as in 620.22, 23 and 24.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-123.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-125 Log #1717 NEC-P03 **Final Action: Accept**
(590.6)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 13 for information.
Submitter: Ray Stanko, Underwriters Laboratories, Inc.
Recommendation: Revise text to read as follows:
Ground-Fault Protection for Personnel.
Ground-fault protection for personnel for all temporary wiring installations shall be provided to comply with 590.6(A) and 590.6(B). This section shall apply only to temporary wiring installations used to supply temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities. This section shall apply to power derived from an electric utility company or from an onsite generated power source.
Substantiation: This new text provides clarification that the source of temporary power for branch circuits supplying 15-, 20-, and 30-ampere 125-volt receptacles on these various sites is not limited to just utility power but also includes any generator power used on the site since the same hazards would apply no matter the source. By deleting 305.6(A), Exception No. 1 for the 2002 NEC [renumbered as 527.6(A)], Panel 3 intended to require GFCI protection for personnel for all 125-volt 15-, 20-, and 30-amp receptacles. Some generator manufacturers are incorrectly assuming that by deleting this exception, GFCI protection is no longer required for generators supplying temporary power.
Requiring GFCI protection for personnel on temporary power during construction, remodeling, maintenance, repair, or demolition is intended to apply to all power sources, including generator power. Electrical equipment, such as table saws, pressure washers, and hand-held tools, should have adequate GFCI protection for personnel on construction sites. There are many hazards associated with temporary installations, such as cut and abraded wire, wet locations, and similar hazardous applications on job sites requiring GFCI protection no matter the power source.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
CASPARRO, P.: This proposal eliminates a possible misunderstanding of the current text of the NEC. The intent of the section is to make sure that all persons on a construction site are protected by a Ground Fault Circuit Interrupter regardless of the source of the power. This addition to the NEC adds clarity to this section.

3-126 Log #572 NEC-P03 **Final Action: Reject**
(590.6(A))

Submitter: David Barnhart, City of Portland
Recommendation: Delete the following:
~~For the purposes of this section, cord sets of devices incorporating listed ground-fault circuit-interrupter protection for personnel identified for portable use shall be permitted.~~
Substantiation: The deleted wording allowed a temporary power pole to be installed with receptacles not having GFCI protection. This code could not be enforced without involving OSHA or shutting down power. Also, it is difficult to enforce this section of the code when protection is up to the individual and can only be used at their discretion.
Most of the new temporary services are GFCI protected, in many cases the temporary services that are reused should not be in service anymore. Or, if they are in good shape, could have GFCI protection installed to accommodate the rule.
The main issue is that in residential, where OSHA is not as effective, the installers do not take as much care of their equipment and some don't even know what GFCI protection is, they just want power.
Panel Meeting Action: Reject
Panel Statement: There should be an option to use listed portable personal GFCI protection sets that someone can clip to their belts or to their belt loop. This places the GFCI device at the point of connection of the equipment and can be an effective way for someone to ensure personal protection. This option can be used very effectively on small or large jobsites where the owner or contractor has made this portable personal GFCI a requirement for all work at that jobsite.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-127 Log #2708 NEC-P03 **Final Action: Reject**
(590.6(A))

Submitter: Gary L. Siggins, Underwriters Laboratories Inc.
Recommendation: Revise as follows:

590.6 Ground-Fault Protection for Personnel. Ground-fault protection for personnel for all temporary wiring installations shall be provided to comply with 590.6(A) and 590.6(B). This section shall apply only to temporary wiring installations used to supply temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities .

(A) Performance. Portable power distribution equipment that provides ground-fault protection for personnel shall continue to provide protection with the supply cord to the equipment damaged or its attachment plug miswired.

FPN: The test conditions are described in UL 1640, Standard for Safety Portable Power Distribution Equipment.

(Subsequent text unchanged but references updated)

Substantiation: Construction sites can be harsh environments. The supply cords of portable power distribution equipment could be damaged. It is also possible an attachment plug could be miswired when a damaged one was replaced. The components and circuits provided for ground-fault protection for personnel in such equipment must continue to protect in the event of these abnormal situations. Standard listed receptacle type GFCIs will not provide adequate protection when assembled into equipment rated 120/240 single phase 3-wire. They will not function correctly with an open neutral.

Safety requirements for portable power distribution equipment designed for construction sites is detailed in the Standard for Portable Power Distribution Equipment, UL 1640. These requirements detail the test conditions that represent the anticipated damaged supply cords and miswired attachment plugs. These unique ground-fault protection requirements were originally developed in the 1970's after extensive input from industry. Present NEC text allows use of equipment certified to a lesser standard of safety.

Panel Meeting Action: Reject
Panel Statement: The submitter's recommendation is not clear. The appropriate portions of UL 1640 should be submitted to the Panel to provide explanation as to the intent of the requirements for GFCI protection of miswiring of the attachment plug and damage of the supply cord. The Panel does not agree that the NEC allows the use of equipment certified to a lesser standard of safety. The Panel notes that the term "Portable Power Distribution Unit" is defined in Article 520 and only applies to the requirements in Article 520.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 2
Explanation of Negative:

CASPARRO, P.: I agree with Mr. Guida's explanation of negative vote on Proposal 3-127.

GUIDA, T.: This proposal should have been accepted in principle with the text inserted as a new second paragraph in (A), before the exception, and revised as follows:

"Portable ground-fault circuit-interrupter devices shall continue to provide protection in accordance with the applicable requirements for Class A ground-fault circuit-interrupters with the following incorrectly wired attachment plugs or damage to the supply cords to the electrical equipment:

(1) Where the ungrounded conductor(s) have been transposed with the grounded conductor ofthe branch circuit on the receptacle,

(2) Where each ungrounded conductor of the supply to the receptacle is in an open condition,

(3) Where each grounded conductor of the supply to the receptacle is in an open condition, or

(4) Where the equipment-grounding conductor of the supply to the receptacle is in an open condition."

The proposal recognizes a very real situation where GFCI devices, designed to be installed in a permanent installation, are being installed as portable devices without the added protection required by UL 1640, the Standard for Safety of Portable Power Distribution Equipment for these portable devices.

3-128 Log #3445 NEC-P03 **Final Action: Reject**
(590.6(A), FPN (New))

Submitter: Redwood Kardon, Code Check Institute
Recommendation: Add a FPN to read:

FPN: Utilizing GFCI devices at the end of an extension cord increases the risk of an electrical hazard. An "open neutral" condition resulting from cord damage with such installations can leave equipment unprotected from ground fault. Some specialized GFCI devices and all listed Portable GFCIs have open neutral protection but they too, require that they not be installed at the end of an extension cord. See 110.3(B).

Substantiation: It is not common knowledge that an open neutral ahead of a GFCI can disable its ability to clear an equipment fault. A FPN clarifying this hazard will increase job-site safety.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided sufficient substantiation for the proposed FPN. The FPN as proposed is not accurate. The first sentence is not universally true. Some units are intended for installation at the receptacle end of the cord set.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-129 Log #2825 NEC-P03 **Final Action: Reject**
(590.6(B) Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 13 for information.
Submitter: Paul Schnackenberg, Gen/Tran Corp.
Recommendation: Add text to read as follows:

Exception: 30A - 125 V and 125/250V receptacles on portable generators, when used for home standby systems with approved transfer switches shall not be required to have GFCI protection on these specific receptacles.

Substantiation: 70 percent of portable generators are used primarily for home standby. The 30A - 125V and 125/250V receptacles on these generators are used for home standby systems. Whole generator GFCIs have been a major problem for years on these applications. Either the imbalance on the neutral on 125/250V house wiring or capacitive leakage because the whole house wiring is on the GFCI or the dual return of the neutral and ground causing an imbalance, has caused nuisance tripping of these GFCIs on this application.
Panel Meeting Action: Reject
Panel Statement: Section 590.6 only applies to temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities. This proposed text more appropriately belongs in Article 702 since the proposal is addressing portable generators used for optional standby power for a dwelling unit.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-130 Log #1735 NEC-P03 **Final Action: Reject**
(590.7)

Submitter: Craig Schumann, Yorkville, IL
Recommendation: Delete 590.7 in its entirety.
Substantiation: Consistent with 590.2(A), this paragraph 590.7 does not modify the requirements found in 110.30, 110.31, 110.32, 110.33 and 110.34. All the requirements found in Article 110 pertaining to over 600 volts should apply to Article 590 and by deletion of this paragraph, the Code would be clearer in its requirements for Temporary Installations.
Panel Meeting Action: Reject
Panel Statement: The submitter is correct that Section 590.2(A) requires compliance with Part III of Article 110 covering high voltage. However, an additional reminder of the guarding requirements for over 600 volt systems and the limited accessibility to only authorized and qualified personnel on a construction site should remain in 590.7. Too often, safety is compromised on a temporary installation because someone assumed it was just "temporary" and everyone "knows" that it is high voltage.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-131 Log #3195 NEC-P03 **Final Action: Reject**
(590.8 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 13 for information.
Submitter: Timothy M. Croushore, Allegheny Power
Recommendation: Please add a new section in Article 590 for temporary connection of portable generators. The section should read as follows:

590.8 Portable Generators. Temporary connection of a portable generator shall be permitted to supply permanent premises wiring where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.

Substantiation: The purpose of this change is to add portable generators as a means of supply to permanent premises wiring in Article 590 as permitted by the exception to 702.6, Transfer Equipment. Putting these requirements in Article 590 bring all of the other provisions such as time constraints and wiring methods of Article 590 for this application. This proposal has a companion proposal to 702.6 Transfer Equipment to properly correlate the two Code sections (New 590.8 and existing 702.6 Exception) within the scopes of their respective articles.

A companion proposal to add a new exception to 702.6 was submitted. The new exception is proposed to read as follows:

Exception: Connection of a portable generator without transfer equipment shall be permitted as provided in 590.8.

Panel Meeting Action: Reject
Panel Statement: This temporary connection is already permissible in the existing exception to 702.6 so this new section in Article 590 with similar wording is not needed.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
MENENDEZ, J.: This proposal should have been accepted. According to the scope of Article 702, the requirements of that Article are for optional standby systems that are <u>permanently</u> installed in their entirety and not for temporary installations. The specific requirements for temporary installations in 590.2; 590.3; and 590.4 should cover the temporary connection of portable generators.
The new section 590.8 as originally proposed properly deals with the "temporary connection of portable generators", and has additional requirements that are not covered under the provisions of Article 702.

ARTICLE 600 — ELECTRIC SIGNS AND OUTLINE LIGHTING

18-111 Log #526 NEC-P18 **Final Action: Accept in Principle**
(600.2)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
Section Sign. A sign or outline lighting system, shipped <u>to the site</u> as subassemblies, <u>that requires either field-installed interconnections and wiring between subassemblies of a single sign unit or</u> field-installed wiring between the subassemblies of an overall sign that are remote from one another ~~but to complete the overall sign~~ .
Substantiation: Panel 18 took a real positive step by adding a definition of section sign to Article 600. The product standard UL 48 has specific details about listed section signs. This proposed revision to the definition accepted in the 2005 cycle is an effort to only improve the good work of the technical committee and provide more descriptive information that more accurately describes these types of signs. The two types of section signs that are manufactured and installed in the field should be included in the description. The NEC handbook (2005) included a good description and differentiation between the two types, but the definition accepted for the 2005 Code, was not complete. This proposed revision to this definition should help clarify what is meant by the term section sign. The handbook includes a picture of a section sign that is assembled at the site to form a single unit.
The subassemblies may be physically joined to form a single sign unit, or they may be installed as separate remote parts of an overall sign. The proposed revision to this definition of section sign clarifies that the multiple parts of a section sign are referred to as subassemblies and the only field wiring involved are the interconnections and wiring between subassemblies or field-installed wiring between the subassemblies remote from one another for overall sign and connection of the subassemblies to the power source. (Portions of this description taken from the NEC handbook)
Panel Meeting Action: Accept in Principle
Revised the definition in 600.2 to read:
Section Sign. A sign or outline lighting system, shipped as subassemblies, that requires field-installed wiring between the subassemblies to complete the overall sign. <u>The subassemblies are either physically joined to form a single sign unit or are installed as separate remote parts of an overall sign.</u>
Panel Statement: The panel agrees that additional information would improve the definition. This modified sentence from the 2005 NEC Handbook concisely accomplishes that task.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-112 Log #1191 NEC-P18 **Final Action: Reject**
(600.3)

Submitter: Stephen G. Kieffer, Kieffer & Co., Inc. / Rep. International Sign Association
Recommendation: Modify 600.3 LISTING by deleting the words "section sign" as follows:
"Electric signs, ~~section signs~~ , and outline lighting — fixed, mobile, or portable — shall be listed and installed in conformance with that listing, unless otherwise approved by special permission.
Substantiation: After CMP 18 completed their work processing comments for the 2005 Code, the Technical Correlating Committee took action on Comment 18-79 deleting the word "listed" from the definition of a section sign and inserting "section sign" in o 600.3 Listing.
The International Sign Association appealed this change to the Standards Council. The appeal stated "On behalf of the International Sign Association I'd like to appeal the action of the Technical Correlating Committee on Comment 18-79."
While the Technical Correlating Committee was correct in removing this word "listed" from the new definition for section sign, it is not correct to add the words "section sign" to 600.3 A section sign is a specific subtype of electric sign and as such is already covered by 600.3. Adding "section sign" to 600.3 does not change the requirements for this type of sign and might add confusion as a reader could wonder about the status of other subtypes of signs.
Therefore, it is recommended that the Standards Council delete the words "section sign" from 600.3.
After oral presentations at the Standards Council meeting this appeal was rejected as it had not first been taken to the NFPA membership. During those oral presentations, Mr. Mark Ode spoke on behalf of the Technical Correlating Committee and stated the following:
It is a new term or definition that's put in 600, and people may not equate it to the 600.3 listing requirements for those general types of signs that they've been used to.
And by putting it in there -- and it may just be necessary for the Code Panel to leave it in there for one code cycle until people get the idea that this is in fact a listing requirement, and then it could be removed for the 2008, if the panel decided that that was a problem with putting it in there. But sometimes you put those kinds of things in to introduce these new definitions and concepts. And that's one of the main reasons, I believe, that we as a Correlating Committee did the action that we did.
Including the words "section sign" in the listing requirements is redundant and could lead to confusion as people wonder whether or not other subtypes of signs are required to be listed. CMP 18 should take action to delete these words.
Panel Meeting Action: Reject
Panel Statement: Because of the unique nature of section signs, emphasis needs to be placed on the requirement that they be listed.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-113 Log #2861 NEC-P18 **Final Action: Accept in Principle**
(600.4)

Submitter: Randall K. Wright, RKW Consulting
Recommendation: Add new text as follows:
<u>(C) Section Signs Requiring Field-Wiring. Sections signs requiring field wiring shall be marked that field - wiring and installation instructions are required.</u>
Substantiation: UL, the primary listing agency has, clearly stated any field-wiring is the inspection requirement of the local (AHJ) and therefore marking for the local electrical inspection is required. The majority of the signs I investigate after a fire, are that of the section sign type. The concealed wiring is in areas where a large fire gets started before detection.
Panel Meeting Action: Accept in Principle
Add new text as follows:
<u>(C) Section Signs. Section signs shall be marked to indicate that field-wiring and installation instructions are required.</u>
Panel Statement: "Requiring Field-Wiring" was deleted, as this is a redundant repetition of a phrase included in the definition of Section Sign.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-114 Log #1170 NEC-P18 **Final Action: Accept in Principle**
(600.4(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Signs and outline lighting systems with ~~incandescent~~ lampholders <u>for incandescent lamps</u> ...(remainder unchanged).
Substantiation: Edit. Present wording infers the lampholders are incandescent.
Panel Meeting Action: Accept in Principle
Re-write 600.4(B) to read:
<u>Signs</u> with ~~Incandescent~~ Lampholders <u>for Incandescent Lamps</u> . Signs and outline lighting systems with ~~incandescent~~ lampholders <u>for incandescent lamps</u> shall be marked to indicate the maximum allowable <u>lamp</u> wattage ~~of lamps~~ <u>per lampholder</u> . The markings shall be permanently installed, in letters at least 6 mm (1/ 4 in.) high, and shall be located where visible during relamping.
Panel Statement: The submitter has correctly identified that this section is not worded correctly. The panel identified other wording in the section that required clarification.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-117 Log #2752 NEC-P18 **Final Action: Reject**
(600.5(A))

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: Add a new sentence that reads as follows:
<u>One circuit shall be permitted to supply an outlet at more than one pedestrian entrance</u> .
Substantiation: There is variability in interpretation as to whether the required outlet at each pedestrian entrance is permitted to be supplied by one 20-ampere branch circuit when the circuit is adequate to supply the load. In some jurisdictions a separate 20-ampere branch circuit is required for each entrance and others one 20-ampere branch circuit is permitted to supply all of these required outlets.

Panel Meeting Action: Reject
Panel Statement: The Code requires at least one outlet per pedestrian entrance. It does not restrict the number of outlets on the circuit. The Code requires each circuit to be 20 amperes or larger. The Code does not prohibit extending the circuit to multiple entrances.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-115 Log #520 NEC-P18 **Final Action: Accept**
(600.5(C)(3))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(3) Metal or Nonmetallic Poles. Metal or Nonmetallic poles used to support signs shall be permitted to enclose supply conductors, provided the poles and conductors are installed in accordance with 410.15(B).
Substantiation: 410.15(B) was revised in the 2005 NEC to include references to nonmetallic poles in addition to metallic poles. 600.5(C)(3) provides a reference to 410.15(B). While it is recognized that nonmetallic poles are generally not used to support electric signs, there appears to be a restriction by not including the allowance in Article 600. Since 410.15(B) is referenced from this section in Article 600 it would seem logical to provide consistency between the two articles with the recognition of both metallic and nonmetallic poles as supports.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-116 Log #2042 NEC-P18 **Final Action: Accept in Principle**
(600.6(A))

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
600.6(A) Location
(1) Within Sight of the Sign The disconnecting means shall be within sight of the sign or outline lighting system that it controls. Where the disconnecting means is out of the line of sight from any section that is able to be energized, the disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
(2) Within Sight of the Controller The following shall apply for signs or outline lighting systems operated by electronic or electromechanical controllers located external to the sign or outline lighting system:
(1) The disconnecting means shall be permitted to be located within sight of the controller or in the same enclosure with the controller.
(2) The disconnecting means shall disconnect the sign or outline lighting system and the controller from all ungrounded supply conductors.
(3) The disconnecting means shall be designed such that no pole can be operated independently and shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
Substantiation: The problem with the present wording of this section is that the disconnect in many sign applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.
This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.
This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
Where signs are involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.
Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances
The same level of safety is needed for these disconnecting means for signs.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposals 18-118 and 18-120.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-118 Log #355 NEC-P18 **Final Action: Accept**
(600.6(A)(1))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(A) Location.
(1) Within Sight of the Sign. The disconnecting means shall be within sight of the sign or outline lighting system that it controls. Where the disconnecting means is out of the line of sight from any section that may be energized, the disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-119 Log #2139 NEC-P18 **Final Action: Reject**
(600.6(A)(1))

Submitter: David Pawlicki, Lansing, MI
Recommendation: Revise text to read:
600.6(A) Location.
(1) Within Sight of the Sign. The disconnecting means shall be within sight of the sign or outline lighting system that it controls. ~~Where the disconnecting means is out of the line of sight from any section that is able to be energized, the disconnecting means shall be capable of being locked in the open position.~~
Substantiation: The code requirement for a disconnecting means to be within sight of the sign is very important for safety. Servicing and inspections often occur when the business is not open and without a disconnecting means by the sign it puts the service or inspection personnel at risk of electrical shock.
Panel Meeting Action: Reject
Panel Statement: The proposal fails to recognize that many types of signs include portions that are not visible from a single location, either because of the physical size of the sign or because a portion of the sign is installed behind a surface on which the rest of the sign is located. The substantiation does not offer any injury data or incident reports indicating that the present wording is inadequate.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-120 Log #360 NEC-P18 **Final Action: Accept**
(600.6(A)(3))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(2) Within Sight of the Controller. The following shall apply for signs or outline lighting systems operated by electronic or electromechanical controllers located external to the sign or outline lighting system:
(1) The disconnecting means shall be permitted to be located within sight of the controller or in the same enclosure with the controller.
(2) The disconnecting means shall disconnect the sign or outline lighting system and the controller from all ungrounded supply conductors.
(3) The disconnecting means shall be designed so that no pole can be operated independently and shall be capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for workers should be consistent. This wording and requirement should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers

when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430-102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-121 Log #659 NEC-P18 **Final Action: Reject**

(600.6(C))

Submitter: Leon Przybyla, Southern Arizona Chapter IAEI

Recommendation: Add new subsection as follows:

(C) Isolation. Conductors to the line of the disconnecting means as required in 600.6(A)(1) shall be isolated in a separate raceway, cable, or conduit within the sign or enclosure.

Substantiation: Conductors in a sign section, enclosure or raceway may be energized while sign switch is in the off position.

Panel Meeting Action: Reject

Panel Statement: The proposal fails to provide technical substantiation of a hazard or field reports of a problem. Safety concerns and construction requirements within a listed product are addressed by the ANSI standard for that product. The submitter is referred to the UL STP process which encourages public proposals.

There are many instances where the disconnect is not within the sign.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-122 Log #665 NEC-P18 **Final Action: Reject**

(600.6(C))

Submitter: Rick Hollander, City of Tucson-Development Services

Recommendation: Add new subsection as follows:

(C) Isolation. Conductors to the line side of the disconnecting means as required in 600.6(A)(1) shall be isolated in a separate raceway, cable, or conduit within the sign or enclosure.

Substantiation: Conductors in a sign section, enclosure or raceway may be energized while sign switch is in the off position.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 18-121.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-123 Log #338 NEC-P18 **Final Action: Accept in Principle in Part**

(600.7)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to the Technical Correlating Committee Bonding and Grounding Task Group for information. The Technical Correlating Committee understands that this proposal modifies the action taken on Proposal 18-8.

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

600.7 Grounding and Bonding.

(A) Grounding.

(1) Signs and metal equipment of outline lighting systems shall be grounded by connection to the equipment grounding conductor of the supply branch circuit or feeder using any of the types of equipment grounding conductors specified in 250.118.

(2) The equipment grounding conductor size shall be in accordance with 250.122 based on the rating of the overcurrent device protecting the branch circuit or feeder conductors supplying the sign or equipment.

(3) Connections. Equipment grounding conductor connections shall be made in accordance with 250.130 and in a method specified in 250.8.

(4) Supplementary Gounding Electrode. Supplementary grounding electrode(s) shall be permitted for electric signs and equipment covered by this article and shall meet the requirements of 250.54.

(5) Metal Building Parts. Metal parts of a building shall not be permitted as a secondary return conductor or an equipment grounding conductor.

(6) The earth shall not be used as an effective ground-fault current path.

(B) Bonding.

(1) Metal parts of electric signs and outline lighting systems shall be bonded together and to the associated transformer or power supply equipment grounding conductor of the supply branch circuit or feeder and shall meet the requirements of 250.90.

(2) Bonding connections shall be made in accordance with 250.8.

(3) Metal Building Parts. Metal parts of a building shall not be permitted to be used as a means for bonding metal parts of signs or outline lighting systems together or to the transformer or power supply equipment grounding conductor.

(4) Flexible Metal Conduit Length. Listed flexible metal conduit or listed liquidtight flexible metal conduit that encloses the secondary circuit conductor from a transformer or power supply for use with electric discharge tubing shall be permitted as a bonding means if the total accumulative length of the conduit in the secondary circuit does not exceed 30 m (100 ft).

(5) Small Metal Parts. Small metal parts not exceeding 50 mm (2 in.) in any dimension, not likely to be energized and spaced at least 19 mm (3/4 in.) from neon tubing shall not require bonding.

(6) Nonmetallic Conduit. Where listed nonmetallic conduit is used to enclose the secondary circuit conductor from a transformer or power supply and a bonding conductor is required, the bonding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 38 mm (1 1/2 in.) from the conduit when the circuit is operated at 100 Hz or less or 45 mm (1 3/4 in.) when the circuit is operated at over 100 Hz.

(7) Bonding Conductors. Bonding conductors shall be copper and not smaller than 14 AWG. Bonding conductors installed external shall be protected where subject to physical damage.

(8) Signs in Fountains. Signs or outline lighting installed inside a fountain shall have all metal parts and bonded to the equipment grounding conductor of the branch circuit for the fountain recirculating system. The bonding connection shall be as near as practicable to the fountain and shall be permitted to be made to metal piping systems that are bonded in accordance with 680.53.

FPN: Refer to 600.32(J) for restrictions in length of high-voltage secondary conductors.

Substantiation: The proposed wording is an effort to differentiate between the requirements for grounding and bonding of electric signs and outline lighting systems. The revision structures this section into a list format to meet the requirements of the NEC Style Manual. The proposed revision divides this section into two parts "Grounding" and "Bonding," and provides clear direction for users and enforcement as to what bonding is intended to accomplish and where the bonding conductors or jumpers are required to be connected. The Code currently does not provided any clear direction about where the bonding conductor path is required to originate or be connected to. This revision should provide additional needed clarification. I have provided two photos to help substantiate the need for this language in the NEC.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

Revise recommendation to read as follows:

600.7 Grounding and Bonding.

(A) Grounding.

(1) Signs and metal equipment of outline lighting systems shall be grounded by connection to the equipment grounding conductor of the supply branch circuit or feeder using any of the types of equipment grounding conductors specified in 250.118.

Exception: portable cord-connected signs shall not be required to be connected to the equipment grounding conductor where protected by a system of double insulation or its equivalent. Double insulated equipment shall be distinctively marked. (2) The equipment grounding conductor size shall be in accordance with 250.122 based on the rating of the overcurrent device protecting the branch circuit or feeder conductors supplying the sign or equipment.

(3) Connections. Equipment grounding conductor connections shall be made in accordance with 250.130 and in a method specified in 250.8.

(4) Supplementary Gounding Electrode. Supplementary grounding electrode(s) shall be permitted for electric signs and equipment covered by this article and shall meet the requirements of 250.54.

(5) Metal Building Parts. Metal parts of a building shall not be permitted as a secondary return conductor or an equipment grounding conductor.

(B) Bonding.

(1) Metal parts of electric signs and outline lighting systems shall be bonded together and to the associated transformer or power supply equipment grounding conductor of the supply branch circuit or feeder and shall meet the requirements of 250.90.

(2) Bonding connections shall be made in accordance with 250.8.

(3) Metal Building Parts. Metal parts of a building shall not be permitted to be used as a means for bonding metal parts of signs or outline lighting systems together or to the transformer or power supply equipment grounding conductor.

(4) Flexible Metal Conduit Length. Listed flexible metal conduit or listed liquidtight flexible metal conduit that encloses the secondary circuit conductor from a transformer or power supply for use with neon tubing shall be permitted as a bonding means if the total accumulative length of the conduit in the secondary circuit does not exceed 30 m (100 ft).

(5) Small Metal Parts. Small metal parts not exceeding 50 mm (2 in.) in any dimension, not likely to be energized and spaced at least 19 mm (3/4 in.) from neon tubing shall not require bonding.

(6) Nonmetallic Conduit. Where listed nonmetallic conduit is used to enclose the secondary circuit conductor from a transformer or power supply and a bonding conductor is required, the bonding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 38 mm (1 1/2 in.) from the conduit when the circuit is operated at 100 Hz or less or 45 mm (1 3/4 in.) when the circuit is operated at over 100 Hz.

(7) Bonding Conductors. Bonding conductors shall be copper and not smaller than 14 AWG. Bonding conductors installed external shall be protected where subject to physical damage.

(8) Signs in Fountains. Signs or outline lighting installed inside a fountain shall have all metal parts and bonded to the equipment grounding conductor of the branch circuit for the fountain recirculating system. The bonding connection shall be as near as practicable to the fountain and shall be permitted to be made to metal piping systems that are bonded in accordance with 680.53.

FPN: Refer to 600.32(J) for restrictions in length of high-voltage secondary conductors.

Panel Statement: The panel added an exception to Section 600.7(A)(1) to allow cord-connected double-insulated signs. In 600.7(B)(4); the panel did not accept 600.7(A)(6) because it is redundant. The panel changed 600.7(B)(4) the term from "electric discharge" to "neon".

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KIEFFER, S.: These proposals should have been accepted in principle with Proposal 18-125 rather than 18-123 being the basis for the panel's action.

Both proposals, 18-123 and 18-124, as well as the panel action in Proposal 18-123 contain numerous violations of the 2003 NEC Style Manual, 4.1 Reference to Other NEC Rules, by referencing specific sections in Article 250 without modification. They are already covered by 90.3.

Of potential serious consequence, by only referencing a few of the sections in Article 250 applicable to signs and outline lighting, the panel action could lead users to the mistaken assumption that all other sections of Article 250 not referenced in Article 600 no longer apply to signs.

It is not appropriate to add references to Article 250 in Article 600 to improve the use of this article as a training tool for those who choose to ignore 90.1(C) or fail to enforce the code.

Proposal 18-125 should have been the basis for the panel's actions with the addition of the exception for cord-connected signs due to the Panel's action in Proposal 18-8, and the addition of the Proposal 18-129.

18-124 Log #632 NEC-P18 **Final Action: Accept in Principle**
(600.7)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to the Technical Correlating Committee Bonding and Grounding Task Group for information.

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

600.7 Grounding and Bonding .

(A) Grounding. Signs and metal equipment of outline lighting systems shall be ~~grounded~~ connected to an equipment grounding conductor installed with the branch circuit or feeder supplying the sign or outline lighting system. Supplementary grounding electrode(s) shall be permitted for electric signs and equipment covered by this article and shall meet the requirements of 250.54.

(B) Bonding. Metal parts of electric signs and outline lighting systems shall be bonded together and to the associated transformer or power supply equipment grounding conductor of the supply branch circuit or feeder and shall meet the requirements of 250.90.

~~(A)~~ (1) Flexible Metal Conduit Length. Listed flexible metal conduit or listed liquidtight flexible metal conduit that encloses the secondary circuit conductor from a transformer or power supply for use with electric discharge tubing shall be permitted as a bonding means if the total accumulative length of the conduit in the secondary circuit does not exceed 30 m (100 ft).

~~(B)~~ (2) Small Metal Parts. Small metal parts not exceeding 50 mm (2 in.) in any dimension, not likely to be energized, and spaced at least 19 mm (3/4 in.) from neon tubing shall not require bonding.

~~(C)~~ (3) Nonmetallic Conduit. Where listed nonmetallic conduit is used to enclose the secondary circuit conductor from a transformer or power supply and a bonding conductor, is required, the bonding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 38 mm (1 1/2 in.) from the conduit when the circuit is operated at 100 Hz or less or 45 mm (1 3/4 in.) when the circuit is operated at over 100 Hz.

~~(D)~~ (4) Bonding Conductors. Bonding conductors shall be copper and not smaller than 14 AWG. Bonding conductors shall be protected where subject to physical damage.

~~(E)~~ (5) Metal Building Parts. Metal parts of a building shall not be permitted as a bonding means, a secondary return conductor, or an equipment grounding conductor.

~~(F)~~ (6) Signs in Fountains. Signs or outline lighting installed inside a fountain shall have all metal parts and equipment grounding conductors bonded to the equipment grounding conductors of the branch circuit supplying ~~for~~ the fountain recirculating system. The bonding connection shall be as near as practicable to the fountain and shall be permitted to be made to metal piping systems that are bonded in accordance with 680.53.

Substantiation: The proposed wording is an effort to differentiate between the requirements for grounding and bonding of electric signs and outline lighting systems. This section was previously titled "Grounding" yet there are more bonding rules in 600.7 than grounding rules, thus the proposed revision to the title of this section to include the word "Bonding". The revision restructures this section into a list format to meet the requirements of the NEC Style Manual. The proposed revision divides this section into two parts "Grounding" and "Bonding" and renumbers the balance of the section accordingly. Additional text has been added under bonding to provide clear direction for installers and enforcement as to what bonding is intended to accomplish and where the bonding conductors or jumpers are required to be connected. The Code currently does not provided any clear direction about where the bonding conductor path is required to originate or be connected to. This revision should provide additional needed clarification.

Since physical protection requirements are not currently provided in this section, it is proposed for the small 14 AWG copper conductors that would be installed for bonding. Obviously, where these bonding conductors are not installed in areas where physical damage is a concern (hollow spaces in walls and ceilings for example) additional protection would not be necessary.

The additional text concerning supplementary grounding electrodes is an effort to include a reference to the supplementary grounding electrode requirements in 250.54 to establish a clear distinction between the equipment grounding conductor which performs grounding and as an effective ground-fault path for ground fault currents and grounding by connection to a grounding electrode alone. Connecting a sign to a ground rod meets the definition of "grounded" as defined in Article 100. The additional text under new 600.7(A) is an effort to clarify what is required and will correlate with the equipment grounding requirements in 250.112(G). Similar revisions are being proposed for 250.112 and other sections of the Code that clarify how the terms and words used in grounding and bonding requirements are being used.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 18-123.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KIEFFER, S.: These proposals should have been accepted in principle with Proposal 18-125 rather than 18-123 being the basis for the panel's action.

Both proposals, 18-123 and 18-124, as well as the panel action in Proposal 18-123 contain numerous violations of the 2003 NEC Style Manual, 4.1 Reference to Other NEC Rules, by referencing specific sections in Article 250 without modification. They are already covered by 90.3.

Of potential serious consequence, by only referencing a few of the sections in Article 250 applicable to signs and outline lighting, the panel action could lead users to the mistaken assumption that all other sections of Article 250 not referenced in Article 600 no longer apply to signs.

It is not appropriate to add references to Article 250 in Article 600 to improve the use of this article as a training tool for those who choose to ignore 90.1(C) or fail to enforce the code.

Proposal 18-125 should have been the basis for the panel's actions with the addition of the exception for cord-connected signs due to the Panel's action in Proposal 18-8, and the addition of the Proposal 18-129.

18-125 Log #1192 NEC-P18 **Final Action: Accept in Principle**
(600.7)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to the Technical Correlating Committee Bonding and Grounding Task Group for information.

Submitter: Stephen G. Kieffer, Kieffer & Co., Inc. / Rep. International Sign Association

Recommendation: Reorganize and reword 600.7 to read as follows:

600.7 Grounding and Bonding:

A. Grounding .

(1) Signs and metal equipment of outline lighting systems shall be grounded.

(2) Metal parts of a building shall not be permitted as a secondary return conductor or an equpment grounding conductor.

B. Bonding of Secondary Neon Tubing Circuits over 1000 volts.

(1) Flexible Metal Conduit Length. Listed flexible metal conduit or listed liquidtight flexible metal conduti that encloses the secondary circuit conductor from a transformer or power supply for use with ~~electric discharge~~ neon tubing shall be permitted as a bonding means if the total accumulative length of the conduit in the secondary circuit does not exceed 30 m (100 ft).

(2) Small Metal parts. Small metal parts not exceeding 50 mm (2 in.) in any dimension, not likely to be energized, and spaced at least 19 mm (3/4 in.) from neon tubing shall not require bonding.

(3) Nonmetallic Conduit. Where listed nonmetallic conduit is used to enclose the secondary circuit conductor from a transformer or power supply f or use with neon tubing and a copper bonding conductor not smaller than 14 AWG is requried, the bonding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 38 mm (1 1/2 in.) from the conduit when the circuit is oprated at 100 Hz or less or 45 mm (1 3/4 in.) when the circuit is operted at over 100 Hz.

C. Signs in Fountains. Signs or outline lighting installed inside a fountain shall have all metal parts and equipment grounding conductors bonded to the equipment grounding conductor for the fountain recirculating system. The bonding connection shall be as near as practicable to the fountain and shall be permitted to be made to metal piping systems that are bonded in accordance with 680.53.

~~D. Bonding Conductors. Bonding conductors shall be copper and not smaller than 14 AWG.~~

~~FPN: Refer to 600.32(J) for restriction on length of high voltage secondary conductors.~~

Substantiation: In 1999, 600.7 was changed to improved readability. Unfortunately that change has caused some difficulites as those requirements which exist to modify Article 250 specifically as it relates to the bonding of secondary neoncircuits over 1000 volts have been intrpreted by some ndividuals to be general requirements for all signs.

This proposal retains the original intent as evidenced by the record beginnng with the 1996 code.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 18-123.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:

KIEFFER, S.: These proposals should have been accepted in principle with Proposal 18-125 rather than 18-123 being the basis for the panel's action.

Both proposals, 18-123 and 18-124, as well as the panel action in Proposal 18-123 contain numerous violations of the 2003 NEC Style Manual, 4.1 Reference to Other NEC Rules, by referencing specific sections in Article 250 without modification. They are already covered by 90.3.

Of potential serious consequence, by only referencing a few of the sections in Article 250 applicable to signs and outline lighting, the panel action could lead users to the mistaken assumption that all other sections of Article 250 not referenced in Article 600 no longer apply to signs.

It is not appropriate to add references to Article 250 in Article 600 to improve the use of this article as a training tool for those who choose to ignore 90.1(C) or fail to enforce the code.

Proposal 18-125 should have been the basis for the panel's actions with the addition of the exception for cord-connected signs due to the Panel's action in Proposal 18-8, and the addition of the Proposal 18-129.

18-126 Log #3263 NEC-P18 **Final Action: Reject**
(600.7)

Submitter: David Servine, Channelume/Let-R-Edge Co.
Recommendation: Revise text to read as follows:

Grounding. Signs and metal equipment of outline lighting systems shall be ~~grounded~~ . bonded to the supply system ground as permitted or required in 600.7(A) through 600.7(F) and 250.

Substantiation: There is confusion about what this section pertains to. Some illumination systems used in signs and outline lighting are correctly referred to as un-grounded systems. This section in its entirety describes bonding. Adding bonding clarifies that it is the metal parts of signs and outline lighting that must be connected together, "to insure electrical continuity and the capacity to conduct safely any current likely to be imposed" to ground for compliance with 600.7 and 250. There are other requirements than those itemized in 600.7 and referencing 250 puts the reader of this Article on notice that these also must be complied with.
Panel Meeting Action: Reject
Panel Statement: The proposal conflicts with the Section 4.1 of the 2003 NEC Style manual and the Code Arrangement in 90.3. No substantiation was provided to support the claim that "some illumination systems used in signs and outline lighting are correctly referred to as un-grounded systems".
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-127 Log #3264 NEC-P18 **Final Action: Reject**
(600.7 Exception No. 1)

Submitter: David Servine, Channelume/Let-R-Edge Co.
Recommendation: Exception No.1: Sign Bodies of non-metallic section letter signs.
Substantiation: 600.7 and 250.112 mandate signs are to be grounded. Some section letter sign systems utilize sign bodies that are thermo-formed or fabricated with other than metal components. Questions frequently arise about the Code compliance of these types of section signs. This clarifies that no bonding is required for these types of sign bodies in section signs.
Panel Meeting Action: Reject
Panel Statement: Bonding is defined a "the permanent joining of metallic parts to form an electrically conductive path that ensures electrical continuity and the capacity to conduct safely any current likely to be imposed." By definition bonding does not involve nonmetallic parts, therefore this proposal does not represent a change in the Code. Additionally, the panel notes that the NEC, as stated in 90.1 (C), is intended to be used by trained personnel. Repetition of requirements contained in Chapters 1 through 4 violates Section 4.1 of the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-128 Log #3265 NEC-P18 **Final Action: Reject**
(600.7 Exception No. 2)

Submitter: David Servine, Channelume/Let-R-Edge Co.
Recommendation: Add text to read as follows:

Exception No.2: Sign Bodies of Section Signs with Class 2 Power Supplies and lighting systems operating at 30 volts or less where not installed within 3.0 m (10 Ft.) of pools, spas, fountains or similar locations.

Substantiation: Historically, Article 600 rules have mostly pertained to sign illumination operating at line voltages and electric discharge lighting operating at voltages in excess of line voltages requiring transformers, power supplies and ballasts to boost the secondary current. With the introduction of technology that requires just the opposite, reducing line voltage to very low voltages, Article 600 rules are non-respresentational and obscure for these systems. The Code does recognize thermostats, programmable controllers, security systems, sound systems, track and landscape lighting as operating with low voltage loads, but for signs, rules have to be abridged from other articles. The content of 600.7 is typical. Requiring bonding and grounding for signs with Class 2 circuits is not consistent with Code requirements for the low voltage installations described above or a supportable safety concern.

Class 2 circuits are considered safe from fire initiation because the Class 2 power supply limits the power to 100 VA for circuits 30V or less. Protection against electric shock is achieved by limiting the current to 5 mA for circuits over 30V (Chapter 9, Table 11) Bonding is not necessary for Class 2 sign circuits that operate at less than 50 volts because there is no need to create a low-impedance path for fault current. [*Understanding Low Voltage and Power-Limited Systems by Mike Holt]*

While 250.112 includes signs, regardless of voltage requiring grounding, by Code arrangement, this rule is amendable in Chapter 6 "for the particular conditions" of low voltage section sign installations. This is a start at fully recognizing a rapidly increasing sign lighting system that does not fit the historical mold of Article 600.

Panel Meeting Action: Reject
Panel Statement: The Code states that a Class 2 circuit is "the portion of the wiring system between the load side of a Class 2 power source and the connected equipment. Due to its power limitations, a Class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock." This definition does not state that Class 2 circuits are inherently (always) safe from the risks of fire or shock. It is stating that the requirements of the Code are adequate to provide safety from fire and shock, even though these requirements are not as extensive as those for general wiring. According to 250.112 (I), the exceptions for grounding that may exist in Article 725 only apply to Class 2 or Class 3 circuits used for remote-control, signaling, or fire alarm circuits. This exception does not apply to a low-voltage lighting circuit of the type used in section signs. No technical substantiation has been provided to support an exception to the requirement for grounding of Class 2 circuits.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:

KEMPEL, K.: The Panel should accept proposal 18-128 based on the following rationale.

The Panel Statement implies that Class 2 circuits are not always safe from the risks of fire and shock and points to Section 250.112(I) for support. This appears to be a misapplication of this Code Section.

Section 250.112(I) applies only to remote control, signaling, and fire alarm circuits that are power limited but not to power limited circuits that power lighting or signs. This is based on the fact that there is NO comma between "power-limited "and "remote control" in the title of Section 250.112(I). Therefore, Section 250.112(I) does not apply to signs.

Further, the Code supports not grounding transformer isolated secondary circuits operating within Class 2 voltage limits. Section 411.5(A) states that secondary circuits of low voltage lighting systems are not to be grounded and is further emphasized by Section 250.22 (4).

The fact that Section 411.5(A) does not require the secondary circuits of a low voltage lighting system to be grounded and Article 725 does not require the grounding of a power limited Class 2 secondary circuit that the Code implies that the risk of shock in a transformer isolated secondary operating at 30 volts rms or less is within accepted limits without the added protection of grounding.

Therefore, it is reasonable to conclude that the risk of shock in a sign with a power limited Class 2 secondary circuit operating at 30 volts rms or less would also be within accepted levels of risk of shock defined by the Code without grounding the secondary.

18-129 Log #527 NEC-P18 **Final Action: Accept in Principle**
(600.7(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:

(D) Bonding Conductors. Bonding conductors shall be copper and not smaller than 14 AWG. Bonding conductors shall be installed where not subject to physical damage unless protected by approved means.

Substantiation: 600.7(C) addresses spacing issues where separate bonding conductors are installed with nonmetallic raceways. This section specifies the minimum size of the conductor required to accomplish bonding purposes but stops short of providing rules on protecting it from physical damage. This proposed text is an effort to provide a clear requirement for installers and inspectors for protection of such bonding conductors in these small sizes. There does not appear to be any provisions in Article 600 that address this concern. 250.120(C) only has protection rules for equipment grounding conductors in sizes smaller than 6 AWG where run in hollow spaces or walls or partitions. This proposal adds language addressing the bonding conductors installed to meet the rules in Article 600 that are generally installed exposed in hollow spaces and often in areas where they are subject to physical damage.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 18-123.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-130 Log #2862 NEC-P18 **Final Action: Reject**
(600.8(B))

Submitter: Randall K. Wright, RKW Consulting
Recommendation: Revise text to read as follows:
(B) Material. Sign and outline lighting system enclosures shall be constructed of metal or shall be rated for the voltage and listed for the purpose.
Substantiation: Electric sign components are special parts and require special conditions. The sign industry requires parts listed for the purpose, to maintain the safety. A number of similar parts are available with lower milliampere rating then the transformer output and the parts they are to protect.
Panel Meeting Action: Reject
Panel Statement: The applicable ANSI standard for these enclosures covers the detailed requirements, including any voltage rating, if necessary. Technical substantiation or reports of field problems of an inadequacy in the ANSI standard were not provided to support this proposal. Adding the words "for the purpose" doesn't not change the requirement. This is an unenforceable term in conflict with 3.2.1 of the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-131 Log #532 NEC-P18 **Final Action: Accept**
(600.9(B))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(B) Pedestrians. Neon tubing, other than dry-location portable signs, readily accessible to pedestrians shall be protected from physical damage.
FPN: See 600.41(D) for additional requirements.
Substantiation: This is a companion proposal to work cooperatively with the revisions proposed in 600.41. The word readily was added for consistency in how accessible is defined in Article 100. The tubing could be installed at an elevated height and still be accessible, by definition, to pedestrians. By adding the word "readily" to this section, it brings more specifics to application of this section. The FPN was added to correlate with the proposed revision to 600.41 which includes the specific rules for field-installed skeleton tubing.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-132 Log #2573 NEC-P18 **Final Action: Reject**
(600.10(C)(a))

Submitter: Bud Swathwood, Bud Swathwood Consulting
Recommendation: Add new paragraph (a) to read:
(a) Receptacles for cord connected signs shall comply with 406.8(B)(1) and 406.8(1)(2)(a).
Substantiation: This addition to 600.10(c)(b) will make it clear that the outside receptacles need to be installed, the same as any other outside receptacle.
Panel Meeting Action: Reject
Panel Statement: This proposal is rejected, as it is not within the scope of Article 600. Article 600 does not address the installation requirements for receptacles.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-133 Log #856 NEC-P18 **Final Action: Accept**
(600.12)

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 3 for comment regarding the use of Class 2 wiring methods without there being a Class 2 power supply. This action will be considered by the panel as a public comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
600.12 Field-Installed Secondary Wiring.
Field-installed secondary circuit wiring for electric signs and outline lighting systems shall be in accordance with (A), (B), or (C). ~~section signs shall comply with 600.31 if 1000 volts or less, or with 600.32 if over 1000 volts.~~
(A) 1000 Volts or Less. Secondary circuit wiring of 1000 volts or less shall comply with 600.31.
(B) Over 1000 Volts. Secondary circuit of over 1000 volts shall comply with 600.32.
(C) Less Than 50 Volts. Secondary circuit wiring less than 50 volts shall be installed in accordance with any of the following:
(1) Any wiring method included in Chapter 3 suitable for the conditions.
(2) Class 2 wiring methods as provided in 725.52(B)
Substantiation: Panel 18 made a positive step in the 2005 cycle by inserting this new section to provide users with direction on the rules that apply to secondary circuit wiring, but it was limited to only section signs. This proposal retains the original content and reorganizes it in a fashion to include coverage of secondary circuit wiring for low voltage (class 2) secondary circuit wiring. The installation requirements for wiring on the secondary side of a Class 2 power source are already provided in 725.54 and 725.61. The requirements for insulation on these conductors are provided in 725.82, which is also referenced from 725.52(B). It is logical to provide a reference to the requirements for these low voltage secondary circuits associated with electric signs and outline lighting installations. The revision also removes the limitation of coverage of secondary circuit wiring for only section signs. Companion proposals have been submitted to editorially adjust the titles of 600.31 and 600.32 from addressing just circuit conductors to circuit wiring (which includes the conductors). A companion proposal has also been submitted that creates a correlation to the requirements for the low voltage power supply requirements in 600.24.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-134 Log #2863 NEC-P18 **Final Action: Reject**
(600.12)

Submitter: Randall K. Wright, RKW Consulting
Recommendation: Revise text as follows:
The field-installed secondary circuit wiring of section signs shall comply with Part II. Field-Installed secondary wiring and skeleton tubing ~~600.31 if 1000 volts or less, or with 600.32 if over 1000 volts.~~
Substantiation: Since UL has presented in writing their position that all field wiring in Listed signs will be the inspection responsibility of the local authority having jurisdiction, Part II of the article is needed in its entirety for the inspection of electric signs requiring any field wiring.
Panel Meeting Action: Reject
Panel Statement: No technical substantiation is provided to support applying Sections 600.41 and 600.42 to section signs.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-135 Log #3266 NEC-P18 **Final Action: Reject**
(600.12)

Submitter: David Servine, Channelume/Let-R-Edge Co.
Recommendation: Revise text to read as follows:
600.12 Field-Installed Secondary Wiring. The field-installed secondary circuit wiring of skeleton neon and neon section signs shall comply with ~~600.31 if 100o volts or less, or with 600.32 if ever 1000 volts~~ Part II.
Field installed secondary circuit wiring for Class 2 section signs shall comply with 600 and 725. Field-installed wiring with other secondary voltages shall comply with the applicable article.
Substantiation: Present wording of this rule was inserted in the 2005 Code to provide the AHJ with a basis for inspection of field wiring in a particular type of listed neon sign. 600.12 covers only neon described in Part II. Part II was originally intended only for skeleton tube neon but revisions made during the 2005 Code cycle have moved away from that concept to facilitate inspection of secondary field-wiring of neon section signs and outline lighting for compliance with Code installation rules. This has resulted in the same rules for skeleton tubing becoming applicable to section signs. For consistency with the intent and title of the article, other field-installed secondary wiring systems regardless of voltage should be included. Part II of the 2005 NEC is applicable only to field wiring for neon installations. Including section signs and outline lighting with Class 2 lighting, and other possible voltages not covered in 600 Part II, provides the basis for Code compliance with Chapter 6. Article 725 is referenced in its entirety because there are multiple requirements in 725 for the safe installation of Class 2 secondary circuitry.
Panel Meeting Action: Reject
Panel Statement: Section 600.12 applies to all section signs regardless of illumination source. No technical substantiation was provided to support limiting 600.12 to neon illumination. The general reference to Articles 600 and 725 is a violation of 4.1.1 of the 2003 NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-136 Log #660 NEC-P18 **Final Action: Accept**
(600.21(E))

Submitter: Leon Przybyla, Southern Arizona Chapter IAEI
Recommendation: Add new text to section 600.21(E) as follows:
(E) Attic and Soffit Locations. Ballasts, transformers, and electronic power supplies shall be permitted to be located in attics and soffits, provided there is an access door at least 900 mm by 600 mm (3 ft by 2 ft) and a passageway of at least 900 mm (3 ft) high by 600 mm (2 ft) wide with a suitable permanent walkway at least 300 mm (12 in.) wide extending from the point of entry to each component. At least one lighting outlet containing a switch or controlled by a wall switch shall be installed in such spaces. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing.

Substantiation: To coordinate with 210.70(C).
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-137 Log #666 NEC-P18 **Final Action: Accept in Principle**
(600.21(E))

Submitter: Rick Hollander, City of Tucson-Development Services
Recommendation: Add new text to section 600.21(E) as follows:
(E) Attic and Soffit Locations. Ballasts, transformers, and electronic power supplies shall be permitted to be located in attics and soffits, provided there is an access door at least 900 mm by 600 mm (3 ft by 2 ft) and a passageway of at least 900 mm (3 ft) high by 600 mm (2 ft) wide with a suitable permanent walkway at least 300 mm (12 in.) wide extending from the point of entry to each component. At least one lighting outlet containing a switch or controlled by a wall switch shall be installed in such spaces. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing.
Substantiation: To coordinate with 210.70(C).
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 18-136.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-138 Log #1622 NEC-P18 **Final Action: Accept in Part**
(600.21(E))

Submitter: Phil Yehl, City of Peoria, IL
Recommendation: Revise text to read as follows:
(E) Attic and Soffit Locations. Ballasts, transformers, and electronic power supplies shall be permitted to be located in attics and soffits, provided there is an access door at least 900 mm by ~~600 mm~~ 562.5 mm (36 in. by 22 1/2 in.) and a passageway of at least 900 mm ~~(3 ft)~~ (36 in.) high by ~~600 mm~~ 562.5 mm ~~(2 ft)~~ (22 1/2 in.) wide with a suitable permanent walkway at least 300 mm (12 in.) wide extending from the point of entry to each component.
Substantiation: This request for a proposed code change is driven by the construction and engineering practice of commonly spacing trusses 24 in. on center. This creates a net opening of 22 1/2 in. without modifying or reengineering the trusses.
Panel Meeting Action: Accept in Part
Revise text to read as follows:
(E) Attic and Soffit Locations. Ballasts, transformers, and electronic power supplies shall be permitted to be located in attics and soffits, provided there is an access door at least 900 mm by 562.5 mm (36 in. by 22 1/2 in.) and a passageway of at least 900 mm (3 ft) high by 600 mm (2 ft) wide with a suitable permanent walkway at least 300 mm (12 in.) wide extending from the point of entry to each component.
Panel Statement: The panel accepts the reduction in width of the access door and reject the reduction in the width of the passageway.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-139 Log #855 NEC-P18 **Final Action: Accept**
(600.24)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
600.24 Class 2 Power Sources.
~~In addition to the requirements of Article 600,~~ S igns and outline lighting systems supplied by Class 2 transformers, power supplies, and power sources shall comply with ~~725.41 and~~ the applicable requirements of Article 600 and all of the following:
(A) Listing. Class 2 Power supplies and power sources shall be listed for use with electric signs and outline lighting systems and shall comply with 725.41.
(B) Grounding. Systems shall be grounded where required by 250.20(A). Metal parts of signs and outline lighting systems shall be grounded in accordance with 600.7 and 250.112(G).
(C) Secondary Wiring. Secondary wiring from Class 2 power sources shall comply with 600.12(C).
Substantiation: This proposal is an effort to provide additional clarity in this new section added for the 2005 NEC. While the new requirement was needed for emerging technologies, it still lacked key provisions. The first proposed addition is a clear reference to 250.20(A) which provides the requirements as to when a low voltage system is required to be grounded or is permitted to be ungrounded. This is applicable to the system only. The grounding of metal parts of signs and outline lighting systems is referenced here again in addition to 600.7 to provide a clear direction for users about the grounding and bonding requirements for metal parts as differentiated from system grounding requirements. This is a companion proposal to the proposal to revise 600.12.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-140 Log #3267 NEC-P18 **Final Action: Reject**
(600 Part II)

Submitter: David Servine, Channelume/Let-R-Edge Co.
Recommendation: Revise text to read as follows:
II. Field-Installed ~~Skeleton Tubing~~ Neon Seconary Wiring .
Substantiation: 600.12 makes rules in Part II applicable to section letter signs. The rules no longer are exclusive to Skeleton Tubing. The change in the text is necessary to harmonize the description for Part II with 600.12. This categorizes rules in Part II as covering all secondary field wiring of neon.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 18-141.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-141 Log #531 NEC-P18 **Final Action: Accept in Principle in Part**
(600 Part II and 600.30)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise the title of Part II of Article 600 as follows and 600.30 as follows:
II. Field-Installed Skeleton Neon Tubing and Wiring
600.30 Applicability. Part II of this article shall apply to field-installed skeleton neon tubing and wiring . These requirements are in addition to the requirements of Part I.
Substantiation: This proposed revision is intended to be an editorial revision to clarify and reflect what is actually covered by Part II of Article 600. Part II includes rules for more than just the tubing. The tubing requirements are covered in 600.41. This revision adds accuracy to what is actually covered which includes secondary circuit wiring, neon tubing, and electrode connections. The addition of the word neon is proposed to clarify that only neon tubing and associated secondary circuit wiring and electrode connections are covered by Part II. Cold Cathode installations are covered by Part XIV of Article 410.
Panel Meeting Action: Accept in Principle in Part
Revise the title of Part II of Article 600 as follows and 600.30 as follows:
II. Field-Installed Skeleton Tubing and Wiring
600.30 Applicability. Part II of this article shall apply to all of the following:
(1) Field-installed skeleton tubing
(2) Field-installed skeleton tubing wiring
These requirements are in addition to the requirements of Part I.
Panel Statement: The word "neon" was removed because neon is contained in the definition of skeleton tubing. The recommendation was reworded for usability.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-142 Log #3059 NEC-P18 **Final Action: Accept in Principle**
(600.30)

Submitter: Randall K. Wright, RKW Consulting
Recommendation: Revise text to read as follows:
II. Field-Installed Secondary Wiring and Skeleton Tubing.
630.30 Applicability. Part II of this article shall apply to field-installed secondary wiring and skeleton tubing. These requirements are in addition to the requirements of Part I.
Substantiation: Since UL has presented in writing their position that all field wiring in Listed signs will be the inspection responsibility of the local authority having jurisdiction, Part II of the article is needed in its entirety for the inspection of electric signs requiring any field wiring.
Panel Meeting Action: Accept in Principle
Panel Statement: See the action and statement on Proposal 18-141. The panel concluded that the action on Proposals 18-133 and 18-141 enables installation and inspection of field wiring for both listed section signs and field installed skeleton tubing.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
WRIGHT, R.: I concur with the action and appreciate the panel comment to explain the panel's intent to have the field installed secondary wiring inspected by the (AHJ).

18-143 Log #3268 NEC-P18 **Final Action: Accept in Principle**
(600.30)

Submitter: David Servine, Channelume/Let-R-Edge Co.
Recommendation: Revise text to read as follows:
600.30 Applicability. Part II of this article shall apply to field installed wiring for skeleton tubing and neon section signs . These requirements are in addition to the requirements of Part I.

Substantiation: This change in text is necessary to harmonize Part II with 600.12. The rules in Part II are no longer exclusive to skeleton tubing but also include section signs with secondary neon wiring. The change also harmonizes with the proposed text revision for the title of Part II by this submitter.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposals 18-141 and 18-142.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-144 Log #854 NEC-P18 **Final Action: Accept**
(600.31)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
600.31 Neon Secondary-Circuit Wiring . ~~Conductors,~~ 1000 Volts or Less, Nominal.
(A) Wiring Method Conductors shall be installed using any wiring method included in Chapter 3 suitable for the conditions.
(B) Insulation and Size Conductors shall be listed, insulated, and not smaller than 18 AWG.
(C) Number of Conductors in Raceway. The number of conductors in a raceway shall be in accordance with Table 1 of Chapter 9.
(D) Installation Conductors shall be installed so they are not subject to physical damage.
(E) Protection of Leads. Bushings shall be used to protect wires passing through an opening in metal.
Substantiation: The revision is editorial in nature. The title of this section as it is currently worded should apply to only the conductors, however, the section addresses wiring methods and other items beyond just the conductors. Secondary circuit wiring includes rules applying to all of the items in (A) through (E).
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-145 Log #853 NEC-P18 **Final Action: Accept**
(600.32)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
600.32 Neon Secondary Circuit Wiring ~~Conductors~~ , Over 1000 Volts, Nominal
(A) Wiring Methods
(1) Installation Conductors shall be installed on insulators, in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for the purpose and shall be installed in accordance with the requirements of Chapter 3.
(2) Number of Conductors. Conduit or tubing shall contain only one conductor.
(3) Size Conduit or tubing shall be a minimum of metric designator 16 (trade size 1/2).
Balance remains unchanged.
Substantiation: The revision is editorial in nature. The title of this section as it is currently worded should apply to only the conductors, however, the section addresses wiring methods and other items beyond just the conductors. Secondary circuit wiring includes rules applying to all the items in (A) through (J).
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-146 Log #1193 NEC-P18 **Final Action: Accept in Principle**
(600.32(A))

Submitter: Stephen G. Kieffer, Kieffer & Co., Inc. / Rep. International Sign Association
Recommendation: Modify 600.32 Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal
(A) Wiring Methods to read:
(1) Installation. Conductors shall be installed ~~on insulators~~ , in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for the purpose and shall be installed in accordance with the requirements of Chapter 3.
Substantiation: Article 398 Open Wiring on Insulators permits the use of this wiring method in industrial and agricultural applications. There are few instances where field installed skeleton tubing is installed in these locations. However, this wiring method had historically been permitted as equipment was not available to completely enclose the Type GTO cable beginning at the neon electrode. That situation has now changed.
As a result of changes in Article 600, Underwriters Laboratories has developed and issued UL 879, as the Electric Sign Component Standard. The effective date for this standard is June, 2007.
Within this standard, listed equipment complying with the requirements of 600.42 is required to include enclosure of the GTO cable from the electrode enclosure to a raceway. This listed product is also required to include a means for attachment of the GTO cable enclosure to the raceway. This listed product is also required to include a means for attachment of the GTO cable enclosure to the raceway. These assemblies are listed as a system.
The requirements for this equipment can be found in three sections under part 5, Sign Components for Field and Factory Installation, of the standard:
5.9 Neon electrode splice and GTO cable polymeric enclosure systems
5.10 Glass cup neon electrode receptacle and GTO cable splice enclosure systems
5.12 Neon electrode enclosure and GTO cable with integral sleeving enclosure system
As a result, the need no longer exists to allow the use of conductors on insulators, as it is no longer possible to comply with the provisions of 600.42 without enclosing the GTO cable.
Panel Meeting Action: Accept in Principle
Modify 600.32 Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal
(A) Wiring Methods to read:
(1) Installation. Conductors shall be installed ~~on insulators~~ , in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, on insulators in metal raceways , or other equipment listed for the purpose and shall be installed in accordance with the requirements of Chapter 3.
Panel Statement: The phrase “on insulators in metal raceways” was added to prevent elimination of the use of insulators within raceways.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-147 Log #1210 NEC-P18 **Final Action: Accept in Principle**
(600.32(A)(1))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
600.32 Neon Secondary Circuit Wiring ~~Conductors~~ , Over 1000 Volts Nominal.
(A) Wiring Methods.
(1) Installation. Conductors shall be installed ~~on insulators,~~ in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures or other equipment listed for the purpose and shall be installed in accordance with the requirements of Chapter 3.
Substantiation: This method of installation for high voltage secondary conductors was used in the past, but is rare to be applied today. There are specific requirements for high voltage secondary conductors included in Part II of Article 600 as well as the product standard (UL 814) that call for these conductors to be protected from mechanical and physical damage. Neon secondary conductors are required to be installed so they are not subject to physical damage by 600.32(C). It’s not uncommon to see installers attempt to use glass neon tubing supports for GTO conductors to try to meet the requirements in 600.32(A)(1). Tubing supports are required to be listed by 600.41(B) and do not appear to be listed or evaluated for use as an insulator to install GTO cable exposed. Removing this method of installing GTO cable that was used years ago should remove the gray area in this section and provide installers and inspectors with more clear requirements for the acceptable wiring methods to use. Perhaps insulators are still used in listed signs.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 18-146.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-148 Log #3205 NEC-P18 **Final Action: Accept**
(600.32(A)(1))

Submitter: Donald Cook, Shelby County Development Services
Recommendation: 600.32(A)(1). Conductors shall be installed on insulators, in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for ~~the purpose~~ use with circuits over 1000 volts and shall be installed in accordance with the requirements of Chapter 3.

Substantiation: During the 200? NEC cycle, the TCC provided direction where the NEC required items to be listed for the purpose, that the "purpose" be included in the requirement. Since the title of 600.32 relates to neon secondary circuit conductors over 1000 volts, I assumed that the specific purpose must relate to some or all that statement.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
KIEFFER, S.: Proposal 18-148 should have been accept in principle, see Proposal 18-149.

18-149 Log #3207 NEC-P18 **Final Action: Accept in Principle**
(600.32(A)(1))

Submitter: Donald Cook, Shelby County Development Services
Recommendation: 600.32(A)(1). Conductors shall be installed on insulators, in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for ~~the purpose~~ <u>neon secondary circuit wiring methods over 1000 volts</u> and shall be installed in accordance with the requirements of Chapter 3.
Substantiation: During the 200? NEC cycle, the TCC provided direction where the NEC required items to be listed for the purpose, that the "purpose" be included in the requirement. Since the title of 600.32 relates to neon secondary circuit conductors over 1000 volts, I assumed that the specific purpose must relate to some or all that statement.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 18-148.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
KIEFFER, S.: Proposal 18-149 should have been accept. The correct wording should include the word "neon".

18-150 Log #2585 NEC-P18 **Final Action: Reject**
(600.32(B))

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC
Recommendation: Add following text to the end of existing text:
<u>For the purposes of this section, the provisions of Section 310.6 shall not apply.</u>
Substantiation: The rules of Chapters 1-4 still apply in Chapters 5-7 unless specifically amended. I do not think that it is the intention to require shielded cable on a permanently wired neon sign, however. This will help to clarify that.
Panel Meeting Action: Reject
Panel Statement: Section 310.1 specifically excludes conductors specifically provided for elsewhere in this Code from the requirements of Article 310. Type GTO cable is only referenced in Article 600 and is therefore exempted from Article 310 requirements.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-151 Log #3204 NEC-P18 **Final Action: Accept**
(600.32(F))

TCC Action: The Technical Correlating Committee directs that the Panel reconsider and correlate their actions on this proposal with Proposal 18-152. This action will be considered by the Panel as a Public Comment.
Submitter: Donald Cook, Shelby County Development Services
Recommendation: Revise text to read:
Insulators and bushings for conductors shall be listed for ~~the purpose~~ <u>use with neon secondary circuits over 1000 volts.</u>
Substantiation: In a past NEC cycle, the TCC provided direction where the NEC required items to be listed for the purpose, that the "purpose" be included in the requirement. Since the title of 600.32 relates to neon secondary circuit conductors over 1000 volts, I assumed that the specific purpose must relate to some or all that statement.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 18-152.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
BER, M.: The Panel Action and statement were reported incorrectly as:
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 18-152
The correct information should be:
Panel Meeting Action: Accept
Panel Statement: None
There was also an editorial change required because the proposal as submitted has the term "...for conductors..." twice. The final corrected wording should be: "600.32(F) INSULATORS AND BUSHINGS FOR CONDUCTORS SHALL BE LISTED FOR USE WITH NEON SECONDARY CIRCUITS OVER 1000 VOLTS.
CARPENTER, F.: NEMA believes the panel action is in error and should have been "Accept in Principle" to correct the wording to read as follows:
Insulators and bushings for conductors shall be listed for use with neon secondary circuits over 1000 volts.
COSTELLO, P.: The panel action and results were reported incorrectly and should read as follows:
Accept: Insulators and bushings for conductors shall be listed for use with neon secondary circuits over 1000 volts.
KEMPEL, K.: Panel action and results were reported incorrectly and should be:
Panel Meeting Action: Accept
With editorially corrected wording of: "600.32F INSULATORS AND BUSHINGS FOR CONDUTORS SHALL BE LISTED FOR USE WITH NEON SECONDARY CIRCUITS OVER 1000 VOLTS."
KIEFFER, S.: Proposal 18-151 was accepted and Proposal 18-151 should not be referenced in the panel statement.
OWENS, T.: There is an editorial change required with the accepted wording. The sentence as contained in the proposal has a duplication of the phrase "for conductors."
SMITH, M.: Panel action and results were reported incorrectly and should be:
Panel Meeting Action: Accept
600.32(F) insulators and bushings for conductors shall be listed for use with neon secondary circuits over 1000 volts.
WALL, C.: The panel action and results were reported incorrectly and should be:
Panel Meeting Action: Accept.
Panel Statement: To eliminate duplicate words the wording should be editorially corrected to read as follows: "600.32(F) Insulators and Bushings. Insulators and bushing for conductors shall be listed for use with neon secondary circuits over 1000 volts."
WELLS, J.: The panel action and results were reported incorrectly and should be: Panel Meeting Action: Accept with editorially corrected wording of: "600.32F INSULATORS AND BUSHINGS FOR CONDUCTORS SHALL BE LISTED FOR USE WITH NEON SECONDARY CIRCUITS OVER 1000 VOLTS".
WRIGHT, R.: My records reflect that we accepted this proposal in Principal (APR) and deleted the second... ~~for conductors~~ ...
The panel action does not reflect our action.

18-152 Log #3206 NEC-P18 **Final Action: Accept**
(600.32(F))

TCC Action: The Technical Correlating Committee directs that the Panel reconsider and correlate their actions on this proposal with Proposal 18-151. This action will be considered by the Panel as a Public Comment.
Submitter: Donald Cook, Shelby County Development Services
Recommendation: Insulators and bushings for conductors for conductors shall be listed for ~~the purpose~~ <u>use with circuits over 1000 volts</u> .
Substantiation: In a past NEC cycle, the TCC provided direction where the NEC required items to be listed for the purpose, that the "purpose" be included in the requirement. Since the title of 600.32 relates to neon secondary circuit conductors over 1000 volts, I assumed that the specific purpose must relate to some or all that statement.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
OWENS, T.: Accepting this proposal as written creates a conflict with Proposal 18-151 which was also accepted. This proposal should have been an "accept in principle" with a panel statement referring to Proposal 18-151.
Comment on Affirmative:
BER, M.: The Panel Action and statement were reported incorrectly as:
Panel Meeting Action: Accept
Panel Statement: None
The correct information should be:
Panel Meeting Action: Accept in Principle
Panel Statement: See Panel action on Proposal 18-151.
Please note that if the above corrections are not made to Proposals 18-151 and 18-152 the potential exists for two different "wordings" for the same section. The inclusion of the term "...neon secondary..." and the removal of the second "...for conductors..." is essential for total clarity in this section.
CARPENTER, F.: The correct panel action should have been "Accept in Principle". See NEMA comment on Proposal 18-151.
COSTELLO, P.: The panel action and statement were reportedly incorrectly and should read as follows:
Accept in Principle: See the panel action on Proposal 18-151.

KEMPEL, K.: Panel action and results were reported incorrectly and should be: Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 18-151.

KIEFFER, S.: Proposal 18-152 should have been accepted in principle, see Proposal 18-151. Proposal 18-151 contains the correct wording because it includes the word "neon".

SMITH, M.: Panel action and results were reported incorrectly and should be: Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on proposal 18-151.

WALL, C.: The panel action and results were reported incorrectly and should be: Panel Meeting Action: Accept in principle.

Panel Statement: See panel action on Proposal 18-151.

WELLS, J.: The panel action and results were reported incorrectly and should be: Panel Meeting Action: Accept in Principle. Panel Statement: See panel action on Proposal 18-151.

WRIGHT, R.: My records indicate we accepted this proposal which would be incorrect. We should have accepted in principal in part and our panel action should reflect the deletion of the redundant... ~~for conductors~~ ... but would not remove the wording...neon secondary... from proposal 151.

In my opinion, the section should read as follows:

600.32(F) Insulators and Bushings. Insulators and bushings for conductors shall be listed for ~~the purpose~~ <u>use with neon secondary circuits over 1000 volts</u> .

18-153 Log #1194 NEC-P18 **Final Action: Reject**
(600.32(G)(1) and (2))

Submitter: Stephen G. Kieffer, Kieffer & Co., Inc. / Rep. International Sign Association

Recommendation: Revise 600.32 Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal, (G) conductors in Raceways as follows:

(G) Conductors in Raceways

~~(1) Damp or Wet Locations in damp or wet locations, the insulation on all conductors shall extend not less than 100 mm (4 in.) beyond the metal conduit or tubing.~~

~~(2) Dry Locations. In dry locations~~ , ~~t~~ <u>T</u> he insulation on all conductors shall extend not less than 65 mm (2 1/2 in.) beyond the metal conduit or tubing.

Substantiation: This proposal was submitted and accepted by CMP 18 during the 2005 Code cycle. Comments were submitted in opposition to this change and those comments were rejected by CMP 18.

At the Annual NFPA meeting an amendment was presented and approved to accept Comment 18-110. This had the affect of rejecting the panel's acceptance of this change. CMP 18 and the Technical Correlating Committee voted on and rejected the amendment. The panel's vote was appealed to the Standards Council. NFPA rules are such that regardless of the merits of the panel's vote the section reverts to the 2002 wording.

This change has great merit and is properly substantiated. The opposition to this proposal rests on claims that the high-voltage GTO cable is not tested for arc-tracking and, therefore, the opposition assumes there would be some undocumented problem in wet and damp locations.

Arc-tracking tests are conducted on sheet materials. Arc-tracking tests do not exist for wire. Therefore, the claims of a failure to perform a nonexistent test are not valid substantiation for objection to this change.

Significant substantiation in support of the change was submitted during the 2005 code cycle by the International Sign Association and Underwriters Laboratories. Those documents are provided as part of this substantiation.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel concludes that retaining this requirement maintains the current level of protection that has not been shown to be a safety hazard.

The panel suggests that a fact-finding study or other technical data be provided to the panel during the comment stage to provide the appropriate information for the panel on which to base a more informed decision on this issue.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KIEFFER, S.: The panel reversed its position on this issue, ignoring significant prior input during the 2005 code cycle.

The panel's action was based on nonscientific samples of claimed failures of listed GTO conductors handed out during the meeting. No evidence was provided that those samples relate to this proposal. No details were provided regarding the test procedures followed to produce those samples. It was implied that listed GTO cable had failed, yet no record was submitted of reports of these failures being made to the listing agency. I heard quiet comments by the submitter of these samples that they performed properly. They didn't burn. The insulation was self-extinguishing, even though they were subject to artificial conditions in an attempt to produce a failure.

In a rush to complete the panel's work late Wednesday afternoon, discussion was rapidly cut off. As a result the panel's attention was never directed to secondary-circuit fault-protection requirements of 600.23 which preclude the occurrence of the supposed failures. The panel never evaluated its actions in Proposals 18-146; 18-147; 18-148; 18-149; 18-154 and 18-158 which singularly and in total eliminate all conditions where GTO wire can exit a raceway into open air.

The panel should accept this proposal.

18-154 Log #407 NEC-P18 **Final Action: Accept in Principle**
(600.32(K))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Add text to read as follows:

<u>(K) Splices. Splices in high voltage secondary circuit conductors shall be made in a listed high voltage splice enclosure. Splice enclosures shall be accessible after installation and listed for the location where they are installed.</u>

Substantiation: Part II of Article 600 addresses field-installed skeleton tubing installations which often include splices in high voltage secondary circuit conductors. There are currently no requirements for high voltage splice enclosures within Article 600 and specifically Part II. Only electrode connections are covered in 600.42. This proposed revision should provide needed guidance for installers and provide enforcement with rules to apply to such equipment and locations of such devices. There are various manufacturers that currently produce listed devices for this purpose. Requirements to locate the splice device at an accessible location are consistent with low voltage splice rules requirements contained in Chapter 3 and including information about the location where the device is installed should provide guidance when high voltage splice enclosures are installed in dry, damp, or wet locations. They should be listed for those locations. Listed signs covered by Part I should already include this as part of being manufactured to meet the minimum requirements of the product standard.

Panel Meeting Action: Accept in Principle

Revise the wording in the proposal to read as follows:

"(K) Splices. Splices in high-voltage secondary circuit conductors shall be made in listed enclosures rated over 1000 volts. Splice enclosures shall be accessible after installation and listed for the location where they are installed."

Panel Statement: The revised wording clarifies that enclosures other than high-voltage splice enclosures are also acceptable to meet this requirement.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-156 Log #530 NEC-P18 **Final Action: Accept**
(600.41(B))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read:

(B) Support tubing shall be supported by listed tube supports. <u>The neon tubing shall be supported within 150 mm (6 in.) from the electrode connection.</u>

Substantiation: This proposed revision improves clarity by relocating neon tubing support requirements currently located in 600.42(C) to 600.41(B) because that is the section that covers tubing supports. It is more appropriate to include the support location rules relative to the electrode connection in this section. This is a companion proposal to a similar revision to 600.42(C). No technical changes are proposed here, just revisions for clarity.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-157 Log #529 NEC-P18 **Final Action: Accept**
(600.41(D) (New))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Add a new subdivision (D) to 600.41 as follows:

<u>(D) Protection. Field-installed skeleton tubing shall not be subject to physical damage. Where the tubing is readily accessible to other than qualified persons, field-installed skeleton tubing shall be provided with suitable guards or protected by other approved means.</u>

Substantiation: While it is understood that 600.9(B) also has general application in Part II, more specific language is needed in the section that specifically covers protection for field-installed skeleton tubing. 600.9(B) indicates that neon tubing shall be protected from physical damage, but stops short. The proposed revision places language in the Code that restricts the tubing from being installed where it would be subject to physical damage as a first requirement. The proposal also clarifies that where the tubing can be contacted (readily accessible) to other than qualified persons, the provision for suitable guards approved by the AHJ allows installers the ability to install the tubing in window frames or other locations where children or other unqualified persons can touch them. Many qualified neon installers already understand the hazards of such installations that are not protected and provide plexi-glass (clear) guards for physical damage protection and contact protection. The proposed revision uses "readily accessible" rather than "accessible" because of how the word "accessible" is defined in Article 100. The tubing, could be 12 ft above the floor and still be accessible by definition. See the companion proposal to 600.9.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-158 Log #473 NEC-P18 **Final Action: Accept in Part**
(600.42(A) (New))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Add new text to read:
(A) Points of Transition. Where the high voltage secondary circuit conductors emerge from the wiring methods specified in 600.32(A), they shall be enclosed in a listed assembly or listed products for such transitions at electrode connections. The high voltage secondary conductors shall be protected and enclosed at transition points in sleeve material from the point of emergence to the electrode connection enclosure.
Substantiation: This part of field installed skeleton tubing installations is not adequately or clearly covered by rules presently provided in 600.32. This proposed revision adds a requirement that is clear and easy to follow. There is no clear language in the Code to address this part of the installation. The wiring method is covered in 600.32(A) and the electrode connection enclosure is covered in 600.42. Where high secondary wiring is installed for field installed skeleton tubing, the point of transition from the wiring method to the electrode connection at the tube is always the most challenging part of the installation for installers and inspectors. It also is the point where the most failures are occurring in these types of installations. There are listed products of the glass and nonmetallic types available to readily accomplish these transitions. One of the most critical points in any electrical installation is the connections. Generally, if something is going to fail in an electrical circuit, it usually starts at the connection points. I have submitted pictures of two listed assemblies suitable for use in this application and also two pictures of what is more commonly found in the field that does not comply with the minimum requirements of the Code and often leads to failure in these installations.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Part
Revise the proposed wording to read as follows:
"(A) Points of Transition. Where the high voltage secondary circuit conductors emerge from the wiring methods specified in 600.32(A), they shall be enclosed in a listed assembly."
Panel Statement: Transition assemblies are listed as a complete system, not as components. The deleted sections of the proposed wording addressed the components, not the assembly.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-159 Log #533 NEC-P18 **Final Action: Accept**
(600.42(C))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(C) Support. ~~The neon tubing and~~ Neon secondary conductor (s) shall be supported not more than 150 mm (6 in.) from the electrode connection to the tubing .
Substantiation: This proposed revision improves clarity by relocating neon tubing support requirements currently located in 600.42(C) to 600.41(B) because that is the section that covers tubing supports. It is more appropriate to include the support location rules relative to the electrode connection in this section since 600.42 applies to the electrode connections. This is a companion proposal to a similar revision to 600.41(B). No technical changes are proposed here, just revisions for clarity.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

18-160 Log #361 NEC-P18 **Final Action: Accept**
(600.42(G))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(G) Electrode Enclosures. Electrode enclosures shall be listed.
(1) Dry Locations. Electrode enclosures that are listed for use in dry, damp, or wet locations shall be permitted to be installed and used in such locations.
(2) Damp and Wet Locations. Electrode enclosures installed in damp and wet locations shall be specifically listed and identified for use in such locations.
FPN: See Section 110.3(B) covering installation and use of electrical equipment.
Substantiation: In the 2005 Code cycle, each of the CMPs were charged with the task of addressing the term "listed for the purpose." The objective was intended to result in Code that was more specific as to the purpose if it was not already self-evident in the rule. This section was revised to only require that the electrode enclosure be listed, which resulted in reduced significance for users and enforcement to a degree. It is understood by those involved in the Code process that 110.3(B) applies here. The problem is that the specialized technicians installing signs and outline lighting systems generally have a minimal understanding of the NEC and how it is to be used and the general requirements in Article 110 that apply to electrical installations. Having the specific details about the requirements related to electrode enclosures and their locations addressed in this text will be more understandable and user friendly. There are far too many electrode enclosures (that are listed) being used in violation of that listing. There is no question about a need for specific language in this section for improvement in the Code for both installers and enforcement.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 604 — MANUFACTURED WIRING SYSTEMS

19-129 Log #1709 NEC-P19 **Final Action: Accept in Principle in Part**
(604.2)

Submitter: Sherman Robbins, Joe Ross, Herman Miller Inc.
Recommendation: Add text to read as follows:
Manufacturing Wiring Systems. A listed system containing component parts that are assembled in the process of manufacturing and cannot be inspected at the building site without damage or destruction to the assembly and used for the connection of fixed or semi-fixed luminaries, utilization equipment, trolley-type busways and other devices .
Substantiation: The proposal expands the use and installation of listed manufactured wiring systems to include connection of equipment, other than luminaries, with strict accordance to the provisions of applicable articles (604.3 and 604.5). Trolley-type busway has proven to be a valuable wiring method to support reconfiguration in manufacturing environments that may be useful in other environments such as mall retail spaces, display spaces, and certain types of office spaces.
Panel Meeting Action: Accept in Principle in Part
Revise the proposed wording to read as follows:
"Manufacturing Wiring Systems. A ~~listed~~ system containing component parts that are assembled in the process of manufacturing and cannot be inspected at the building site without damage or destruction to the assembly and used for the connection of ~~fixed or semi-fixed~~ luminaries, utilization equipment, ~~trolley-type~~ **continuous plug-in type** busways and other devices."
Panel Statement: The panel accepts in principle the clarification of intended applications in the definition and addition of busways. The panel Rejects the addition of "Listed" as the NEC Style Manual prohibits the addition of requirements in a definition.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-130 Log #3418 NEC-P19 **Final Action: Accept**
(604.6)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: I. In 604.6(A)(3) delete the phrase "other than luminaires (fixtures)."
II. Add an exception to 604.6(A)(3) as follows:
Exception: Listed electric-discharge luminaires (fixtures) that comply with 410.30(C) shall be permitted with conductors smaller than 12 AWG.
III. Delete 604.6(F).
Substantiation: Although the intent of the 2005 change was appropriate, to allow smaller cord connections, the literal text looks very much like a flat prohibition against flexible cord connections to luminaires, and some inspectors are taking exactly that approach. 604.6(A)(3) can now be read to remove luminaires from the flexible cord allowance. Remember that 410.30(C) covers more than just flexible cord connections, so the allowance in 604.6(F) does not necessarily conflict with this position. 604.6(F) is in effect an exception to 604.6(A)(3). This proposal is much more clear. Leave the generic rules in 604.6(A)(3) as they were in the 2002 NEC, and add a straightforward permissive exception for the desired usage.
Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-131 Log #2507 NEC-P19 **Final Action: Accept**
(604.6(A))

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the proposal and move the FPN reference to the product standard into Annex A. The NEC Style Manual requires that product standards references appear in Annex A. This action will be considered by the panel as a public comment.
Submitter: Tom Lichtenstein, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
604.6(A) Cable or Conduit Types. Manufactured wiring systems shall be listed as manufactured wiring systems assemblies or shall be constructed in accordance with (1), (2) or (3). FPN: One method of determining applicable requirements for listing of manufactured wiring systems is to refer to ANSI/UL 183-2004, the Standard for Manufactured Wiring Systems. Remainder of section unchanged.
Substantiation: For several years, some Listed manufactured wiring systems have been constructed with recognized component flexible metal conduit that was fully evaluated as part of the Listed manufactured wiring system, however, because it was not Listed flexible metal conduit, presented a conflict with the wording in 604.6(A)(2).

The Standard for Manufactured Wiring Systems, ANSI/UL 183 permits flexible metal conduit that may not be Listed, however, requires it to be fully evaluated as part of the Listing of the manufactured wiring system for compliance with all the requirements in UL 1, The standard for Flexible Metal Conduit, except for certain inner and outer diameter dimensions that permit for different shapes and trade sizes not permitted in UL 1. UL 183 permits these constructions provided the assemblies are provided with factory installed mating connectors and fittings and the conduit complies with factory follow up performance evaluation in accordance with UL 1.

The revised text would permit the other than Listed conduit, only when fully evaluated as part of a Listed assembly that was Listed for compliance with the Standard for Manufactured Wiring Systems, ANSI/UL 183. The FPN: would present guidance on the appropriate Listing standard.

Panel Meeting Action: Accept

Number Eligible to Vote: 7

Ballot Results: Affirmative: 5 Negative: 2

Explanation of Negative:

BERNSON, J.: Using flexible metal conduits (FMC) that are not listed not only presents a conflict with existing wording in 604.6(A)(2), it conflicts with 348.6 which requires FMC and associated fittings to be listed. Another concern is how these "different shape" conduits can be called flexible metal conduit when 348.2 defines flexible metal conduit as being "a raceway of circular cross section."

348.20 clearly states that FMC less than metric designator 16 (trade size 1/2) shall not be used unless permitted in 348.20(A)(1) for enclosing the leads of motors. Therefore, allowing smaller sizes in manufactured wiring systems would be in violation of 348.20.

The fact that manufactured wiring systems have been using flexible metal conduit in violation of the listing requirement in 604.6(A)(2) does not justify altering the Code to allow the use of a non-listed product. Making a change of this nature sets a precedent that is undesirable. If these other types of flexible conduits must be used, the products should obtain listing and meet current Code requirements, or the "different shapes and trade sizes" should be evaluated for inclusion in Article 348 by CMP 8.

MCNEIVE, T.: The principle substantiation used for this proposal is that Manufactured Wiring Systems have been listed "for several years" using unlisted flexible metal conduit which is contrary to NEC 604.6(A)(2). Past noncompliance with the NEC is not valid substantiation for a code change. NEMA is concerned that acceptance of this broad proposal will open the code to inconsistent interpretation and application of component standards by an increasing number of competing nationally recognized testing laboratories.

NEMA manufacturers liberally volunteer in the maintenance and updating of component product standards. Acceptance of this proposal would promote circumventing of this important process and introduction of component parts into listed assemblies that are not held to the same standards as those that are separately supplied for field installations.

19-132 Log #1710 NEC-P19 **Final Action: Accept in Principle in Part**
(604.6(A)(4) (New))

TCC Action: It was the action of the Technical Correlating Committee that this proposal be sent to Code-Making Panel 8 for comment relative to the requirements associated with busway.

Submitter: Sherman Robbins, Joe Ross, Herman Miller Inc.

Recommendation: Add inner subparagraph (4) to 604.6(A) as follows :

<u>(4) Trolley-Type Busway. Where used as a component of a listed manufactured wiring system, trolley-type busways shall be installed in accordance with 368.10 and 368.12.</u>

Substantiation: Trolley-type busway has proven to be a valuable wiring method to support reconfiguration in manufacturing environments that may be useful in other environments such as mall retail spaces, display spaces, and certain types of office spaces.

Panel Meeting Action: Accept in Principle in Part

Revise the proposed wording to read as follows:

"604.6(A) Wiring Methods

604.6(A)(4) Busways. Busways shall be Listed Continuous plug-in type containing factory mounted, bare or insulated conductors, which shall be copper or aluminum bars, rods or tubes. The busway shall be grounded and provided with an equipment ground busbar equivalent in size to the ungrounded busbar. The busway shall be rated nominal 600 volts 20, 30, or 40 amperes. Busways shall be installed in accordance with 368.12, 368.17(D) and 368.30."

Panel Statement: The panel accepts in principle the addition of busway as a wiring method and describing construction, ratings and use of the busways. The panel replaced "trolley type" busway with "continuous plug-in type" busway because trolley type may be provided with accessible uninsulated live parts and is not intended to be placed within reach of individuals. A continuous plug-in busway has no exposed bus bars, and is intended for general use, including installation within the reach of persons.

Busway is not sized in AWG so guidance on the acceptable ampacity of the branch circuit busway is required. 20 – 40 amps falls within the current 12 - 8 AWG wire range accepted in Article 604.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-133 Log #3531 NEC-P19 **Final Action: Accept**
(604.6(A)(1))

Submitter: Richard Temblador, Southwire Company

Recommendation: Revise as follows:

(A) Cable or Conduit Types.

(1) Cables. Cable shall be ~~listed Type AC cable, or listed Type MC cable containing nominal 600 volt, 8 to 12 AWG insulated copper-conductors with a bare or insulated copper equipment grounding conductor equivalent in size to the ungrounded conductor~~ <u>one of the following:</u>

<u>a. Listed Type AC cable containing nominal 600-volt, 8 to 12 AWG insulated copper conductors with a bare or insulated copper equipment grounding conductor equivalent in size to the ungrounded conductor.</u>

<u>b. Listed Type MC cable containing nominal 600-volt, 8 to 12 AWG insulated copper conductors with a bare or insulated copper equipment grounding conductor equivalent in size to the ungrounded conductor.</u>

<u>c. Listed Type MC cable nominal 600 volts, 8 to 12 AWG insulated copper conductors with an aluminum grounding conductor and armor assembly identified as acceptable ground paths. The aluminum ground armor assembly shall have a current-carrying capacity equivalent to the ungrounded copper conductor.</u>

Other cables as listed in 725.61, 800.113, 820.113, and 830.179 shall be permitted in manufactured wiring systems for wiring of equipment within the scope of their respective articles.

The text of 604.6(A)(1) has been revised by a tentative interim amendment (TIA) see page 1.

Substantiation: Traditionally, a separate copper equipment grounding conductor has been required in Type MC or AC cables to insure that an effective ground fault current path is maintained when manufactured wiring components are subjected to frequent relocation. A listed MC cable product is available with an aluminum grounding conductor and an armor that provides redundant effective ground fault current paths and has current-carrying capacity equivalent to ungrounded circuit conductor in the cable.

The ground path effectiveness of this cable has been thoroughly evaluated by UL and found to provide an effective ground fault current path before and after physical performance testing.

Panel Meeting Action: Accept

Number Eligible to Vote: 7

Ballot Results: Affirmative: 6 Negative: 1

Explanation of Negative:

BERNSON, J.: 330.108 requires type MC cable to comply with 250.118(10) where it is used for equipment grounding. The new language in 604.6(A)(1)(b) and(c): "Listed Type MC cable," is not consistent with language in 250.118(10). Additionally, 250.118(10) requires the MC cable to be "listed and identified for grounding." The new language "grounding conductor and armor assembly identified as acceptable ground paths" in 604.6(A)(1)(c) does not meet the requirement in 250.118(10).

19-134 Log #1712 NEC-P19 **Final Action: Reject**
(604.6(G) (New))

Submitter: Timothy Edwards, Alcan Cable

Recommendation: Add text to read as follows:

604.6 Construction

(G) Mounting Brackets. The mounting brackets for supporting Metallic Outlet Boxes shall be listed for the purpose and shall have a thickness not less than 0.0625 in. (16 gauge) steel.

Substantiation: 314.40(B) Thickness of Metal defines the minimum thickness of metal boxes but the thickness for the bracket used to support and secure the boxes is not identified in the code. To ensure their suitability to support and secure boxes, it is essential that this requirement be specified in the code for the brackets. This change will ensure that the brackets, where used, will be capable of supporting the weight likely to be imposed on them from the boxes and other components of the system. Proposed thickness (16 gauge or 0.0625 in.) is consistent with the minimum dimensions used for the thickness of the steel used for boxes.

Panel Meeting Action: Reject

Panel Statement: Typically a manufactured wiring system is not constructed with metallic outlet boxes. The requirements for support of boxes and enclosures in 314.23 do not prescribe a minimum metal thickness. Listed box supports are subject to performance tests in lieu of prescriptive construction dimensions. See UL514A and C.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 7

19-135 Log #3086 NEC-P19 **Final Action: Reject**
(604.6(G) (New))

Submitter: Timothy Edwards, Alcan Cable

Recommendation: Add text to read as follows:

604.6 Construction

(G) Mounting Brackets. The mounting brackets for supporting Metallic Outlet Boxes shall be listed for the purpose and shall have a thickness not less than 0.0625 in. (16 gauge) steel.

Substantiation: 314.40(B) Thickness of Metal defines the minimum thickness of metal boxes but the thickness for the bracket used to support and secure the boxes is not identified in the code. To ensure their suitability to support and secure boxes, it is essential that this requirement be specified in the code for the brackets. This change will ensure that the brackets, where used, will be capable of supporting the weight likely to be imposed on them from the boxes and other components of the system. Proposed thickness (16 gauge or 0.0625 in.) is consistent with the minimum dimensions used for the thickness of the steel used for boxes.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 19-134.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-136 Log #510 NEC-P19 **Final Action: Accept in Principle in Part (604.7)**

Submitter: Robert L. Knapp, Byrne Electrical Specialists Inc. / Rep. UL-183 Working Group
Recommendation: Revise text to read:
604.7 ~~Unused~~ Outlets. All ~~unused~~ outlets shall be designed to prevent inadvertent contact with live parts. ~~capped to effectively close the connector opening~~ .
Substantiation: A standard NEMA outlet and a Manufactured Wiring System (MWS) connector currently could have similar size openings, be right next to each other and both pass a 1/4 in. probe test, but the MWS connector needs to have a cap and the NEMA receptacle doesn't. The UL 183 Standards Technical Panel proposes to add a 1/4 in. probe test to the UL 183 standard to evaluate the ability of a design to prevent inadvertent contact. This would be the same or similar to UL 498 Attachment Plugs and Receptacles 10.5 Contacts, UL 5 Surface Metal Raceways and Fittings 22.1(b), and CSA C22.2 No: 203.1-94 Manufactured Wiring Systems 4.3.4.
Panel Meeting Action: Accept in Principle in Part
Revise the existing Code with a following new second sentence to 604.6(C) to read as follows:
All connector openings shall be designed to prevent inadvertent contact with live parts or capped to effectively close the connector openings.
Delete 604.7
~~604.7 Unused Outlets. All unused outlets shall be capped to effectively close the connector openings.~~
Panel Statement: The panel a ccepts the proposed wording in principle in part as a second sentence to 604.6(C) to be consistent with the appropriate connector subsection and deleted 604.7. The panel retained the option for the use of caps to close openings as a means for complying with the requirements.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

ARTICLE 605 — OFFICE FURNISHINGS (CONSISTING OF LIGHTING ACCESSORIES AND WIRED PARTITIONS)

18-161 Log #922 NEC-P18 **Final Action: Reject**
(605.8(A), (B), (C) and (E) (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:
(A) Flexible Power-Supply Cord. The flexible power-supply cord shall be extra hard usage type with 12 AWG or larger conductors with an insulated equipment grounding conductor, a 20-ampere grounding type attachment plug, and not exceeding 600 mm (2 ft) in length.
(B) Receptacle Supplying Power. The receptacle supplying power shall be a grounding type rated 20-amperes 125 volts on a separate circuit serving only a panel ~~s and no other load~~ , and shall be located not more than 300 mm (12 in.) from the partition that ~~is connected to~~ it supplies.
(C) Individual partitions shall not contain more than 13 15- or 20 -ampere rated receptacle outlets.
Add:
(E) The branch circuit load shall be calculated in accordance with applicable requirements of 220.3 .
Substantiation: It appears the requirement for 12 AWG cord conductors and the (intended) limit of 13 receptacles correspond to 20-ampere circuit requirements, therefore a 20-ampere rated plug should be specified. If this is reasonable the 13 receptacles can be rated 15 or 20-amperes per 210.21(B)(3) and Tables 210.21(B)(3) and 210.24. Present limitation to 13 "outlets" is presumed to limit load (at 180 va each) to the ampacity of a 20-ampere circuit. However, only the number of outlets is limited; one outlet may contain more than one receptacle. Fixed type partitions (605.6) have no specific requirements re: number of receptacles or rating, nor does 605.7, therefore, 605.2(B) applies which involks other code sections for number, rating, and load calcualtion (220.3(B)(9)(11). The proposal would clarify load calculations and is more realistic than perhaps considering only the supply receptacle at 180 va as the load.
Panel Meeting Action: Reject
Panel Statement: Implementation of this restriction has not been substantiated. The use of a 12 AWG flexible cord does not necessarily dictate the requirement for a 20 amp plug cap.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 610 — CRANES AND HOISTS

12-1 Log #1523 NEC-P12 **Final Action: Accept in Principle (610, 620, 630, 640, 645, 650, and 665)**

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal by inserting the specific Sections or Parts of Article 250 that apply as required by 4.1.1 of the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
The Technical Correlating Committee directs that this proposal be referred to the Technical Correlating Committee Task Group on Grounding and Bonding for comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 610, 620, 630, 640, 645, 650, and 665 as described in the following, relative to the terms bonding and grounding.
610.61: Revise 610.61 as follows:
610.61 Grounding All exposed non–current-carrying metal parts of cranes, monorail hoists, hoists, and accessories, including pendant controls, shall be ~~metallically joined together into a continuous electrical conductor so that the entire crane or hoist will be grounded in accordance with Article 250~~ connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142 .
Moving parts, other than removable accessories, or attachments that have metal-to-metal bearing surfaces, shall be considered to be electrically connected to each other through bearing surfaces for grounding purposes. The trolley frame and bridge frame shall not be considered as electrically grounded through the bridge and trolley wheels and its respective tracks. A separate equipment bonding ~~conductor~~ jumper shall be provided.
620.81: Revise 620.81 as follows:
620.81 Metal Raceways Attached to Cars. Metal raceways, Type MC cable, Type MI cable, or Type AC cable attached to elevator cars shall be connected ~~bonded~~ to ~~grounded~~ metal parts of the car that are connected to the equipment grounding conductor ~~they contact~~ .
620.82: Revise 620.82 as follows:
620.82 Electric Elevators. For electric elevators, the frames of all motors, elevator machines, controllers, and the metal enclosures for all electrical equipment in or on the car or in the hoistway shall be connected to the equipment grounding conductor ~~grounded~~ in accordance with Article 250.
620.83: Revise 620.83 as follows:
620.83 Nonelectric Elevators. For elevators other than electric having any electric conductors attached to the car, the metal frame of the car, where normally accessible to persons, shall be connected to the equipment grounding conductor ~~grounded~~ in accordance with Article 250.
630.15 FPN: Revise 630.15 FPN as follows:
FPN: Connecting welder secondary circuits to ~~grounded~~ objects that are connected to ground can create parallel paths and can cause objectionable current over equipment grounding conductors.
640.7(A): Revise 640.7(A) as follows:
(A) General. Wireways and auxiliary gutters shall be ~~grounded and bonded in accordance with the requirements of Article 250~~ . connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142 Where the wireway or auxiliary gutter does not contain power-supply wires, the equipment grounding conductor shall not be required to be larger than 14 AWG copper or its equivalent. Where the wireway or auxiliary gutter contains power-supply wires, the equipment grounding conductor shall not be smaller than specified in 250.122.
64515: Revise 645.15 as follows:
645.15 Grounding. All exposed non-current-carrying metal parts of an information technology system shall be connected to the equipment grounding conductor ~~grounded~~ in accordance with Article 250 or shall be double insulated. Power systems derived within listed information technology equipment that supply information technology systems through receptacles or cable assemblies supplied as part of this equipment shall not be considered separately derived for the purpose of applying 250.20(D). Where signal reference structures are installed, they shall be bonded to the equipment grounding conductor ~~system~~ provided for the information technology equipment.
FPN No. 1: The bonding ~~and grounding~~ requirements in the product standards governing this listed equipment ensure that it complies with Article 250.
FPN No. 2: Where isolated grounding-type receptacles are used, see 250.146(D) and 406.2(D).
650.5: Revise 650.5 as follows:
650.5 Grounding. The rectifier shall be connected to the equipment grounding conductor ~~grounded~~ according to the provisions in 250.11(B).

665.26: Revise 665.26 as follows:

665.26 Grounding and Bonding. Connecting to the equipment grounding conductor ~~Grounding~~ or inter-unit bonding, or both, shall be used wherever required for circuit operation, for limiting to a safe value radio frequency voltages between all exposed non-current-carrying parts of the equipment and earth ground, between all equipment parts and surrounding objects, and between such objects and earth ground. Such ~~grounding~~ connection to the equipment grounding conductor and bonding shall be installed in accordance with Article 250, Parts II and V.

FPN: Under certain conditions, contact between the object being heated and the applicator results in an unsafe condition, such as eruption of heated materials. This unsafe condition may be prevented by grounding of the object being heated and ground detection.

Substantiation: 610.61: The proposed changes are intended to make the requirements more prescriptive in nature and providing reference to where the requirements are found in Article 250.

620.81: The proposed changes are intended to make the requirements more prescriptive.

620.82: The proposed revision is intended to be more specific as to where the connection of the specified parts is to be made. The equipment grounding conductor, by definition establishes the connection to ground.

620.83: The proposed revision is intended to be more specific to where the connection of the specified parts is to be made. The equipment grounding conductor, by definition establishes the connection to ground.

630.15 FPN: The terminology has been revised to reflect the changes in Article 250.

640.7(A): The proposed changes are intended to make the requirements more prescriptive in nature and provide reference to where the requirements are found in Article 250.

645.15: The proposed revision is intended to be more specific as to where the connection of the specified parts is to be made. The equipment grounding conductor, by definition establishes the connection to ground.

645.15 FPN: The words “and grounding” are deleted from FPN No. 1 as the product standards for information technology equipment deal solely with bonding.

650.5: The proposed revision is intended to be more specific as to how the rectifier is to be grounded. The equipment grounding conductor, by definition establishes the connection to ground.

665.26: The terminology has been revised to reflect the changes in Article 250.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms “bonded”, “grounded”, and “equipment grounding conductor” in Article 100 relative to this Task Group’s recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Revise 610.61 as follows:

610.61 Grounding. All exposed non-current-carrying metal parts of cranes, monorail hoists, hoists, and accessories, including pendant controls, shall be bonded either by mechanical connections or bonding jumpers, where applicable so that the entire crane or hoist is a ground fault current path as required or permitted by Article 250, Parts V and VII.

Moving parts, other than removable accessories, or attachments that have metal-to-metal bearing surfaces, shall be considered to be electrically bonded to each other through bearing surfaces for grounding purposes. The trolley frame and bridge frame shall not be considered as electrically grounded through the bridge and trolley wheels and its respective tracks. A separate bonding conductor shall be provided.

620.81 Metal Raceways Attached to Cars. Metal raceways, Type MC cable, Type MI cable, or Type AC cable attached to elevator cars shall be bonded to metal parts of the car that are bonded to the equipment grounding conductor.

620.82 Electric Elevators. For electric elevators, the frames of all motors, elevator machines, controllers, and the metal enclosures for all electrical equipment in or on the car or in the hoistway shall be bonded in accordance with Article 250.

620.83 Nonelectric Elevators. For elevators other than electric having any electric conductors attached to the car, the metal frame of the car, where normally accessible to person, shall be bonded in accordance with Article 250.

630.15 FPN - Reject change in the TCC Subcommittee proposal.

640.7(A) Change “connected” to “bonded” in the TCC Subcommittee proposal.

645.15 Change “connected” to “bonded” in the TCC Subcommittee proposal.

650.5 Grounding. The rectifier shall be bonded to the equipment grounding conductor according to the provisions of Article 250, Parts V, VI, VII and VIII.

665.26 Change “connecting” to “bonding” in the TCC Subcommittee proposal.

Panel Statement: The proposed wording meets the intent of the TCC Task Group but changes the terminology to be technically correct for the equipment.

The existing FPN wording in 630.15 is clear and the submitter has provided no substantiation that there is a problem with existing text. Welding return current can appear on EGC and create noise or other objectionable currents.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

12-2 Log #2217 NEC-P12 **Final Action: Reject**
(610.11)

Submitter: Kyle Cope, Prysmian Cables and Systems

Recommendation: Revise as follows:

“Conductors shall be enclosed in raceways or be Type AC cable with insulated grounding conductor, Type PA , Type MC cable, or Type MI cable...”.

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (610.11) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Type PA cable has not been recognized by the NEC as suitable at this time. No substantiation has been provided that this product has been listed by a qualified testing laboratory. The proposed article relating to this product has not been accepted at this time. Without the requirements necessary for the use of this product being in force, the panel cannot accept its inclusion in Article 610.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

12-3 Log #1175 NEC-P12 **Final Action: Reject**
(610.12(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Change “exposed” to “open”.

Substantiation: Edit. This section appears related to open (individual) conductors. Exposed (wiring methods) as defined in Article 100 is on or attached to the surface or behind access panels which permits many wiring methods.

Panel Meeting Action: Reject

Panel Statement: There is no definition for the term “open”. The term exposed is defined and well understood. This term was revised in the 2005 cycle, and section works in conjunction with 610.11(B) “Exposed conductors.”

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

12-4 Log #950 NEC-P12 **Final Action: Reject**
(610.14(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add:

Neutral conduits shall not be required to be counted in determining allowable ampacities.

Substantiation: Edit. Neutral conductors are generally not required to be counted as current-carrying per 310.15(B)(4), Tables 310.15(B)(2)(a), 310.16, 310.18.

Panel Meeting Action: Reject

Panel Statement: The panel disagrees with the submitter’s substantiation that the proposal is editorial in nature. Furthermore, the substantiation deals with neutral conductors where the text of the proposal is requesting a change for neutral conduits. Section 310.15(B)(4) sets forth the requirements when common neutral conductors are counted as a current carrying conductor and when they are not. The statement in the substantiation,”generally not required”, is not correct in many installations where a neutral conductor is not a common conductor to all phase conductors.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

12-5 Log #3280 NEC-P12 **Final Action: Accept**
(Table 610.14(A))

TCC Action: The Technical Correlating Committee understands the accepted change to this Table occurs in the heading at the top of the Table and not to the notes at the bottom of the Table.

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Recommendation: Revise text to read as follows:

Up to Four Simultaneously Energized Conductors in Raceway or Cable

Up to Three ac 2 or Four dc 1 Simultaneously Energized Conductors in Raceway or Cable.

Substantiation: The notes to Table 610.14(A) refer to simultaneously Energized conductors. The ampacities are based on simultaneously energized conductors as indicated by Notes 1 and 2. Present wording indicates neutrals are to be counted, where used. 310.15(B)(4) does not require a neutral conductor that carries only the unbalanced current from other conductors to be counted.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

12-6 Log #3281 NEC-P12 **Final Action: Accept in Principle**
(Table 610.14(D))

TCC Action: The Technical Correlating Committee directs the panel to reconsider this proposal and clarify if their revisions are to the recommendation or the existing code text. This action will be considered by the panel as a public comment.
Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Revise Table 610.14(D) to read:

Table 610.14(D) Contact Conductor Supports

Size of Wire (AWG)	**Maximum Distance Between End Strain Insulators or Clamp Type Intermediate Supports**
6	9.0 m (30 ft) or less
4	18 m (60 ft) or less
2	Over 18 m (60 ft)

Substantiation: Table 610.14(D) determines the maximum distance permitted between supports for contact conductors based on conductor size required for the installation.
Panel Meeting Action: Accept in Principle
Change the Table 610.14 (D) title to: “Minimum Contact Conductor Size Based on Distance Between Supports”.
Add the word “Minimum” in front of the column title “Size of Wire (AWG)”
Panel Statement: Table 610.14(D) provides mechanical strength in the wire depending on the distance between supports. The wire required for ampacity might only be 10 AWG (43 amp 30 min 75C) but must be 4 AWG because the distance between supports is 9 to 18 meters.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

12-7 Log #3282 NEC-P12 **Final Action: Accept in Principle**
(610.14(D))

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Revise text to read as follows:
(D) Contact Conductors. The ampacity of contact conductors shall be based on Table 610.14(A) for 75°C (167°F) wire and shall be supported in accordance with Table 610.14(D).
Substantiation: Table 610.14(D) determines the maximum distance permitted between supports for contact conductors based on the contact conductor size required for the installation.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 12-6.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

12-8 Log #1548 NEC-P12 **Final Action: Accept in Principle**
(610.21(F)(4))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term “effectively” from the terms “effectively grounded” and “effectively bonded” from Articles 610 and revise text as shown for the affected NEC sections.
610.21(F)(4): (4) The rail serving as a conductor is ~~effectively grounded~~ connected to the equipment grounding conductor at the transformer and also shall be permitted to be grounded by the fittings used for the suspension or attachment of the rail to a building or structure.
Substantiation: 610.21(F)(4): The definition of “effectively grounded” is ambiguous and very subjective without any defined values or parameters for one to judge as either “effective” or “ineffective.” This section has been revised to prescribe the connection to the equipment grounding conductor.
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term “grounded, effectively” and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group’s recommendations. The substantiation of this proposal is as follows.
The term “Effectively Grounded” is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word “grounded” or phrase “connected to an equipment grounding conductor” could be used. Other proposals are submitted to make those changes.
The 1996 NEC in Section 250.51 used the term “effective grounding path,” and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term “effectively grounded.”
The definition “Effectively Grounded” is very subjective and without any defined values or parameters for one to judge grounding as either “effective” or “ineffective.” “Effective” is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes “effectively grounded.” Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.
This proposal is to change the term “Effectively Bonded” to just “Bonded” in each of the section where it is used. The term “Effectively Bonded” is currently not defined in the NEC.
The term “effectively bonded” is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between “Effectively Bonded” and “Bonded” really is. Where the term appears in the NEC, it is revised to just “bonded” and still has the same meaning in each rule.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Revise 610.21(F)(4) to read:
The rail serving as a conductor shall be bonded to the equipment grounding conductor at the transformer and also shall be permitted to be grounded by the fittings used for the suspension or attachment of the rail to a building or structure.
Panel Statement: The text meets the intent of the submitter and changes the word “connected” to “bonded”.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

12-9 Log #359 NEC-P12 **Final Action: Accept in Principle**
(610.31)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
610.31 Runway Conductor Disconnecting Means. A disconnecting means that has a continuous ampere rating not less than that computed in 610.14(E) and (F) shall be provided between the runway contact conductors and the power supply. Such disconnecting means shall consist of a motor-circuit switch, circuit breaker, or molded case switch. This disconnecting means shall be as follows:
(1) Readily accessible and operable from the ground or floor level
(2) Capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase “capable of being locked in the open position” is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: The panel changed the wording of the first sentence to be consistent with 430.102(B), exception.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
QUAVE, D.: I agree with the submitter that it does provide consistency in the NEC and that it increases Safety for the installer/maintainer.
WHITE, K.: I would like to affirm with a comment, the last sentence that was added by the panel “Portable means for adding a lock to the switch or circuit breaker shall not be permitted.” Will prohibit the use of portable devices that provide for the attachment of multiple locks (i.e. Scissors) to the locking mechanism. The sentence should be removed.

12-10 Log #2043 NEC-P12 **Final Action: Accept in Principle**
(610.31)

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
610.31 Runway Conductor Disconnecting Means
A disconnecting means that has a continuous ampere rating not less than that calculated in 610.14(E) and 610.14(F) shall be provided between the runway contact conductors and the power supply. Such disconnecting means shall consist of a motor-circuit switch, circuit breaker, or molded case switch. This disconnecting means shall be as follows:
(1) Readily accessible and operable from the ground or floor level
(2) Capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
(3) Open all ungrounded conductors simultaneously
(4) Placed within view of the runway contact conductors
Substantiation: The problem with the present wording of this section is that the disconnect in many crane/hoist applications is a circuit breaker in a panelboard/switchboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.
This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.
This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
Where cranes and hoists are involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.
Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances
The same level of safety is needed for these disconnecting means for cranes and hoists.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
QUAVE, D.: See my Comment on Affirmative for Proposal 12-9.

12-11 Log #353 NEC-P12 **Final Action: Accept in Principle**
(610.32)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to red as follows:
610.32 Disconnecting Means for Cranes and Monorail Hoists. A motor-circuit switch, molded-case switch, or circuit breaker shall be provided in the leads from the runway contact conductors or other power supply on all cranes and monorail hoists. The disconnecting means shall be capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-12 Log #2044 NEC-P12 **Final Action: Accept in Principle**
(610.32)

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
610.32 Disconnecting Means for Cranes and Monorail Hoists
A motor-circuit switch, molded-case switch, or circuit breaker shall be provided in the leads from the runway contact conductors or other power supply on all cranes and monorail hoists. The disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.
Where a monorail hoist or hand-propelled crane bridge installation meets all of the following, the disconnecting means shall be permitted to be omitted:
(1) The unit is controlled from the ground or floor level.
(2) The unit is within view of the power supply disconnecting means.
(3) No fixed work platform has been provided for servicing the unit.
Where the disconnecting means is not readily accessible from the crane or monorail hoist operating station, means shall be provided at the operating station to open the power circuit to all motors of the crane or monorail hoist.
Substantiation: The problem with the present wording of this section is that the disconnect in many crane/hoist applications is a circuit breaker in a panelboard/switchboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.
This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.
This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
Where cranes and hoists are involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.
Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances
The same level of safety is needed for these disconnecting means for cranes and hoists.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:
QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-13 Log #1006 NEC-P12 **Final Action: Reject**
(610.43(A) Exception (New))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
Exception: Overload protection shall not be required where the interruption of the circuit would create a hazard.
Substantiation: This is permitted in 240.4(A) but not stated in this article, which may be perceived as modifying that section.
Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any technical substantiation to identify a hazard or a safety problem with regard to the fuse or circuit breaker rating as required by 610.42 (A). The size of the fuse or circuit breaker rating in 610.42(A) and Table 430.52 is for short-circuit protection of the circuit and not overload protection. The permission in 240.4(A) does not identify a crane, hoist, or monorail hoist as a potential hazardous situation where an overcurrent protective device for short-circuit protection can be omitted because of an overload.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

12-14 Log #495 NEC-P12 **Final Action: Accept in Principle**
(610.61)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
VII. Grounding and Bonding.
610.61 Grounding and Bonding. All exposed normally non-current-carrying metal parts of cranes, monorail hoists, hoists, and accessories, including pendant controls, shall be metallically joined together into a continuous electrical conductor so that the entire crane or hoist will be grounded in accordance with Article 250. Moving parts, other than removable accessories, or attachments that have metal-to-metal bearing surfaces, shall be considered to be electrically connected to each other (bonded) through bearing surfaces for grounding and bonding purposes. The trolley frame and bridge frame shall not be considered as electrically grounded or bonded through the bridge and trolley wheels and its respective tracks. A separate bonding conductor shall be provided.
Substantiation: A change was accepted in the 2005 NEC in this section to require a separate bonding conductor for bonding purposes. It appears that both bonding and grounding requirements are provided in this section. The proposed revision to the title of the part and the section is to reflect what is covered in the rule. The words “and bonding” have been added where appropriate to complete the requirements in this section.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 12-1.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

12-15 Log #1061 NEC-P12 **Final Action: Reject**
(610.61)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete “in accordance with the requirements of Article 250”.
Substantiation: Edit. To comply with the Style Manual. Article 250 already applies per 90.3.
Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the submitter’s substantiation that this is mandated by the NEC Style Manual. The reference provides better clarity and helps the user and is allowed by 4.1.1 of the NEC Style Manual where additional conditions are specified.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

12-16 Log #1176 NEC-P12 **Final Action: Reject**
(610.61)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete “Article 250”.
Substantiation: Edit. To conform to the Style Manual. 90.3 states Article 250 applies generally unless amended.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-15.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 620 — ELEVATORS, DUMBWAITERS, ESCALTORS, MOVING WALKS, WHEELCHAIR LIFTS, AND STAIRWAY CHAIR LIFTS

12-16a Log #CP1201 NEC-P12 **Final Action: Accept**
(620)

Submitter: Code-Making Panel 12,
Recommendation: Add the following two new definitions to 620.2:
Remote Machine Room and Control Room (for Elevator, Dumbwaiter). A Machine Room or Control Room that is not attached to the outside perimeter or surface of the walls, ceiling or floor of the hoistway.
Remote Machinery Space and Control Space (for Elevator, Dumbwaiter). A Machinery Space or Control Space that is not within the hoistway, machine room or control room, and that is not attached to the outside perimeter or surface of the walls, ceiling or floor of the hoistway.
Substantiation: Remote Machine Rooms, Contro; Rooms, Machinery Spaces and Contro;l Spaces exist and are defined in A17.1-2004 , Safety Code for Elevators and Escalators.. The terms are also used in Article 620 and should be defined and coordinated with the Elevator Safety Code.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-17 Log #3539 NEC-P12 **Final Action: Accept in Principle**
(620)

TCC Action: The Technical Correlating Committee advises that Article titles and Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action on both with the request that “wheelchair lift” be changed to “platform lifts” and “stairway chair lifts” be changed to “stairway chairlifts” to agree with the title of the ASME A18.1 standard and to comply with 3.3.3 of the NEC Style Manual.
Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Replace “wheelchair” lift with “platform” lift.
Substantiation: To provide consistent language with ASME A18.1 — Safety Standard for Platform Lifts and Stairway Chairlifts.
Panel Meeting Action: Accept in Principle
Replace the term “wheelchair lift(s)” with the term “platform lift(s)” throughout Article 620, Article 620 Title, 620.1 Scope, 620.4, 620.5(A)(1), 620.21, 620.21(C), 620.21(C)(1), 620.21(C)(2), 620.34, 620.38, 620.51(A) Exception, 620.51(C)(4), 620.61(B)(4), 620.71(B), 620.84.
Panel Statement: The submitter did not identify the exact sections, which should be changed, however, the panel agrees with the concerns of the submitter. The panel requests that the TCC review changing the term “wheelchair lift” to “platform lift” throughout the entire NEC. The panel also requests the TCC change both the title and scope of Article 620 to reflect the correct term “Platform Lift” as used in ASME A18.1.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-18 Log #3540 NEC-P12 **Final Action: Reject**
(620)

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Add a section with requirements for battery operated equipment.
Substantiation: Manual platform (wheelchair) lifts are battery powered and the current requirements do not adequately address this newer technology.
Panel Meeting Action: Reject
Panel Statement: The proposed changes fail to comply with Section 4-3.3 of NFPA Regulations Governing Committee Projects. A clear recommendation fails to exist.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-19 Log #1219 NEC-P12 **Final Action: Accept in Principle**
(620.1 and FPN No. 1 and 2)

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:
620.1 Scope. This article covers the installation of electrical equipment and wiring used in connection with elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts.
FPN No. 1: For further information, see ASME ~~/ANSI A17.1 2000~~ A17.1-2004, Safety Code for Elevators and Escalators.
FPN No. 2: For further information, see ~~ASME/ANSI A17.5 1996 (CSA B44.1 199~~ 6 CSA B44.1-04/ASME-A17.5-2004 ~~),~~ Elevator and Escalator Electrical Equipment Certification Standard.
Substantiation: The FPNs should reflect the latest Edition of the referenced standards.
Panel Meeting Action: Accept in Principle
.**Panel Statement:** See action taken on Proposal 12-20.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-20 Log #2026 NEC-P12 **Final Action: Accept**
(620.1 FPN No. 1 & No. 2)

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
620.1 Scope. This article covers the installation of electrical equipment and wiring used in connection with elevators, dumbwaiters, escalators, moving works, wheelchair lifts, and stairway chair lifts.
FPN 1: For further information, see ASME ~~/ANSI A17.1 2000~~ A17.1-2004, Safety Code for Elevators and Escalators.

FPN 2: For further information, see ~~ASME/ANSI A17.5 1996 (CSA B44.1 1996~~ CSA B44.1-04/ASME-A17.5-2004 ~~)~~

Substantiation: The FPNs should reflect the latest Edition of the referenced standards.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-20a Log #CP1200 NEC-P12 **Final Action: Accept**

(620.1, FPN 3)

TCC Action: The Technical Correlating Committee understands that the first sentence in the Recommendation is explanatory and the Panel Action on this Proposal does not incorporate the first sentence into the FPN.

Submitter: Code-Making Panel 12,

Recommendation: 1) Add a new fine print note 3 as follows:

FPN No. 3: The term "Wheelchair Lift" has been changed to "Platform Lift". For further information, see ASME A18.1–2005 *Safety Standard for Platform Lifts and Stairway Lifts.*

Substantiation: The user should be informed of the safety standard governing this equipment which is included in Article 620. ASME A18.1 Safety Standard for Platform Lifts and Stairway Chairlifts covers the design, construction, installation, operation, inspection, testing, maintenance, and repair of inclined stairway chairlifts and inclined and vertical platform lifts intended for transportation of a mobility impaired person only. These lifts are not intended for material handling purposes.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-21 Log #1215 NEC-P12 **Final Action: Accept**

(620.3(A))

Submitter: Andy Juhasz, KONE Inc.

Recommendation: Revise text to read as follows:

620.3 Voltage Limitations. The supply voltage shall not exceed 300 volts between conductors unless otherwise permitted in 620.3(A) through 620.3(C).

(A) Power Circuits. Branch circuits to door operator controllers and door motors and branch circuits and feeders to motor controllers, driving machine motors, machine brakes, and motor-generator sets shall not have a circuit voltage in excess of 600 volts. Internal voltages of power conversion equipment and functionally associated equipment, and the operating voltages of wiring interconnecting the equipment ~~including the interconnecting wiring~~ , shall be permitted to ~~have~~ be higher ~~voltages~~ , provided that all such equipment and wiring shall be listed for the higher voltages. Where the voltage exceeds 600 volts, warning labels or signs that read "DANGER - HIGH VOLTAGE" shall be attached to the equipment and shall be plainly visible.

Substantiation: The wording "Internal voltages of power conversion and functionally associated equipment, including the interconnecting wiring, shall be permitted to have higher voltages, provided that all such equipment and wiring shall be listed for the higher voltages." is not clear. Is it interconnecting internal wiring or wiring that interconnects power conversion equipment with functionally associated equipment that is also permitted to have higher voltages? The use of the word "interconnecting", meaning connecting between, suggests the latter. For clarity, revise the wording as shown in this proposal.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-22 Log #2021 NEC-P12 **Final Action: Accept**

(620.3(A))

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee

Recommendation: Revise text to read as follows:

620.3 Voltage Limitations. The supply voltage shall not exceed 300 volts between conductors unless otherwise permitted in 620.3(A) through 620.3(C).

(A) Power Circuits. Branch circuits to door operator controllers and door motors and branch circuits and feeders to motor controllers, driving machine motors, machine brakes, and motor-generator sets shall not have a circuit voltage in excess of 600 volts. Internal voltages of power conversion equipment and functionally associated equipment, and the operating voltages of wiring interconnecting the equipment ~~including the interconnecting wiring,~~ shall be permitted to ~~have~~ be higher ~~voltages~~ , provided that all such equipment and wiring shall be listed for the higher voltages. Where the voltage exceeds 600 volts, warning labels or signs that read "DANGER - HIGH VOLTAGE" shall be attached to the equipment and shall be plainly visible.

Substantiation: The wording "Internal voltages of power conversion and functionally associated equipment, including the interconnecting wiring, shall be permitted to have higher voltages, provided that all such equipment and wiring shall be listed for the higher voltages." is not clear. Is it interconnecting internal wiring or wiring that interconnects power conversion equipment with functionally associated equipment that is also permitted to have higher voltages? The use of the word interconnecting, meaning connecting between, suggests the later.

For clarity, revise the wording as shown in the proposal.

Panel Meeting Action: Accept

Panel Statement: See action taken on Proposal 12-21.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

JONES, R.: My notes indicate this was accept in principle.

12-23 Log #3532 NEC-P12 **Final Action: Reject**

(620.11(A))

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association

Recommendation: Revise as follows:

620.11(A) Hoistway Door Interlock Wiring. The conductors to the hoistway door interlocks from the hoistway riser shall be flame retardant and suitable for a temperature of not less than 200°C (392°F). Conductor shall be Type SF or equivalent. This requirement shall be waived for nonfire rated applications.

Substantiation: To clarify that this requirement does not apply to equipment that is not intended for use during fires.

Panel Meeting Action: Reject

Panel Statement: Elevators for which non-fire resistive construction is used and that travel more than 80 inches or that penetrate a floor are still required to operate on firefighters operation. The construction of this wiring is still necessary to provide for the protection of firefighters using the equipment. In addition, 620.11(C) states that all conductors in raceways shall have flame-retardant insulation.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-24 Log #935 NEC-P12 **Final Action: Reject**

(Table 620.14)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text:

Feeder conductors of less ampacity than required by 620.13 shall be permitted ~~subject to the requirements of~~ a demand factor in accordance with Table 620.14. No other demand factors shall be permitted. Delete 1 in left column and 1.00 in right column.

Substantiation: Edit. Table 620.14 relates to permitted applications, not requirements per se which may infer demand factors must be used. A 100 percent demand factor for one elevator is not "permitted" to be 100 percent, but required.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any definitive technical substantiation that a problem exists with the present wording of Table 620.14. The intent of Table 620.14 is clearly expressed with the present wording, and the proposed wording would be of no value in explaining the intent.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-25 Log #3096 NEC-P12 **Final Action: Accept in Principle**

(620.21 Exception)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding the exact location of the Exception.

The Technical Correlating Committee understands that the last phrase in the first sentence should read "the pump shall be permitted to be cord connected."

This action will be considered by the Panel as a Public Comment.

Submitter: Joseph A. Hertel, Safety and Buildings

Recommendation: Revise as follows:

Wiring methods [620.21] This is an exception in addition to the requirements of 620.21(A)(1):

Exception: The hoistway storm water sump pump motor and the hoist oil recovery pump motor shall be permitted to be cord connected. The cord shall be a hard usage oil resistant type and shall be routed where not subject to physical damage.

Substantiation: Currently, there is no provision for the use of cord connected equipment in an elevator hoistway. An exception or the addition of appropriate language would allow installations that are commonly accepted.

Panel Meeting Action: Accept in Principle

Revise as follows:

Exception: Where a sump pump or oil recovery pump is located in the pit, shall be permitted to be cord connected. The cord shall be a hard usage oil-resistant type, of a length not to exceed 1.8 m (6 ft), and shall be located to be protected from physical damage.

Panel Statement: The panel's change meets the intent of the submitter and clarifiies that cord-connected sump pump and oil recovery pump equipment is permitted but sets the limit on the length of the cord.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-26 Log #1216 NEC-P12 **Final Action: Accept**
(620.21(A)(1)(d))

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:
620.21(A)(1)
~~(d) Flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit or flexible cords and cables, or conductors grouped together and taped or corded that are part of listed equipment, a driving machine, or a driving machine brake shall be permitted in the hoistway, in lengths not to exceed 1.8 m (6 ft), without being installed in a raceway and where located to be protected from physical damage and are of a flame retardant type.~~
(d) The following wiring methods shall be permitted in the hoistway in lengths not to exceed 1.8 m (6 ft):
(1) flexible metal conduit
(2) liquidtight flexible metal conduit
(3) liquidtight flexible nonmetallic conduit
(4) flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be of a flame-retardant type and shall be part of:
(a) listed equipment,
(b) a driving machine, or
(c) a driving machine brake
Substantiation: The current wording is not grammatically correct and leads to misinterpretation. It is only the flexible cords and cables or conductors grouped together and taped or corded that are not required to be installed in a raceway. The other methods listed are raceways themselves. For clarity revise the wording as shown in the proposal.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-27 Log #2022 NEC-P12 **Final Action: Accept in Principle**
(620.21(A)(1)(d))

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
620.21(A)(1)
~~(d) Flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit or flexible cords and cables, or conductors grouped together and taped or corded that are part of listed equipment, a driving machine, or a driving machine brake shall be permitted in the hoistway, in lengths not to exceed 1.8 m (6 ft), without being installed in a raceway and where located to be protected from physical damage and are of a flame retardant type.~~
(d) The following wiring methods shall be permitted in the hoistway in lengths not to exceed 1.8 m (6 ft):
(1) flexible metal conduit
(2) liquidtight flexible metal conduit
(3) liquidtight flexible nonmetallic conduit
(4) flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be a flame-retardant type and shall be part of:
(a) listed equipment,
(b) a driving machine, or
(c) a driving machine brake
Substantiation: The current wording is not grammatically correct and leads to misinterpretation. It is only the flexible cords and cables or conductors grouped together and taped or corded that are not required to be installed in a raceway. The other methods listed are raceways themselves. For clarity, revise the wording as shown in the proposal.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 12-26.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-28 Log #1217 NEC-P12 **Final Action: Accept**
(620.21(A)(2)(d))

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:
620.21(A)(2)
~~(d) Flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit or flexible cords and cables, or conductors grouped together and taped or corded that are part of listed equipment, a driving machine or a driving machine brake shall be permitted on the car assemble, in lengths not to exceed 1.8 m (6 ft), without being installed in a raceway and where located to be protected from physical damage and are of a flame retardant type.~~
(d) The following wiring methods shall be permitted on the car assembly in lengths not to exceed 1.8 m (6 ft):
(1) flexible metal conduit
(2) liquidtight flexible metal conduit
(3) liquidtight flexible nonmetallic conduit
(4) flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be of a flame-retardant type and shall be part of:
(a) listed equipment,
(b) a driving machine, or
(c) a driving machine brake
Substantiation: The current wording is not grammatically correct and leads to misinterpretation. It is only the flexible cords and cables or conductors grouped together and taped or corded that are not required to be installed in a raceway. The other methods listed are raceways themselves. For clarity revise the wording as shown in the proposal.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-29 Log #2023 NEC-P12 **Final Action: Accept in Principle**
(620.21(A)(2)(d))

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
620.21(A)(2)
~~(d) Flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit or flexible cords and cables, or conductors grouped together and taped or corded that are part of listed equipment, a driving machine, or a driving machine brake shall be permitted in the hoistway, in lengths not to exceed 1.8 m (6 ft), without being installed in a raceway and where located to be protected from physical damage and are of a flame retardant type.~~
(d) The following wiring methods shall be permitted on the car assembly in lengths not to exceed 1.8 m (6 ft):
(1) flexible metal conduit
(2) liquidtight flexible metal conduit
(3) liquidtight flexible nonmetallic conduit
(4) flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be a flame-retardant type and shall be part of:
(a) listed equipment,
(b) a driving machine, or
(c) a driving machine brake
Substantiation: The current wording is not grammatically correct and leads to misinterpretation. It is only the flexible cords and cables or conductors grouped together and taped or corded that are not required to be installed in a raceway. The other methods listed are raceways themselves. For clarity, revise the wording as shown in the proposal.
Panel Meeting Action: Accept in Principle
.Panel Statement: See panel action on Proposal 12-28.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-30 Log #3534 NEC-P12 **Final Action: Reject**
(620.21(A)(2)d. Exception (New))

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Add an exception to read as follows:
Exception: Flex conduit in excess of 1.8 m (6 ft) shall be permitted when a separate ground is provided and where located to be protected from physical damage and are of a flame-retardant type.
Substantiation: Lengths in excess of 1.8 m are allowed elsewhere in the code when a separate ground is provided and where protected and flame retardant.

Panel Meeting Action: Reject
Panel Statement: The intent of Section 620.21(A)(2)(d) is to limit the amount of these flexible wiring methods and has nothing to do with equipment grounding.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-31 Log #1214 NEC-P12 **Final Action: Accept**
(620.21(A)(3)(e))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal since the proposal text is unclear as to how the final sentence is incorporated into the preceding text. This action will be considered by the Panel as a Public Comment.
Submitter: Andy Juhasz, KONE Inc.
Recommendation: Add text to read as follows:
620.21(A)(3)
(e) Flexible cords and cables in lengths not to exceed 1.8 m (6 ft) that are of a flame-retardant type and located to be protected from physical damage and that are part of:
(1) listed equipment,
(2) a driving machine, or
(3) a driving machine brake
Shall be permitted in these rooms and spaces without being installed in a raceway.
Substantiation: This wiring method is permitted in elevator hoist ways, 620.21(A)(1)(d), on elevator cars, 620.21(A)(2)(d) and on counterweights 620.21(A)(4). The same wiring methods for equipment located in the hoist way, on the car or on the counterweight should be afforded to the same types of equipment located in these rooms and spaces.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-32 Log #2025 NEC-P12 **Final Action: Accept in Principle**
(620.21(A)(3)(e))

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Add text to read as follows:
620.21(A)(3)
(e) Flexible cords and cables in lengths not to exceed 1.8 m (6 ft) that are of a flame-retardant type and located to be protected from physical damage and that are part of:
(1) listed equipment,
(2) a driving machine, or
(3) a driving machine brake shall be permitted in these rooms and spaces without being installed in a raceway.
Substantiation: This wiring method is permitted in elevator hoistways, 620.21(A)(1)(d), on elevator cars, 620.21(A)(2)(d) and on counterweights 620.21(A)(4). The same wiring methods for equipment located in the hoistway, on the car or on the counterweight should be afforded to the same types of equipment located in these rooms and spaces.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 12-31.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-33 Log #1218 NEC-P12 **Final Action: Accept**
(620.21(A)(4)(d))

TCC Action: The Technical Correlating Committee understands that the correct section reference is 620.21(A)(1)(d).
Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:
~~(d) Flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit or flexible cords and cables, or conductors grouped together and taped or corded that are part of listed equipment, a driving machine, or a driving machine brake shall be permitted on the counterweight assembly, in lengths not to exceed 1.8 m (6 ft), without being installed in a raceway and where located to be protected from physical damage and are of a flame-retardant type.~~
(d) The following wiring methods shall be permitted on the counterweight assembly in lengths not to exceed 1.8 m (6 ft):
(1) flexible metal conduit
(2) liquidtight flexible metal conduit
(3) liquidtight flexible nonmetallic conduit
(4) flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be of a flame-retardant type and shall be part of:
(a) Listed equipment,
(b) a driving machine, or
(c) a driving machine brake
Substantiation: The current wording is not grammatically correct and leads to misinterpretation. It is only the flexible cords and cables or conductors grouped together and taped or corded that are not required to be installed in a raceway. The other methods listed are raceways themselves. For clarity revise the wording as shown in the proposal.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-34 Log #2024 NEC-P12 **Final Action: Accept in Principle**
(620.21(A)(4)(d))

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
620.21(A)(4)
~~(d) Flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit or flexible cords and cables, or conductors grouped together and taped or corded that are part of listed equipment, a driving machine, or a driving machine brake shall be permitted in the hoistway, in lengths not to exceed 1.8 m (6 ft), without being installed in a raceway and where located to be protected from physical damage and are of a flame retardant type.~~
(d) The following wiring methods shall be permitted on the counterweight assembly in lengths not to exceed 1.8 m (6 ft):
(1) flexible metal conduit
(2) liquidtight flexible metal conduit
(3) liquidtight flexible nonmetallic conduit
(4) flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be a flame-retardant type and shall be part of:
(a) listed equipment,
(b) a driving machine, or
(c) a driving machine brake
Substantiation: The current wording is not grammatically correct and leads to misinterpretation. It is only the flexible cords and cables or conductors grouped together and taped or corded that are not required to be installed in a raceway. The other methods listed are raceways themselves. For clarity, revise the wording as shown in the proposal.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 12-33.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-35 Log #3533 NEC-P12 **Final Action: Accept**
(620.21(C))

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Revise as follows:
620.21(C) Wheelchair Lifts and Stairway Chairlift Raceways
(1) No change
(2) No change
(3) Flexible Cords and Cables. Flexible cords and cables that are components of listed equipment and used in circuits operating at 30 volts rms or less or 42 volts dc or less shall be permitted in lengths not to exceed 1.8 m (6 ft) provided the cords and cables are supported and protected from physical damage and are of a jacketed and flame-retardant type.
Substantiation: To allow the use of cords and cables on low voltage circuits. The requirements are the same as allowed for elevators.
Panel Meeting Action: Accept
.Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-36 Log #1220 NEC-P12 **Final Action: Accept**
(620.23, FPN)

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:
620.23 Branch Circuits for Machine Room or Control Room/ Machinery Space or Control Space Lighting and Receptacle(s).
FPN: See ~~ANSI /~~ ASME ~~A17.1 2000~~ A17.1-2004 , Safety Code for Elevators and Escalators, for illumination levels.
Substantiation: The FPNs should reflect the latest Edition of the referenced standards.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-37 Log #2027 NEC-P12 **Final Action: Accept in Principle**
(620.23, FPN)

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
620.23 Branch Circuits for Machine Room or Control Room/Machinery Space or Control Space Lighting and Receptacle(s).
FPN: ~~See ANSI/~~ ASME ~~A17.1 2000~~ A17.1-2004, Safety Code for Elevators and Escalators, for illumination levels.
Substantiation: The FPN should reflect the latest Edition of the referenced standards.
Panel Meeting Action: Accept in Principle
.
Panel Statement: See action taken on Proposal 12-36.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-38 Log #1360 NEC-P12 **Final Action: Accept in Principle**
(620.23(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Proposal to require the receptacle to be rated 15 or 20A
620.23 Branch Circuits for Machine Room or Control Room/Machinery Space or Control Space Lighting and Receptacle(s).
(C) Duplex Receptacle. At least one 15A or 20A **,** 125-volt, single-phase, duplex receptacle shall be provided in each machine room or control room and machinery space or control space.
Substantiation: The intent of the proposed additional text is to ensure that a 15A or 20A, single-phase, 125V receptacle be provided for hand-tools and such. As is it currently written, a receptacle of any voltage/ampere rating could be installed to meet the *Code's* requirement.

Panel Meeting Action: Accept in Principle
Revise proposal to read:
(C) Duplex Receptacle. At least one 125-volt, single-phase, 15 or 20 ampere **,** duplex receptacle shall be provided in each machine room or control room and machinery space or control space.
Panel Statement: The panel moved the amperage after the term single-phase to be consistent with other sections of the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-39 Log #1221 NEC-P12 **Final Action: Accept**
(620.24, FPN)

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follow:
620.24 Branch Circuit for Hoistway Pit Lighting and Receptacle(s).
FPN: See ~~ANSI /~~ ASME ~~A17.1 2000~~ A17.1-2004 , Safety Code for Elevators and Escalators, for illumination levels.
Substantiation: The FPN should reflect the latest Edition of the referenced standards.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-40 Log #2028 NEC-P12 **Final Action: Accept in Principle**
(620.24, FPN)

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
620.24 Branch Circuits for Hoistway Pit Lighting and Receptacle(s).
FPN: ~~See ANSI/~~ ASME ~~A17.1 2000~~ A17.1-2004, Safety Code for Elevators and Escalators, for illumination levels.
Substantiation: The FPN should reflect the latest Edition of the referenced standards.
Panel Meeting Action: Accept in Principle
.**Panel Statement:** See action taken on Proposal 12-39.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-41 Log #3535 NEC-P12 **Final Action: Reject**
(620.24(A) Exception (New))

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Add an exception to (A) read as follows:
Pit Lighting and Receptacle(s) are not required for wheelchair lifts and stairway chairlifts.
Substantiation: Many wheelchair lifts and stairway chairlifts do have pits and those that do often have very shallow pits. The running clearances required by ASME A18.1 do not allow ample room to install lighting and receptacle(s).
Panel Meeting Action: Reject
Panel Statement: Section 620.24(A) applies only where lighting and recepticles are required. Scoping for these items is in ASME A18.1.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-42 Log #1361 NEC-P12 **Final Action: Accept in Principle**
(620.24(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Proposal to require the receptacle to be rated 15 or 20A
620.24 Branch Circuit for Hoistway Pit Lighting and Receptacle(s).
(C) Duplex Receptacle. At least one 15A or 20A **,** 125-volt, single-phase, duplex receptacle shall be provided in the hoistway pit.
Substantiation: The intent of the proposed additional text is to ensure that a 15A or 20A, single-phase, 125V receptacle be provided for hand-tools and such. As is it currently written, a receptacle of any voltage/ampere rating could be installed to meet the *Code's* requirement.
Panel Meeting Action: Accept in Principle
Revise proposal to read:
(C) Duplex Receptacle. At least one 125-volt, single-phase, 15 or 20 ampere **,** duplex receptacle shall be provided in the hoistway pit.
Panel Statement: The panel moved the amperage after the term single-phase to be consistent with other sections of the code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-43 Log #3269 NEC-P12 **Final Action: Reject**
(620.25)

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review
Recommendation: Relocate the following text:
620.25 Ground-Fault Circuit -Interrupter Protection for Personal. Each 125-volt, single-phase 15 and 20 ampere receptacle installed in pits, in hoist ways, on elevator car tops, and in escalator and moving walk well ways shall be of the ground-fault circuit-interrupter type.
All 125-volt, single-phase, 15-and 20-ampere receptacles installed in machine rooms and machinery spaces shall have ground-fault circuit-interrupter protection for personnel.
A single receptacle supplying a permanently installed sump pump shall not require ground-fault circuit-interrupter protection.
Substantiation: This is often overlooked during the installation by both the installer and the inspector because of its location in the code book at section IX, which is grounding. This was put in the code for the protection of individuals, and if not installed, it could be a hazard to individuals working on the elevator equipment.
Panel Meeting Action: Reject
Panel Statement: Installers and inspectors must adhere to the whole Code, not just the earlier parts. These requirements appear in all types of sections throughout NFPA 70. In addition, the submitter has not provided any technical substantiation for this change.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
JONES, R.: This proposal should have been accepted in principle. I agree with the submitter that the requirement for GFCI protection should not be located under Part IX Grounding. The more appropriate place for this requirement would be a new 620.26 or revise the wording of 620.23(C) to include the GFCI protection for the required receptacles. This would make the NEC more user friendly.

12-44 Log #3048 NEC-P12 **Final Action: Reject**
(620.26)

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review
Recommendation: Create a new section 620.26 so that when article 620.85 is renamed 620.25, it is relocated by virtue that it is renamed.
Substantiation: You can't have two different articles with the same numbering. By changing the numbering, the sequence is in line with the rest of the article.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-43.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-45 Log #3271 NEC-P12 **Final Action: Reject**
(620.26)

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review
Recommendation: Relocate the following text:
620.26 Branch Circuits for Other Utilization Equipment.

Substantiation: You can't have two different articles with the same numbering. By charging the numbering the sequence is in line with the rest of the article.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-43.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-46 Log #591 NEC-P12 **Final Action: Reject**
(620.37(D))

Submitter: Thomas F. Norton, Norel Service Co. Inc.
Recommendation: Add text to read as follows:
"Wiring connecting The Fire Alarm Recall Outputs to The Elevator Control System shall be kept within The Elevator Machine Room, The Elevator Control Room or The Elevator Control Space."
Substantiation: This is a correlation issue between the NEC-NFPA-70, NFAC-NFPA-72, and ASME A17.1.
This proposal provides clarification of the wiring requirements of NFPA-70 and the supervision requirements of NFPA-72.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-47.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-47 Log #592 NEC-P12 **Final Action: Reject**
(620.37(D))

TCC Action: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Technical Correlating Committee on Signaling Systems for the Protection of Life and Property for information.
The NEC Technical Correlating Committee is in basic agreement with the panel statement that Code-Making Panel 12 has written and that there is not a conflict between NFPA 72 and NFPA 70.
In addition, the NEC Technical Correlating Committee Chair will appoint a Task Group consisting of members from the NFPA 72 committee, NEC Code-Making Panels 3 and 12, and the NEC Technical Correlating Committee to address, in the future, the broader issue of what requirements, if any, from NFPA 72 should be included in the NEC.
Submitter: Wayne D. Moore, Hughes Assoc., Inc. / Rep. Technical Correlating Committee Signaling System for the Protection of Life and Property
Recommendation: Add text to read as follows:
"620.37(D) Interface With Fire Alarm System. Wiring connecting the Fire Alarm Recall Outputs to the Elevator Control System shall be kept within the Elevator Machine Room, the Elevator Control Room, or the Elevator Control Space."
Substantiation: The proposed language was submitted as Comment 12-18 to Proposal 12-26 during the May 2004 cycle and is being submitted as a public proposal for the Annual 2007 cycle. Panel 12 rejected Comment 12-18 (as well as Proposal 12-26) and indicated that the proposed requirement is already covered in the 2002 edition of NFPA 72, National Fire Alarm Code. The panel also indicted that "this is an issue of supervision and training." However, the panel failed to address the point made in the submitter's substantiation that while the NEC is adopted throughout the country, NFPA 72 is not as widely adopted.
It is the position of the TCC on Signaling Systems for the Protection of Life and Property that the proposed wiring requirement falls under the scope of the NEC and would provide a basis for more uniform installation of the fire alarm system wiring interface with the elevator controller. This proposed requirement would also enhance the correlation between the NEC, NFPA 72 and ASME A17.1 Safety Code for Elevators and Escalators.
The NFPA 72 TCC respectfully requests that NEC CMP 12 and the NEC TCC give this proposal full consideration both on its technical merits and on its correlation value.
Panel Meeting Action: Reject
Panel Statement: NFPA 70 is for the practical safeguarding of persons and property from hazards arising from the use of electricity, not one for the supervision of wiring or extending the adoption of NFPA 72. The submitter's proposal to require the outputs to be kept within the elevator machine room, elevator control room, or the elevator control space goes beyond what is required in NFPA 72, Article 6.15.2.2, which only requires the interface to be within 1 m (3 ft) of the controled circuit or appliance. This issue was the subject of an appeal to the Standards Council in the last cycle and was rejected.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-48 Log #1227 NEC-P12 **Final Action: Reject**
(620.44)

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:
620.44 Installation of Traveling Cables.
Traveling cable s that are suitably supported and protected from physical damage shall be permitted to be run without the use of a raceway in either or both of the following:
(A) When used inside the hoistway, on the elevator car, hoistway wall, counterweight, or controllers and machinery that are located inside the hoistway provided the cables are in the original sheath:
(B) from inside the hoistway, to elevator controller enclosures and to elevator car and machine room, control room, machinery space, and control space connections that are located outside the hoistway for a distance not exceeding 1.8 m (6 ft) in length as measured from the first point of support on the elevator car or hoistway wall, or counter weight where applicable, provided the conductors are grouped together and taped or corded, or in the original sheath. These t ~~T~~ raveling cables shall be permitted to be continued to this equipment ~~elevator controller enclosures and to elevator car and machine room, control room, machinery space, and control space connections, as fixed wiring provided they are suitably supported and protected from physical damage.~~
Substantiation: Fully sheathed elevator travel cables are robust and designed to survive in an elevator hoistway for great lengths, as much as 250 meters, in unsupported conditions. Cables are designed for little strain on the copper conductors by use of a steel support member typically used as a center member in a round cable and as integral support members in flat construction and must meet the requirements of NFPA 70. Fully sheathed travel cables that are attached to cars, counterweights, and other hoistway machinery and suitably protected from physical damage have no more risk of damage than cables provided in raceways in these locations
Panel Meeting Action: Reject
Panel Statement: No definitive technical substantiation has been provided to show that there is a problem with the current text.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
JUHASZ, A.: I disagree with the Panel action.
Fully sheathed traveling cables are designed for the conditions imposed on them in the elevator hoistway. To require elevator traveling cables located in the hoistway to be encased in a raceway once it is supported is not technically justified. The same cables hang for hundreds of feet in the hoistway from the points of suspension as flexible connections to the elevator car. As long as the traveling cable is suitably supported and protected from damage, e.g. located and tied off to prevent entanglement and abuse, there is no need for a raceway.

12-49 Log #2034 NEC-P12 **Final Action: Reject**
(620.44)

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
620.44 Installation of Traveling Cables.
Traveling cable s that are suitable supported and protected from physical damage shall be permitted to be run without the use of a raceway in either or both of the following:
a) when used inside the hoistway, of the elevator car, hoistway wall, counterweight, or controllers and machinery that are located inside the hoistway provided the cables are in the original sheath;
b) from inside the hoistway, to elevator controller enclosures and to elevator car and machine room, control room, machinery space, and control space connections that are located outside the hoistway for a distance not exceeding 1.8 m (6 ft) in length as measured from the first point of support on the elevator car or hoistway wall, or counterweight where applicable, provided the conductors are grouped together and taped or corded, or in the original sheath. These t ~~T~~ raveling cables shall be permitted to be continued to this equipment ~~elevator controller enclosures and to elevator car and machine room, control room, machinery space, and control space connections, as fixed wiring, provided they are suitable supported and protected from physical damage~~ .
Substantiation: Fully sheathed elevator travel cables are robust and designed to survive in an elevator hoistway for great lengths, as much as 250 meters, in unsupported conditions. Cables are designed for little strain on the copper conductors by use of a steel support member typically used as a center member in a round cable and as integral support members in flat construction and must meet the requirements of NFPA 70. Fully sheathed travel cables that are attached to cars, counterweights, and other hoistway machinery and suitably protected from physical damage have no more risk of damage than cables provided in raceways in these locations.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-48.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
JUHASZ, A.: See my Explanation of Negative for Proposal 12-48.

12-49a Log #417 NEC-P12 **Final Action: Reject**
(620.51)

Submitter: Peter VandeMotter, BLM Engineers Inc.
Recommendation: Add text to read as follows:
Disconnecting means shall be within 0.46 m (18 in.) of the door where possible.

Substantiation: Bring the NEC into conformance with elevator codes, which most electrical engineers or contractors are not familiar with.
Panel Meeting Action: Reject
Panel Statement: This is a local requirement in some jurisdictions that is not required by ASME A17.1. Section 620.51(C)(1) requires the disconnecting means be located within sight of the motor controller. The motor controller is not required to be within 18 inches of the door.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-50 Log #3536 NEC-P12 **Final Action: Reject**
(620.51 Exception (New))

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Add exception after first paragraph:
Exception: Where units receive power from more than one source (i.e., building power and standby or battery power) two disconnects may be provided in compliance with 620.52.
Substantiation: To clarify that two disconnects may be used when multiple power sources are provided.
Panel Meeting Action: Reject
Panel Statement: Where multiple power sources are used, they are normally connected on the line side of the disconnecting means required by this article. Personnel safety is assured when one disconnecting means is used to open all ungrounded main power supply conductors.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-51 Log #352 NEC-P12 **Final Action: Accept in Principle**
(620.51(A))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal since the sentence requiring the disconnecting means to be listed is in two different locations in the accepted text in Proposals 12-51 and 12-52. This action will be considered by the Panel as a Public Comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(A) Type. The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position. The disconnecting means shall be a listed device. <u>The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</u>
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase “capable of being locked in the open position” is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
<u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</u>
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
QUAVE, D.: Comment on Affirmative for Proposal 12-9.
WHITE, K.: I would like to affirm with a comment, the last sentence that was added by the panel “Portable means for adding a lock to the switch or circuit breaker shall not be permitted.” Will prohibit the use of portable devices that provide for the attachment of multiple locks (i.e. Scissors) to the locking mechanism. The sentence should be removed.

12-52 Log #2045 NEC-P12 **Final Action: Accept in Principle**
(620.51(A))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal since the sentence requiring the disconnecting means to be listed is in two different locations in the accepted text in Proposals 12-51 and 12-52. This action will be considered by the Panel as a Public Comment.
Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
620.51(A) Type The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position. <u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.</u>
The disconnecting means shall be a listed device.
Substantiation: The problem with the present wording of this section is that the disconnect in many elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.
This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.
This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
Where elevator, dumbwaiter, escalator, moving walk, wheelchair and stairway lift equipment are involved we know that regular maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.
Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances
The same level of safety is needed for these disconnecting means for elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
<u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</u>
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
QUAVE, D.: Comment on Affirmative for Proposal 12-9.

(Note: The sequence 12-53 was not used)

12-54 Log #1222 NEC-P12 **Final Action: Accept**
(620.51(A), FPN)

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:
620.51 Disconnecting Means.
(A) Type
FPN: For additional information, see ASME ~~/ ANSI A17.1 2000~~ <u>A17.1-2004,</u> Safety Code for Elevators and Escalators.
Substantiation: The FPN should reflect the latest Edition of the referenced standards.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-55 Log #2029 NEC-P12 **Final Action: Accept**
(620.51(A), FPN)

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:
650.51 Disconnecting Means.
(A) Type
FPN: For additional information, see ASME ~~/ANSI A17.1 2000~~ <u>A17.1-2004,</u> Safety Code for Elevators and Escalators.

Substantiation: The FPN should reflect the latest Edition of the referenced standards.
Panel Meeting Action: Accept
.**Panel Statement:** See action taken on Proposal 12-54.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
JONES, R.: My notes indicate this was accept in principle.

12-56 Log #351 NEC-P12 **Final Action: Accept in Principle**
(620.51(A) Exception)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
Exception: Where an individual branch circuit supplies a wheelchair lift, the disconnecting means required by 620.51(C)(4) shall be permitted to comply with 430.109(C). This disconnecting means shall be listed and shall be capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-57 Log #3537 NEC-P12 **Final Action: Reject**
(620.51(A) Exception)

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Add to end of Exception for (A):
Where an individual branch circuit supplies a stairway chairlift or a portable wheelchair lift the disconnecting means shall be permitted to comply with 430.109(F).
Substantiation: Most stairway chairlift and portable wheelchair lifts are not conducive to hard wiring.
Panel Meeting Action: Reject
Panel Statement: There is not sufficient technical substantiation provided to exclude platform and stairway lifts from the requirements of 620.51(A).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-58 Log #1226 NEC-P12 **Final Action: Accept in Principle**
(620.51(C)(1))

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Add text to read as follows:
620.51
(C) Location. The disconnecting means shall be located where it is readily accessible to qualified persons.
(1) On Elevators Without Generator Field Control. On elevators without generator field control, the disconnecting means shall be located within sight of the motor controller. Where the motor controller is located in the elevator hoistway, the disconnecting means required by 620.51(A) shall be located in a machinery space, machine room, control space or control room outside the hoistway; and an additional, non-fused enclosed externally operable motor circuit switch capable of being locked in the open position to disconnect all ungrounded main power supply conductors shall be located within sight of the motor controller. The additional switch shall be a listed device. Driving machines or motion and operation controllers not within sight of the disconnecting means shall be provided with a manually operated switch installed in the control circuit to prevent starting. The manually operated switch(es) shall be installed adjacent to this equipment.
Where the driving machine of an electric elevator or the hydraulic machine of a hydraulic elevator is located in a remote machine room or remote machinery space, a single means for disconnecting all ungrounded main power supply conductors shall be provided and be capable of being locked in the open position.
Substantiation: Where the motor controller is located in the hoistway, the disconnecting means should be accessible from outside the hoistway. An additional non-fused disconnecting means is necessary within sight of the motor controller for use by and protection of elevator personnel working on the equipment.
Panel Meeting Action: Accept in Principle
Revise the propsal to read as follows:
Where the motor controller is located in the elevator hoistway, the disconnecting means required by 620.51(A) shall be located in a machinery space, machine room, control space or control room outside the hoistway; and an additional, non-fused enclosed externally operable motor circuit switch capable of being locked in the open position to disconnect all ungrounded main power supply conductors shall be located within sight of the motor controller. The additional switch shall be a listed device.
The provision for locking or adding a lock to the disconnecting means, required by this section, shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: The panel agrees with the proposal, but added the wording to be consistent with 430.102(B) exception and the action on Proposal 12-9.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-59 Log #2033 NEC-P12 **Final Action: Accept in Principle**
(620.51(C)(1))

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Add text to read as follows:
620.51
(C) Location. The disconnecting means shall be located where it is readily accessible to the qualified persons.
(1) On Elevators Without Generator Field Control. On elevators without generator field control, the disconnecting means shall be located within sight of the motor controller. Where the motor controller is located in the elevator hoistway, the disconnecting means required by 620.51(A) shall be located in a machinery space, machine room, control space or control room outside the hoistway; and an additional, non-fused enclosed externally operable motor circuit switch capable of being locked in the open position to disconnect all ungrounded main power supply conductors shall be located within sight of the motor controller. The additional switch shall be a listed device. Driving machines or motion and operation controllers not within sight of the disconnecting means shall be provided with a manually operated switch installed in the control circuit to prevent starting. The manually operated switch(es) shall be installed adjacent to this equipment.
Where the driving machine of an electric elevator or the hydraulic machine of a hydraulic elevator is located in a remote machine room or remote machinery space, a single means for disconnecting all ungrounded main power supply conductors shall be provided and be capable of being locked in the open position.
Substantiation: Where the motor controller is located in the hoistway, the disconnecting means should be accessible from outside the hoistway. An additional non-fused disconnecting means is necessary within sight of the motor controller for use by and protection of elevator personnel working on the equipment.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 12-58.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-60 Log #3538 NEC-P12 **Final Action: Reject**
(620.51(C)(4))

Submitter: Kevin L. Brinkman, David Balmer, Accessibility Equipment Manufacturers Association
Recommendation: Revise as follows:
620.51 Disconnecting Means.
(C) Location.
(4) On Wheelchair Lifts and Stairway Chairlifts. On wheelchair lifts and stairway chairlifts, the disconnection means shall be located within sight of the motor controller. Where the motor controller is inside the unit and the unit is installed within a runway, the disconnect shall be permitted to be located outside the runway provided it is within sight of the motor controller when the runway door is open.
Substantiation: Most stairway chairlift and portable wheelchair lifts are not conducive to hard wiring.

Panel Meeting Action: Reject
Panel Statement: There is not sufficient technical substantiation provided to allow movement of the disconnecting means. Dependence on the runway door being open creates a dangerous condition.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-61 Log #1224 NEC-P12 **Final Action: Accept**
(620.53)

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:

620.53 Car Light, Receptacle(s), and Ventilation Disconnecting Means. Elevators shall have a single means for disconnecting all ungrounded car light, receptacle(s), and ventilation power-suppl conductors for that elevator car.

The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. Where there is no machine room or control room, the disconnecting means shall be located in ~~the same space as the disconnecting means required by 620.51~~ . a machinery space or control space outside the hoistway that is readily accessible to only qualified persons.

Disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose light source they control.

The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.

Substantiation: In some cases, the disconnecting means required by 620.51 may be located in the elevator hoistway. In those cases, the car lighting, receptacle(s), and ventilation disconnecting means required by 620.53 should be accessible from outside the hoistway.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-62 Log #2031 NEC-P12 **Final Action: Accept**
(620.53)

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:

620.53 Car Light, Receptacle(s), and Ventilation Disconnecting Means. Elevators shall have a single means for disconnecting all ungrounded car light, receptacle(s), and ventilation power-supply conductors for that elevator car.

The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. Where there is no machine room or control room, the disconnecting means shall be located in ~~the same space as the disconnecting means required by 620.51~~ a machinery space or control space outside the hoistway that is readily accessible to only qualified persons .

Disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose light source they control.

The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.

Substantiation: In some cases, the disconnecting means required by 620.51 may be located in the elevator hoistway. In those cases, the car lighting, receptacle(s) and ventilation disconnecting means required by 620.53 should be accessible from outside the hoistway.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:

JONES, R.: My notes indicate this was accept in principle.

12-63 Log #2048 NEC-P12 **Final Action: Accept in Principle**
(620.53)

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:

620.53 Car Light, Receptacle(s), and Ventilation Disconnecting Means
Elevators shall have a single means for disconnecting all ungrounded car light, receptacle(s), and ventilation power-supply conductors for that elevator car.

The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Where there is no machine room or control room, the disconnecting means shall be located in the same space as the disconnecting means required by 620.51.

Disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose light source they control.

The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.

Substantiation: The problem with the present wording of this section is that the disconnect in many elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
Where elevator, dumbwaiter, escalator, moving walk, wheelchair and stairway lift equipment are involved we know that regular maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:

The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-64 Log #1225 NEC-P12 **Final Action: Accept**
(620.54)

Submitter: Andy Juhasz, KONE Inc.
Recommendation: Revise text to read as follows:

620.54 Heating and Air-Conditioning Disconnecting Means. Elevators shall have a single means for disconnecting all ungrounded car heating and air-conditioning power supply conductors for that elevator car. The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. Where there is no machine room or control room, the disconnecting means shall be located in ~~the same space as the disconnecting means required by 620.51~~ a machinery space or control space outside the hoistway that is readily accessible to only qualified persons.

Where there is equipment for more than one elevator car in the machine room, the disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose heating and air-conditioning source they control.

The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.

Substantiation: In some cases, the disconnecting means required by 620.51 may be located in the elevator hoistway. In those cases, the heating and air-conditioning disconnecting means required by 620.54 should be accessible from outside the hoistway.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-65 Log #2032 NEC-P12 **Final Action: Accept**
(620.54)

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee
Recommendation: Revise text to read as follows:

620.54 Heating and Air-Conditioning Disconnecting Means. Elevators shall have a single means for disconnecting all ungrounded car heating and air-conditioning power supply conductors for that elevator car. The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. Where there is no machine room or control room, the disconnecting means shall be located in ~~the same space as the disconnecting means required by 620.51~~ a machinery space or control space outside the hoistway that is readily accessible to only qualified persons .

Where there is equipment for more than one elevator car in the machine room, the disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose heating and air-conditioning source they control.

The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.

Substantiation: In some cases, the disconnecting means required by 620.51 may be located in the elevator hoistway. In those cases, the heating and air-conditioning means required by 620.54 should be accessible from outside the hoistway.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

JONES, R.: My notes indicate this was accept in principle.

12-66 Log #2049 NEC-P12 **Final Action: Accept in Principle**
(620.54)

Submitter: James T. Dollard, Jr., IBEW Local 98

Recommendation: Revise text to read as follows:

620.54 Heating and Air-Conditioning Disconnecting Means

Elevators shall have a single means for disconnecting all ungrounded car heating and air-conditioning power-supply conductors for that elevator car. The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. <u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.</u> Where there is no machine room or control room, the disconnecting means shall be located in the same space as the disconnecting means required by 620.51.

Where there is equipment for more than one elevator car in the machine room, the disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose heating and air-conditioning source they control.

The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.

Substantiation: The problem with the present wording of this section is that the disconnect in many elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where elevator, dumbwaiter, escalator, moving walk, wheelchair and stairway lift equipment are involved we know that regular maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

<u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</u>

Panel Statement: See panel action and statement on Proposal 12-9.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

WHITE, K.: I would like to affirm with a comment, the last sentence that was added by the panel "Portable means for adding a lock to the switch or circuit breaker shall not be permitted." Will prohibit the use of portable devices that provide for the attachment of multiple locks (i.e. Scissors) to the locking mechanism. The sentence should be removed.

12-67 Log #2050 NEC-P12 **Final Action: Accept in Principle**
(620.55)

Submitter: James T. Dollard, Jr., IBEW Local 98

Recommendation: Revise text to read as follows:

620.55 Utilization Equipment Disconnecting Means

Each branch circuit for other utilization equipment shall have a single means for disconnecting all ungrounded conductors. The disconnecting means shall be capable of being locked in the open position and shall be located in the machine room or control room/machine space or control space. <u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.</u> Where there is more than one branch circuit for other utilization equipment, the disconnecting means shall be numbered to correspond to the identifying number of the equipment served. The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.

Substantiation: The problem with the present wording of this section is that the disconnect in many elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where elevator, dumbwaiter, escalator, moving walk, wheelchair and stairway lift equipment are involved we know that regular maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for elevator, dumbwaiter, escalators, moving walk, wheelchair and stairway lift equipment.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

<u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</u>

Panel Statement: See panel action and statement on Proposal 12-9.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-68 Log #3099 NEC-P12 **Final Action: Reject**
(620.55)

Submitter: Joseph A. Hertel, Safety and Buildings

Recommendation: Renumber 620.55 to become 620.25(C).

Substantiation: Placing the disconnect requirement with the other requirements for utilization equipment in one location will make the code more user friendly. It is confusing to users when requirements are located in remote places.

Panel Meeting Action: Reject

Panel Statement: Disconnecting means for utilization equipment should remain with all the other disconnecting means requirements in Part VI of Article 620.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-69 Log #2518 NEC-P12 **Final Action: Reject**
(620.62)

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC

Recommendation: Revise text to read as follows:

620.62 Selective Coordination. Where more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each disconnecting means shall be selectively coordinated <u>in the long-time portion of the time-current curves</u> with any other supply side overcurrent protective devices. <u>Coordination shall not be required in the current-limiting or instantaneous portions of the time-current curves.</u>

Substantiation: (1) Molded case circuit breakers with instantaneous trips are unable to provide selectively in the instantaneous range of the breaker trip curve. Thus, fuses would be required for all emergency system circuits - including lighting branch circuits. (2) The substantiation provided for this change is insufficient to demonstrate that non-selective tripping of elevator circuits has been problematic.
Panel Meeting Action: Reject
Panel Statement: The panel does not agree with the relaxation of the selective coordination rules based upon the substantiation provided. There are options for all types of overcurrent protective devices that provide selective coordination.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
LOTTMANN, T.: See NEMA's negative comment on Proposal 12-72.

12-70 Log #2519 NEC-P12 **Final Action: Reject**
(620.62)

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Delete 620.62 in its entirety. ~~Selective Coordination. Where more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each disconnecting means shall be selectively coordinated with any other supply side overcurrent protective devices.~~
Substantiation: (1) Molded case circuit breakers with instantaneous trips are unable to provide selectively in the instantaneous range of the breaker trip curve. Thus, fuses would be required for all emergency system circuits - including lighting branch circuits. (2) The substantiation provided for this change is insufficient to demonstrate that non-selective tripping of elevator circuits has been problematic. (3) The wording of this section is ambiguous. What are supply side overcurrent protective devices?
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-72.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
LOTTMANN, T.: See NEMA's negative comment on Proposal 12-72.

12-71 Log #3416 NEC-P12 **Final Action: Reject**
(620.62)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete this section.
Substantiation: This rule first appeared in the 1993 NEC, without a single instance of loss experience presented to justify the change. Now that we have wide-scale awareness of the practical issues involved with perfect selective coordination because of the new rule in 700.27, it is time to revisit the technical merit of this rule as well. This section, if closely examined and literally applied, is tantamount to a mandate to use fused protection at all levels of a distribution that supplies multiple elevators.

The simple fact is there will always be systems that can't be fully coordinated. A system might fully coordinate under short circuit conditions, and fail to coordinate under ground-fault conditions, or vice-versa. One major NEC expert representing a leading circuit breaker manufacturer even noted in this regard that perhaps the only way this could be done with certainty would be with electronic trip CBs and zone selective interlocking (that is, where the upstream protective device response is restrained by the downstream device.) He was prophetic indeed. The conversation occurred in March, and the September/October issue of *IAEI News* , in an article written by the same fuse manufacturer, in fact by the very submitter of the NEC proposal in 700.27, mentioned this approach as the way to make circuit breakers coordinate for elevators, the very subject of this proposal.

There is a more interesting dimension to this problem, however. When you consider ground faults, even when the system is running on the generator it will frequently be impossible to coordinate the levels of protection. This is critical because ground faults are a far more likely source of failures than short circuits. Take a large, heavily loaded feeder, say, 1200A loaded to 1000A, with three 400A subfeeders and a 600A subfeeder originating at a distribution panel. If the 600A subfeeder sees a 800A ground fault, it will likely take out the 1200A main because the other loads that are making it heavily loaded will continue, and the ground fault will push it over the edge. All things being equal, a 600A circuit breaker loaded to 800A (+133%) during the ground fault event will take much longer to trip than a 1200A circuit breaker loaded to 1800A (+150%).

Remember that it is simply not possible to predict how much current will flow during a ground fault, although the worst case can be easily calculated. For many such coordination studies, the worst case for fault duty is the best case for coordination; the best case for fault duty is the worst case for coordination; and coordination for various fault conditions must therefore result in different protective devices under different fault scenarios on the same feeder.

Panel members should carefully review the substantiation and the comments in the voting on 2005 NEC Comment 13-88 (that created 700.27), where both NEMA and UL voted against the comment. They did not do so lightly. UL lists both fuses and circuit breakers and has no axe to grind, and correctly pointed out that the new language "would most likely exclude the application of circuit breakers in emergency systems." Do we seriously want to continue this burden on the design community? The rule in 620.62 has been under many radar screens for a long time, but it will likely become the focus of extensive attention as this code cycle moves forward.

In conclusion, this submitter would like to return to the points made in his Comment 12-44 in the 1993 cycle: Nowhere else in the Code [at that time] was this type of selective coordination required. Section 240.12 is permissive and Section 517.17(B) concerns GFPE. A precedent setting change like this should have been considered only if there were no other way to achieve the submitter's objectives. Solving the problem of the service personnel not knowing where to go if the upstream overcurrent device opened was insufficient substantiation for a change of this magnitude. As Mr. Trout pointed out in his comments in the voting at the time, an outage is an outage. If a fault in the supply feeder to the machine room opens the upstream device, then of what use is the coordination? The answer was, and is, simple and old fashioned: proper marking.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-72.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
LOTTMANN, T.: See NEMA's negative comment on Proposal 12-72.

12-72 Log #3492 NEC-P12 **Final Action: Reject**
(620.62)

Submitter: Alan Manche, Square D Co.
Recommendation: Delete NEC **620.62 Selective Coordination.**
~~**620.62 Selective Coordination.** Where more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each disconnecting means shall be selectively coordinated with any other supply side overcurrent protective devices.~~
Substantiation: The proposed deletion of this section is based on two foundational components under which this requirement exists and was accepted. I brief review of the historical information that supported the introduction of selective coordination of elevators will show that it was accepted based on maintenance practices by the electrician. The rational explains that if you are performing maintenance on one elevator and trip the overcurrent device, you would not want the other elevators to be impacted. The electrical equipment for an elevator should not be worked on while energized. The heightened awareness of electrical safety with the introduction of arc-flash protection and the requirements for developing an electrical safety program make this requirement obsolete. There are no provisions permitting the electrical system for an elevator to be worked on energized so the substantiation that supported this requirement is no longer valid.

The second component that would drive such a requirement is reliability of the electrical system for the elevator system. Unfortunately, selectivity is not an independent answer for ensuring reliability. Selectivity can actually drive a reduction in the electrical system's reliability.

The application of selective coordination is often misunderstood in that it is perceived as being independent of all other electrical design parameters. The seemingly simple misperception is that you just have to pick the correct fuses or circuit breakers to ensure this particular requirement is met. What has not been considered, at least in the NEC, is the impact placed upon the design and reliability of the entire electrical system. My discussion with engineers and our company involvement with coordination studies indicates they do a comprehensive coordination evaluation of electrical systems and maximize the selectivity, unfortunately the requirement in NEC for requiring full selectivity is driving system design parameters that can impact the reliability in a negative manner by possibly reducing that reliability. The requirement also places a requirement on the system that is unnecessary in various areas of the electrical system.

Other industry standards, such as NFPA 110 and IEEE Standard 242, recognize the need for this latitude in maximizing system reliability and permitting the engineer to selectively coordinate devices that support the isolation of the system as necessary. Electrical system designs and demands differ based on the size and occupancy needs. Ensuring the maximum reliability of the electrical system must be determined by the engineering professional for each facility.

A brief review of other technical committees guidance that have addressed this issue will support the need to delete this requirement. The NFPA 110 committee recognizes the limitations of selective coordination by requiring the selective coordination of the emergency system to be "optimized." They further provide an explanation in the annex of NFPA 110 regarding this subject:
A.6.5.1 It is important that the various overcurrent devices be coordinated, as far as
practicable, to isolate faulted circuits and to protect against cascading operation on short circuit faults. In many systems, however, full coordination is not practicable without using equipment that could be undesirable for other reasons or prohibitively costly. Primary consideration also should be given to prevent overloading of equipment by limiting the possibilities of large current inrushes due to instantaneous reestablishment of connections to heavy loads.

A review of IEEE Standard 242 also provides further explanation that selectivity of overcurrent devices may not provide any further enhancement to reliability, but this requirement in the NEC simply drives an unnecessary burden for these particular areas of the electrical system. An example is where primary and secondary protection is necessary for a transformer. Selectively coordinating the primary and secondary may or may not have any impact on isolating the fault.

The NEC places an unnecessary burden on the electrical system design without any benefit.

The only reason for requiring selective coordination in the NEC is to drive a performance parameter for enhanced reliability of power for the system. Based on this premise, that goal is not accomplished in many instances. Our company supports the design and installation of many critical electrical infrastructures and this requirement can drive a compromise in electrical reliability. The easiest system to recognize this issue is when an alternate power source is utilized. The system design must take into consideration of whether to have a generator located near the point of use or decide that a more reliable power source is paralleling a number of generators in the event one of the independent generators do not start. NFPA 70B does recognize that the reliability of the generator starting is an issue, likely based on poor maintenance practices, but that is the reality of our electrical infrastructure. If the power source does not exist then having a selectivity coordinated system serves no purpose. Selective coordination will drive large single generators and in effect prohibit the paralleling of small generators to establish a more reliable power source. Once again, an example that selective coordination is not independent from the rest of the electrical system design.

The present NEC requirement for selective coordination prohibits solid design considerations that would enhance the reliability of the system. I urge the committee to accept this proposal and delete the requirement for selective coordination on the electrical systems providing power to multiple elevators. Deleting this requirement will permit the electrical system design engineer to maximize the reliability of the system and remove a restriction placed on the designer that may reduce the reliability of the system.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree that the requirements for selective coordination reduce the level of reliability based on the substantiation provided. The rule exists to require a certain level of performance that provides the level of reliability needed for elevator circuits. Sufficient technical substantiation is not provided for removal of this requirement.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

LOTTMANN, T.: NEMA believes that the proposal should be accepted and the text in 620.62 should be deleted. The issue of selective coordination is not a Code issue, but one of system design. To do the appropriate system design, there are a number of factors that impact the reliability of a system. In addition, that level of reliability can vary depending on the application and need of the user. The requirement to selectively coordinate the system can actually be at the detriment of other factors that can impact reliability. The level and need of selective coordination is one best handled by the design engineer in a manner that can accommodate the entire range of design parameters. The existing text places a design restriction on the engineer that is unnecessary and forces the engineer to create a design that may be code compliant, but not as reliable as it could be.

Finally, the requirement for selective coordination can also increase the arc flash hazard that the workers may be exposed to. The requirement to use larger overcurrent devices to simply achieve a selective coordination arrangement can result in larger currents and greater arc flash energy. This is another reason why the requirement for when to be selective and to what degree should be made by the engineer.

If the panel is not willing to delete the requirement completely, some concerns of the design community can be addressed by rewording 620.62 to read:

“Selective coordination of overcurrent devices in each elevator disconnecting means shall be optimized where more than one driving machine disconnecting means is supplied by a single feeder.”

This language will give the latitude to the designer to consider selective coordination in a manner that is consistent with the objectives of the system design.

12-73 Log #1447 NEC-P12 **Final Action: Reject**
(620.85)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Delete 620.85 and relocate it to a new section 620.XXX of Article 620, Part III.

Substantiation: The requirements for GFCI protection have nothing to do with grounding, which is the title of Part IX of this Article.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 12-43.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

JONES, R.: See my explanation of negative vote on Proposal 12-43.

12-74 Log #1223 NEC-P12 **Final Action: Accept**
(620.91, FPN)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the appropriateness of the word “requirement”. This action will be considered by the Panel as a Public Comment.

Submitter: Andy Juhasz, KONE Inc.

Recommendation: Revise text to read as follows:

620.91 Emergency and Standby Power Systems. An elevator(s) shall be permited to be powered by an emergency or standby power system.

FPN: See ASME ~~/ ANSI A17.1 2000~~ A17.1-2004 and CSA B44-04, ~~Rule~~ requirement 2.27.2 ~~, and CAN / CSA B44 1994, Clause 3.12.13,~~ for additional information.

Substantiation: The FPN should reflect the latest Edition of the referenced standards. Note that with the harmonization of the two standards the referenced rule and clause now have the same number.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-75 Log #2030 NEC-P12 **Final Action: Accept in Principle**
(620.91, FPN)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the appropriateness of the word “requirement”. This action will be considered by the Panel as a Public Comment.

Submitter: Geraldine Burdeshaw, American Society of Mechanical Engineers / Rep. ASME A17 Standard Committee

Recommendation: Revise text to read as follows:

620.91 Emergency and Standby Power Systems. An elevator(s) shall be permitted to be powered by an emergency or standby power system.

FPN: See ASME ~~/ANSI A17.1 2000~~ A17.1-2004 and CSA B44-04, ~~Rule~~ requirement 2.27.2 ~~and CAN/CSA B44 1994, Clause 3.12.13,~~ for additional information.

Substantiation: The FPN should reflect the latest Edition of the referenced standards. Note that with the harmonization of the two standards, the referenced rule, and clause are now the same number.

Panel Meeting Action: Accept in Principle

Panel Statement: See action taken on Proposal 12-74.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

ARTICLE 625 — ELECTRIC VEICLE CHARGING SYSTEM EQUPMENT

12-76 Log #404 NEC-P12 **Final Action: Accept**
(625.2)

Submitter: Sam Marcovici, NY City Buildings Dept.

Recommendation: Revise text to read as follows:

625.2 Definitions.

Electric Vehicle. An automotive-type vehicle for ~~highway~~ on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current. For the purpose of this article, electric motorcycles and similar type vehicles and off-road self-propelled electric vehicles, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats, and the like, are not included.

Substantiation: The term “highway use” does not apply to Neighborhood Electric Vehicles (NEVs). The National Highway Traffic Safety Administration (NHTSA) Rule 63 FR 33913 of June 17, 1998 defines NEVs as “low speed” vehicles, with a top speed of 25 miles/hour. These vehicles are approved for use on local roads only, and not on highways. Accordingly, the appropriate term for all the listed vehicles is “on-road use”.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-77 Log #350 NEC-P12 **Final Action: Accept in Principle**
(625.23)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

625.23 Disconnecting Means. For electric vehicle supply equipment rated more than 60 amperes or more than 150 volts to ground, the disconnecting means shall be provided and installed in a readily accessible location. The disconnecting means shall be capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.

Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.

Panel Statement: See panel action and statement on Proposal 12-9.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

WHITE, K.: I would like to affirm with a comment, the last sentence that was added by the panel "Portable means for adding a lock to the switch or circuit breaker shall not be permitted." Will prohibit the use of portable devices that provide for the attachment of multiple locks (i.e. Scissors) to the locking mechanism. The sentence should be removed.

12-78 Log #2051 NEC-P12 **Final Action: Accept in Principle**
(625.23)

Submitter: James T. Dollard, Jr., IBEW Local 98

Recommendation: Revise text to read as follows:

625.23 Disconnecting Means

For electric vehicle supply equipment rated more than 60 amperes or more than 150 volts to ground, the disconnecting means shall be provided and installed in a readily accessible location. The disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

Substantiation: The problem with the present wording of this section is that the disconnect in many electric vehicle supply equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where electric vehicle supply equipment is involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for electric vehicle supply equipment.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.

Panel Statement: See panel action and statement on Proposal 12-9.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-79 Log #403 NEC-P12 **Final Action: Reject**
(625.25)

Submitter: Sam Marcovici, NY City Buildings Dept.

Recommendation: Revise text to read as follows:

625.25 Loss of Primary Source.

Means shall be provided such that, upon loss of voltage from the utility or other electric systems(s), energy cannot be back fed ~~through~~ from the electric vehicle ~~and~~ through the supply equipment to the premises wiring system unless permitted by 625.26.

Substantiation: When in charging mode, the EV is the last link (the load) of power string. The power flows from the premises wiring system, through the supply equipment, and into the EV.

In the event of loss of primary power, the reverse happens and the EV becomes the first link (the source) of the power string. In that case, the power will flow from the EV, through the supply equipment, and to the wiring system.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any definitive technical substantiation that a problem exists with the present wording of Section 625.25. Section 625.25 clearly expresses the intent in the present wording, and the proposed wording would be of no value in clarifying the intent of the requirement.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

QUAVE, D.: I agree with the submitter and the substantiation is correct. The correct terminology should be used. This does add clarity, because power cannot be fed through the source but is fed from the source.

12-80 Log #917 NEC-P12 **Final Action: Reject**
(625.28)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete.

Substantiation: 90.3 indicates Chapter 5 already applies. There is no specific requirement for wet locations, for example, therefore, it is assumed general requirements for such locations apply.

Panel Meeting Action: Reject

Panel Statement: Article 90.3 states that Chapter 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions. These latter Chapters (5, 6, and 7) modify the general rules (Chapters 1, 2, 3, and 4). There is no statement that Chapter 5 modifies or applies to Chapter 6.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

12-81 Log #1650 NEC-P12 **Final Action: Accept in Principle**
(626 (New))

TCC Action: The Technical Correlating Committee advises that Article placement, titles and scope statements are the responsibility of the Technical Correlating Committee and, based on the current content of the Article, the Technical Correlating Committee directs that the Title and Scope be rewritten to read as follows:

"Article 626 Electrified Truck Parking Spaces

626.1 Scope. The provisions of this article cover the electrical conductors and equipment external to the truck or transport refrigerated unit that connect trucks or transport refrigerated units to a supply of electricity, and the installation of equipment and devices related to electrical installations within an electrified truck parking space."

The Technical Correlating Committee directs the Code-Making Panel 12 Chair to instruct the Code-Making Panel 12 Task Group to rewrite the Article for clarity, in accordance with the NEC Style Manual, and for consistency of terminology and submit the rewrite as a Public Comment.

This action will be considered by the Panel as a Public Comment.

Submitter: Juan C. Menendez, Southern California Edison Company

Recommendation: Revise as follows:

ARTICLE XXX Electrified Parking Space Equipment

I. General

xxx.1. Scope. The provisions of this article cover the electrical conductors and equipment that connect trucks and transport refrigerated units to a supply of electricity, and the installation of equipment and devices related to electrical installations within an electrified parking space.

xxx.2. Definitions. (See Article 100 for additional definitions.)

Air-Conditioning or Comfort-Cooling Equipment. All of that equipment intended or installed for the purpose of processing the treatment of air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space.

Appliance, Portable. An appliance that is actually moved or can easily be moved from one place to another in normal use.

FPN: For the purpose of this article, the following major appliances, other than built-in, are considered portable if cord connected: refrigerators, cook tops, range, television, or other similar appliances.

Connector. A device that, by insertion into a truck inlet, establishes an electrical connection to the truck for the purpose of providing power for the on-board electric loads and may provide a means for information exchange. This device is part of the truck coupler.

Converter. A device that changes electrical energy from one form to another, as from alternating current to direct current.

Disconnecting Means. The necessary equipment usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors in a truck and intended to constitute the means of cutoff for the supply to that truck.

Electrified Parking Space. A truck parking space that has been provided with an electrical system that allows truckers to "plug in" their vehicles while stopped, and use off-board power sources in order to operate on-board systems such as air conditioning, heating and appliances, without any engine idling.

Electrified Parking Space Supply Equipment, also known as Truck Stop Electrification Equipment. The conductors, including the ungrounded, grounded and equipment grounding conductors, and the connectors, attachment plugs and all other fittings, devices, power outlets, circuit breakers, switches and fuses and their accessories, located near the point of entrance of supply conductors to a electrified parking space, installed specifically for the purpose of delivering energy from the electrified parking space wiring system to the truck service equipment within the truck and intended to constitute the disconnecting means for the supply to the truck.

FPN: The electrified parking space supply equipment may be configured in three basic styles (i.e., pedestal, overhead gantry, and raised concrete pad design) for use at different electrified parking spaces in different climatic zones and for different parking configurations, see XXX.18 (A).

Electrified Parking Space Wiring Systems. All of the electrical wiring, equipment, and appurtenances related to electrical installations within an electrified parking space including the electrified parking space supply equipment.

Frame. Chassis rail and any welded addition thereto of metal thickness of 1.35 mm (0.053 in.) or greater.

Low Voltage. An electromotive force rated 24 volts, nominal, or less, supplied from a transformer, converter, or battery.

Separable Power Supply Cable Assembly. A flexible cord or cable, including ungrounded, grounded, and equipment grounding conductors, provided with a female connector, a attachment plug and all other fittings, grommets, or devices installed for the purpose of delivering energy from the source of electrical supply to the inlet installed within the truck.

Transformer. A device that, when used, raises or lowers the voltage of alternating current of the original source.

Transport Refrigerated Unit (TRU), also known as Refrigerated Transport Units (RTU). A trailer with an integrated heating or cooling device for the purpose of maintaining the desired environment of temperature-sensitive goods or products (being transported in trucks, trailers, etc).

Truck. A heavy-duty vehicular-type unit primarily designed for commercial transportation of goods and equipment, which has its own motive power. It is built on a permanent chassis, typically designed with but not required to include a sleeper berth and without a permanent foundation where connected to the required utilities and that may include heating, air-conditioning, and electric systems contained therein.

Truck Coupler. A mating truck inlet and connector set.

Truck Inlet. The device(s) on the truck into which the connector(s) is inserted for providing electric energy. It may also be used for the exchange of information. This device is part of the truck coupler. For the purposes of this Code, the truck inlet is considered to be part of the truck and not part of the electrified parking space supply equipment.

Truck Parking Space. An area within a vehicle park set aside and identified for the accommodation of a truck on a temporary basis.

Truck Service Equipment, The on-board equipment attached to or connected to the truck, containing the disconnecting means, overcurrent protective devices, and inlets or other means for connecting the truck to the electrified parking space supply equipment.

Truck Stop. A plot of land upon which two or more truck parking sites are located, established, or maintained for occupancy by trucks for resting purposes.

FPN: An electrified parking space may also include dedicated parking areas for heavy duty trucks at travel plazas, warehouses, shipper and consignee yards, depot facilities, border crossings, etc. It does not include areas such as the shoulders of on and off highway ramps and access roads, camping and recreational vehicle sites, residential and commercial parking areas used for automotive parking or other areas where ac power is provided solely for the purpose of connecting automotive and other light electrical loads, such as engine block heaters, and at private residences.

Truck Stop Electrification. An electrical system that allows truckers to "plug in" their vehicles while stopped, and use off-board power sources in order to operate on-board systems such as air conditioning, heating and appliances, without any engine idling.

Truck Stop Feeder Circuit Conductors. The conductors from the electrified parking space service equipment to the electrified parking space supply equipment.

xxx.3. General Requirements

A. Systems. This article covers 120-, 120/208-, or 120/240-volts, nominal, single-or three-phase, 3 or 4-wire ac power supply systems respectively, with ground. Where a different voltage is required by either design or available power supply system, adjustment shall be made in accordance with other articles and sections for the voltage used.

B. Not Covered. The provisions of this article do not apply to that portion of other equipment in residential, commercial or industrial facilities that require electric power for devices used to load and unload cargo and equipment, operate conveyors, and other devices on the site or truck.

C. Connection to Wiring System. The provisions of this article shall apply to the electrified parking space supply equipment intended for connection to a wiring system as defined in xxx.3(A).

D. Listed or Labeled. All electrical materials, devices, appliances, fittings, and other equipment shall be listed or labeled by a qualified testing agency and shall be connected in an approved manner when installed.

xxx.4. Reserved

II. Electrified Parking Space Electrical Wiring System

xxx.5. Primary Distribution System

A. Voltages. Unless other voltages are specified, the nominal ac system voltages of 120, 120/240, 208Y/120, 240, 480Y/277, and 480 volts shall be used to supply equipment covered by this article.

xxx.6. Other Articles. Whenever the requirements of other articles of this Code and Article xxx differ, the requirements of Article xxx apply.

xxx.7. Secondary Distribution System. The electrified parking space secondary electrical distribution system to electrified parking space supply equipment shall be single-phase derived from 120/208 volt three-phase, four-wire or 120/240 volt split single-phase.

Exception: Existing electrified parking space equipment may also be provided with a 120-volt distribution system for use by legacy vehicles.

xxx.8. Underground Service, Feeder, Branch-Circuit, and Electrified Parking Space Feeder-Circuit Conductors.

A. General. All direct-burial conductors, including the equipment grounding conductor if of aluminum, shall be insulated and identified for the use. All conductors shall be continuous from equipment to equipment. All splices and taps shall be made in approved junction boxes or by use of material listed and identified for the purpose.

B. Protection Against Physical Damage. Direct-buried conductors and cables entering or leaving a trench shall be protected by rigid metal conduit, intermediate metal conduit, electrical metallic tubing with supplementary corrosion protection, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, liquidtight flexible metal conduit, or other approved raceways or enclosures. Where subject to physical damage, the conductors or cables shall be protected by rigid metal conduit, intermediate metal conduit, or Schedule 80 rigid nonmetallic conduit. All such protection shall extend at least 450 mm (18 in.) into the trench from finished grade.

FPN: See 300.5 and Article 340 for conductors or Type UF cable used underground or in direct burial in earth.

xxx.9. Feeder and Service Load Calculations.

A. General. The calculated load of a feeder or service shall not be less than the sum of the loads on the branch circuits supplied, as determined by Part II of this article, after any applicable demand factors permitted have been applied.

FPN: See Examples D1(A) through D10 in Annex D.

xxx.10. Demand Factors. Electrified parking space electrical wiring systems are based upon the climatic zone in which the equipment is installed.

xxx.11. Calculations. Electrical service and feeders shall be calculated on the basis of not less than 11000 volt-amperes per truck parking space. The demand factors set forth in Table xxx.10 shall be the minimum allowable demand factors that shall be permitted in calculating load for service and feeders.

Where the electrical supply for a truck parking space has more than one receptacle, the calculated load shall be calculated for all receptacles. Where the electrical supply is in a location that serves two or more trucks, the equipment for each site must comply with xxx.10 and the calculated load shall be computed on the basis of each parking site. No demand factor shall be allowed for any other load, except as provided in this Code.

Table xxx.10 Demand Factors for Services and Feeders

Climatic Temperature Zone	Demand Factor (percent)
1	70%
2a	67%
2b	62%
3a	59%
3b	57%
4a	55%
4b	51%
5a	47%
5b	43%
6a	39%
6b	34%
7a	29%
7b	24%
8a	21%
8b	20%
9a	20%
9b	20%
10a	21%
10b	23%
11	24%

A. Branch Capacity. Truck site branch circuit conductors shall have a capacity not less than the loads supplied and shall be rated at not less than 30 amperes.

xxx.12. Overcurrent Protection. Overcurrent protection shall be provided in accordance with Article 240.

xxx.13. Grounding. All electrical equipment and installations in truck parks shall be grounded as required by Article 250.

xxx.14. Reserved

III. Electrified Parking Space SupplyEquipment (Off-board)

xxx.15. Grounding.

A. Exposed Non-Current-Carrying Metal Parts. Exposed non-current-carrying metal parts of fixed equipment, metal boxes, cabinets, and fittings that are not electrically connected to grounded equipment shall be grounded by a continuous equipment grounding conductor run with the circuit conductors from the service equipment or from the transformer of a secondary distribution system. Equipment grounding conductors shall be sized in accordance with 250.122 and shall be permitted to be spliced by listed means.

The arrangement of equipment grounding connections shall be such that the disconnection or removal of a receptacle or other device will not interfere with, or interrupt, the grounding continuity.

B. Secondary Distribution System. Each secondary distribution system shall be grounded at the transformer.

C. Neutral Conductor Not to Be Used as an Equipment Ground. The neutral conductor shall not be used as an equipment ground for trucks or equipment within the truck park.

D. No Connection on the Load Side. No connection to a grounding electrode shall be made to the neutral conductor on the load side of the service disconnecting means except as covered in 250.30(A) for separately derived systems and 250.32(B)(2) for separate buildings.

xxx.16. Clearance for Overhead Conductors. Open conductors of not over 600 volts, nominal, shall have a vertical clearance of not less than 5.5 m (18 ft.) measured from the surface of the parking lot and a horizontal clearance of not less than 900 mm (3 ft.) in all areas subject to truck movement. In all other areas, clearances shall conform to 225.18 and 225.19.

FPN: For clearances of conductors over 600 volts, nominal, see 225.60 and 225.61.

xxx.17. Wiring Methods and Installation

A. Electrified Parking Space Supply Equipment Type. The electrified parking space supply equipment shall be provided in one of the following forms:

(1) Pedestal.

(2) Overhead Gantry.

(3) Raised Concrete Pad.

B. Mounting Height. Pedestal and raised concrete pad types of electrified parking space supply equipment shall be not less than 600 mm (2 ft.) above ground or the height of the flood plain level, whichever is greater.

C. Access. All electrified parking space supply equipment shall be accessible by an unobstructed entrance or passageway not less than 600 mm (2 ft.) wide and not more than 2.0 m (6 ft. 6 in.) high.

D. Working Space. Sufficient space shall be provided and maintained about all electrical equipment to permit ready and safe operation, in accordance with 110.26.

E. Facility Disconnecting Means. A disconnecting switch or circuit breaker shall be provided to disconnect one or more electrified parking space supply equipment sites from a remote location in the site supply equipment for disconnecting the power supply to a section of the truck stop. The facility disconnecting means shall be provided and installed in a readily visible and accessible location and shall be capable of being locked in the open position.

xxx.18. Overhead Gantry or Cable Management System

Electrified parking space equipment provided from either overhead gantry or cable management systems may be provided with a permanently attached power supply cable. It may also include or be separate from optional hybrid data, communications, optical fiber cables, shielding, etc. The cable or cables terminate in an electrified parking space supply equipment module that contains receptacles as described in xxx.20 (B). The power supply cable shall be connected directly to the terminals of the panelboard or conductors within a junction box in the equipment and provided with a means to prevent strain from being transmitted to the terminals.

The power supply cable shall be provided with a means to de-energize the cable conductors and power service delivery device upon exposure to strain that could result in either cable rapture or separation of the cable from the power service delivery device and exposure of live parts.

xxx.19. Protection of Outdoor Equipment

A. Wet Locations. All switches, circuit breakers, receptacles, control equipment, and metering devices located in wet locations or outside of a building shall be weatherproof equipment. (See section 100-1.)

B. Meters. If secondary meters are installed, meter sockets without meters installed shall be blanked off with an approved blanking plate.

xxx.20. Means for Connecting to Electrified Parking Space Supply Equipment

A. General. Trucks shall be supplied from electrified parking space supply equipment through not more than two suitable extra hard service cables or cords. Each connection to the equipment shall be by a single separable power supply cable assembly.

B. Type Receptacles Provided. All receptacles shall be of the grounding type. A maximum of three receptacles shall be provided. Every truck parking space with electrical supply shall be equipped with:

(1) Two 20-ampere, 125-volt single receptacles, NEMA type 5-20R, and

FPN: Complete details of the 15-or 20-ampere plug and receptacle configuration can be found in the National ElectricalManufacturersAssociationStandardforDimensionsofAttachmentPlugsandReceptacles,ANSI/NEMAWD6-2002, Figure 520.

(2) One 30-ampere, 120/208-volt, 3-pole, 4-wire receptacle.

FPN: Complete details of the 30-ampere plug and receptacle configuration can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Parts C2.10 or C3.

FPN: See Figure xxx.21 for details regarding receptacle types.

Exception: Where electrified parking space supply equipment provides the air-conditioning and comfort cooling function without requiring a direct electrical connection at the truck, only the two receptacles identified in xxx.21(B)(1) need be provided.

Additional receptacles shall be permitted for the connection of electrical equipment outside the truck within the electrified parking space.

For Transport Refrigerated Units (TRU), see Part VI.

C. Disconnecting Means. The electrified parking space supply equipment shall be provided with a disconnecting switch or circuit breaker for disconnecting the power supply to the individual truck service equipment.

D. Switch-Rated or Interlocked Receptacles. Each receptacle provided by the electrified parking space supply equipment shall be either a switch rated receptacle-plug combination, include an interlocked receptacle with an associated switching device of an interlocking type, or provided with an equivalent means to prevent connection or disconnection under load. The switching device shall be rated to close-into and withstand short circuit fault currents of at least 35kA.

The switch rated receptacle-plug combination, the interlocked plug and receptacle combination, or other means provided shall ensure that the user has no access to live parts.

E. Ground-Fault Circuit Interrupters (GFCI). The electrified parking space equipment shall be designed and constructed such that all receptacle outlets are provided with GFCI protection**.**

xxx.21. Separable Power-Supply Cable Assembly. Where a separable power-supply cable assembly consisting of a cord with a female connector and attachment plug is provided, the vehicle shall be equipped with a permanently mounted, flanged surface inlet in accordance with xxx.21(G)(1), wired directly to the panelboard by an approved wiring method. The attachment plug shall be of a listed type. The power-supply cable assembly or assemblies shall be OEM (factory) supplied or OEM or factory approved, and be of one of the following types and rating specified herein.

Cords with adapters and pigtail ends, extension cords, and similar items shall not be attached to, provided or shipped with a truck.

A. Rating.

(1) Twenty-Ampere Power-Supply Assembly. Trucks wired a 20-ampere, 125-volt truck inlet, in accordance with xxx.21(F)(1), shall use a listed 20-ampere power-supply assembly.

Exception: A listed separable power supply cable assembly, either hard-service or extra hard service and rated 15amperes, 125 volts may be provided for connection to an engine block heater for legacy vehicles.

(2) Thirty-Ampere Power-Supply Assembly. Trucks wired a 30-ampere, 120/208-volt truck inlet, in accordance with xxx.21(F)(2) shall use a listed 30-ampere main power-supply assembly.

B. Conductors. The cord shall be a listed type with three or four conductors, for single phase connection, one of which shall be identified by a continuous green color for use as the grounding conductor.

Exception: A separate listed three conductor separable power supply cable assembly, having one conductor identified by a continuous green color for use as the grounding conductor, and rated 15 amperes, 125-volts may be provided for connection to an engine block heater for legacy vehicles.

C. Cord. Extra-hard usage flexible cords and cables rated not less than 194°F (90°C), 600 volts; listed for both wet locations and sunlight resistance; and having an outer jacket rated to be resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids, and chemicals shall be permitted where flexibility is necessary between the electrified parking space supply equipment and the panelboard and inlet(s) on the truck.

Exception: Cords for the separable power supply cable assembly for 15 and 20 A connections may be a hard-service type.

D. Attachment Plug. Where a flexible cord is provided with an equipment grounding conductor and equipped with an attachment plug, the attachment plug shall comply with 250.138(A) and 250.138(B).

(1) Connection to a 20-Ampere Receptacle. A separable power supply cable assembly for connection to a truck having a 20-ampere inlet shall have an attachment plug that shall be 2-pole, 3-wire, grounding type, rated 20 amperes, 125 volts and intended for use with the 20-ampere, 125-volt receptacle, conforming to the configuration shown in Figure xxx.21(e).

Exception: A separable power supply cable assembly, rated 15A, provided for the connection of an engine block heater only, shall have an attachment plug that shall be 2-pole, 3-wire, grounding type, rated 15 amperes, 125 volts, conforming to the configuration shown in Figure xxx.21(d).

FPN: Complete details of the 15-or 20-ampere plug and receptacle configuration can be found in the National Electrical Manufacturers Association Standard for Dimensions of Attachment Plugs and Receptacles, ANSI/NEMA WD 6 -2002, Figure 515 or 5-20.

(2) Connection to a 30-Ampere Receptacle. A separable power supply cable assembly for connection to a truck having a 30-ampere inlet shall have an attachment plug that shall be 3-pole, 4-wire, grounding type, either:

(a) rated 30 amperes, 120/208 volts and intended for use with the 30-ampere, 120/208-volt receptacle, conforming to the configuration shown in Figure xxx.21(g) and intended for use with 120/208-volt switched receptacle configuration conforming to the configuration shown in Figure xxx.21(c), or

(b) rated 30 amperes, 125/250 volts and intended for use with the 30-ampere, 125/250-volt receptacle, conforming to the configuration shown in Figure xxx.21(f) and intended for use with 125/250-volt receptacle configuration conforming to the configuration shown in Figure xxx.21(b).

FPN: Complete details of the 30-ampere plug and receptacle configuration can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Parts C2.10 or C3.

The attachment plug(s) shall be listed, by itself or as part of a cord set, for the purpose and shall be molded to or installed on the flexible cord so that it is secured tightly to the cord at the point where the cord enters the attachment plug. If a right-angle cap is used, the configuration shall be oriented so that the grounding member is farthest from the cord.

E. Connector

(1) The connector for a separable power supply cable assembly, as specified in xxx.21(A)(1), shall be a 2-pole, 3-wire grounding type, rated 20 amperes, 125 volts.

Exception: The connector for a separable power supply cable assembly, rated 15A, provided for the connection of an engine block heater only, shall have an attachment plug that shall be 2-pole, 3-wire, grounding type, NEMA 5-15R configuration, rated 15 amperes, 125 volts.

(2) The connector for a separable power supply cable assembly, as specified in xxx.21(A)(2), shall be a 3-pole, 4-wire grounding type, either:

(a) rated 30 amperes, 120/208 volts, switched inlet-connector type, conforming to the configuration shown in Figure xxx.21(c) and intended for use with 120/208-volt switched inlet, conforming to the configuration shown in Figure xxx.21(g), or

(b) rated 30 amperes, 125/250 volts, conforming to the configuration shown in Figure xxx.21(b) and intended for use with 125/250-volt inlet, conforming to the configuration shown in Figure xxx.21(f).

FPN: Complete details of the 30-ampere plug and receptacle configuration can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Parts C2.10 or C3.

FPN: The connector in xxx.21(E)(2)(b) may be used on a 120/208-volt, single-phase circuit.

F. Switch-Rated or Interlocked Truck Coupler. Each connector provided by the separable power-supply assembly for use with the electrified parking space supply equipment shall be a part of either a switch rated connector-inlet combination, be used with an interlocked connector-inlet combination with an associated switching device of an interlocking type, or provided with an equivalent means to prevent connection or disconnection under load. The switching device shall be rated to close-into and withstand short circuit fault currents of at least 35kA.

The switch rated connector-inlet combination, the interlocked connector and inlet combination, or other means provided shall ensure that the user has no access to live parts.

G. Truck Coupler.

(1) Truck Inlet. Each truck shall be provided with not more than two inlets corresponding to the type and rating of connector of the power-supply cable assemblies provided and the rating of the receptacle in the electrified parking space supply equipment to which it is intended to be connected. See xxx.21(A).

(2) Construction and Installation. The truck coupler shall be constructed in accordance with xxx.21(F) and be installed so as to guard against inadvertent contact by persons with parts made live from the electrified parking space supply equipment or truck.

(3) Grounding Pole. The truck coupler shall be provided with a grounding pole, unless part of a system identified and listed as suitable for the purpose in accordance with Article 250.

(4) Grounding Pole Requirements. The truck coupler shall be so designed that the grounding pole connection is the first to make and the last to break contact.

H. Overall Length. The exposed cord length shall be measured from the face of the attachment plug to the point of entrance to the truck or the face of the flanged surface inlet or to the point where the cord enters the truck. The overall length of the cable shall not exceed 7.5 m (25 ft) unless equipped with a cable management system that is listed as suitable for the purpose.

I. Point of Entrance. The point of entrance of the separable power supply cable assembly to the truck or location of the truck inlet shall be in the exterior wall, either in front of or behind the driver door located at a height of not less than 600 mm (24 in.) and not more than 1.6 m (5.2 ft) above the parking surface.

J. Protection Against Corrosion and Mechanical Damage. Permanent provisions shall be made for the protection of the inlet and truck distribution panel, attachment plug of the power-supply cord and any connector cord assembly or receptacle against corrosion and mechanical damage if such devices are in an exterior location while the truck is in transit.

xxx.22. Loss of Primary Source. Means shall be provided such that, upon loss of voltage from the utility or other electric system(s), energy cannot be back fed through the truck and the truck supply equipment to the electrified parking space wiring system unless permitted by xxx.23.

xxx.23. Interactive Systems. Electrified parking space supply equipment and other parts of a system, either on-board or off-board the vehicle, that are identified for and intended to be interconnected to a vehicle and also serve as an optional standby system or an electric power production source or provide for bi-directional power feed shall be listed as suitable for that purpose. When used as an optional standby system, the requirements of Article 702 shall apply, and when used as an electric power production source, the requirements of Article 705 shall apply.

xxx.24. Reserved

IV. Transport Refrigerated Units (TRU)

xxx.25. Transport Refrigerated Units. A number of electrified parking spaces with electrical supply may each be equipped with additional ac grid power capacity to provide for operation of the heating/refrigeration units. For electrified parking space equipment covered by Parts I – III, a separate receptacle shall be provided for Transport Refrigerated Units. This receptacle would be used in addition to the three receptacles mentioned in xxx.21(B).

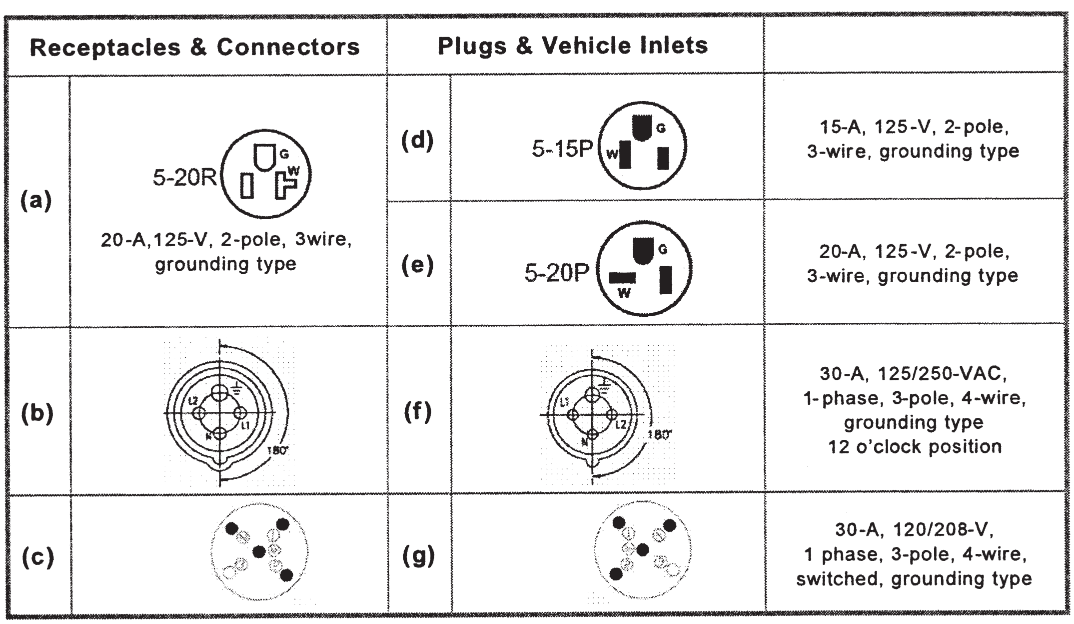


Figure xxx.21 -Receptacle, Connector, Attachment Plug and Inlet Configurations, 2-Pole,3-Wire and 3-Pole, 4-Wire Grounding-Types, Used for Electrified Parking Space SupplyEquipment, Separable Power Supply Cable Assemblies and Truck Inlets.

xxx.26. General Requirements

A. Systems. This part covers 120/208-, 277/480-volts, three-phase, 3 or 4-wire ac power supply systems respectively, with ground. Where different voltage is required by either design or available power supply system, adjustment shall be made in accordance with other articles and sections for the voltage used.

B. Electrified Parking Space Supply Equipment. The electrified parking space supply equipment, or portion thereof, providing electrical power for the operation of transport refrigerated units shall comply with Part VI.

xxx.27. Reserved.

xxx.28. Disconnecting Means and Branch-Circuit Protective Equipment

A. Disconnecting Means. Disconnecting means shall be provided to isolate each refrigerated unit from its supply connection.

B. Type. The disconnecting means shall be permitted to consist of a circuit breaker, motor circuit switch, or both, and shall be properly identified as to which receptacle it controls.

C. Location. The disconnecting means shall be readily accessible, located not more than 762 mm (30 in.) from the receptacle it controls, and shall be located in the supply circuit ahead of the receptacle. Circuit breakers or switches located in power outlets complying with this section shall be permitted as the disconnecting means.

D. Switch-Rated or Interlocked Receptacles. Each receptacle provided by the electrified parking space supply equipment shall be either a switch rated receptacle-plug combination, include an interlocked receptacle with an associated switching device of an interlocking type, or provided with an equivalent means to prevent connection or disconnection under load. The switching device shall be rated to close-into and withstand short circuit fault currents of at least 35kA.

The switch rated receptacle-plug combination, the interlocked plug & receptacle combination, or other means provided shall ensure that the user has no access to live parts.

E. Type Receptacles Provided. All receptacles shall be of the grounding type. Every electrified parking space intended to provide an electrical supply for transport refrigerated units shall be equipped with either a:

(1) 30 ampere, 480-volt, 3-phase receptacle, or

(2) 60 ampere, 208-volt, 3-phase receptacle.

These electrical supplies shall be permitted to include additional receptacles that have configurations in accordance with xxx.21(B).

xxx.29. Power Supply Cable Assembly. Where a power supply cable assembly, consisting of a cord with an attachment plug is provided, it shall be wired directly to the panelboard by an approved wiring method. The attachment plug shall be of a listed type. The power supply cable assembly or assemblies shall be OEM (factory) supplied or OEM or factory approved, and be of one of the following types and rating specified herein.

Cords with adapters and pigtail ends, extension cords, and similar items shall not be attached to, provided or shipped with a truck.

A. Rating. The power supply cable assembly shall be listed and rated:

(1) 30 ampere, 480-volt, three phase, or

(2) 60 ampere, 208-volt, three phase.

B. Conductors. The cord shall be a listed type with four conductors, for three phase connection, one of which shall be identified by a continuous green color for use as the grounding conductor.

C. Cord. Extra-hard usage cables rated not less than 194°F (90°C), 600 volts; listed for both wet locations and sunlight resistance; and having an outer jacket rated to be resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids, and chemicals shall be permitted where flexibility is necessary between the electrified parking space supply equipment and the panelboard and inlet(s) on the truck.

D. Attachment Plug. Where a flexible cord is provided with an equipment grounding conductor and equipped with an attachment plug, the attachment plug shall comply with 250.138(A) and 250.138(B).

An attachment plug for the connection of a truck or trailer shall be either:

(1) rated 30 ampere, 480-volt, three phase and intended for use with a 480-volt, three phase receptacle, or

(2) rated 60 ampere, 208-volt, three-phase and intended for use with the 60-ampere, 208-volt, three phase receptacle and intended for use with 208-volt, three phase receptacle.

FPN: Complete details of the 30-ampere and 60-ampere plug configurations can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Part C2 and Part C3.

The attachment plug(s) shall be listed, by itself or as part of the power supply cable assembly, for the purpose and shall be molded to or installed on the flexible cord so that it is secured tightly to the cord at the point where the cord enters the attachment plug. If a right-angle cap is used, the configuration shall be oriented so that the grounding member is farthest from the cord.

E. Point of Entrance. The point of entrance of the power supply cable assembly to the truck or location of the transport refrigerated unit inlet shall be located at a height of not less than 600 m (24 in.) above the parking surface.

F. Protection Against Corrosion and Mechanical Damage. Permanent provisions shall be made for the protection of the power supply cable assembly, attachment plug and any other exposed portions of the transport refrigeration unit distribution system against corrosion and mechanical damage if such devices are in an exterior location while the truck or trailer is in transit.

xxx.30. Reserved.

Substantiation: By way of introduction to the members of CMP # xx, this code proposal was developed by the Truck Stop Electrification (TSE) Committee of the National Electric Transportation Infrastructure Working Council (IWC), sponsored by the Electric Power Research Institute (EPRI). The TSE Committee is a multi-industry group of professional volunteers, involving truck manufacturers, TSE designers and implementers, component manufacturers, utilities, and members of the National Association of Truck Stop Operators, Society of Automotive Engineers (SAE), Environmental Protection Agency, Department of Energy, Department of Defense, IEEE, EPRI, and others, working together to develop the TSE infrastructure. For most on-road, heavy-duty fleets, idling can account for more than 50 percent of total trip time. The amount of diesel fuel burned, the emissions produced, and the maintenance impacts

trucks owners are significant. Consider the following:

- A class 8 truck typically idles 10-12 hours per night, 300 nights per year (3,000 hours peryear).
- There are approximately 1.4 million heavy-duty long haul trucks on the road.
- Each year a truck emits over 0.3 tons of nitrogen oxides and 21 tons of carbon dioxide.
- Excessive idling has resulted in higher fuel consumption; a typical diesel vehicle burns one to 1.3 gallons of fuel for every hour of idling.
- Idling trucks collectively burn away more than 1.2 billion gallons of diesel fuel annually at a cost of more than one trillion dollars to the industry.
- A truck idling for one hour suffers wear and tear equivalent to being driven seven miles.
- Operating life of engine oil is reduced by 75 percent due to prolonged idling – from 600 engine hours to 150 engine hours.
- Drivers are constantly exposed to exhaust fumes from the idling trucks.

Over the past several years, the attention of regulatory agencies and environmental groups has focused on reducing truck idling. Developing a standardized, safe and efficient means of reducing fuel consumption and emissions has been the goal.

More than twenty states and cities have already adopted legislation to reduce the number of hours a truck idles. There are two topics of importance to fleet and independent operators and governmental regulators -- reducing fuel consumption and emissions. Both of these subjects are intertwined; if done properly both fuel consumption and emissions can be reduced, with the added benefit of lower maintenance costs as well.

One of the most effective opportunities to reduce both fuel consumption and truck emissions is to reduce unnecessary idling. Idling is most extensive when trucks are parked at truck stops or other roadside rest areas, during the required rest times for the driver to sleep.

Alternative technologies are available that provide cab heating, cooling, and/or electrical supply while consuming far less energy. These include:

An auxiliary power unit (APU) mounted externally on the truck cab can provide electric power.

Auxiliary power units (APU) are viable for certain operators, but weight, cost and maintenance issues make them less than an ideal solution for others.

Truck Stop Electrification or “shore power” will provide electric power that which allows drivers to plug trucks into power outlets to run cab amenities (hotel loads) and the heating, ventilation and air conditioning systems necessary for heating and cooling. Variations of TSE systems also allow the HVAC systems to be supplied externally, without a direct electrical connection to the truck, and with the heated or cooled air ducted into the truck via a console fitted through the cab window. The console also provides outlets for various appliances and other amenities carried by the truck driver. The same basic issues relating to engine idling reduction include dealing with cabs of long-haul trucks (TSE) and Transport Refrigerated Units (TRU).

When available, electricity provided at an Electrified Parking Space is the cheapest form of energy for running a truck’s on-board electrical systems, reducing emissions and fuel consumption.

Many large truck stops are located on the edge of metropolitan areas, often within the boundaries of an ozone nonattainment area. Thus, idling at these truck stops can contribute significantly to a region's air quality problems. Idling is also a source of noise.

Fleets and operators would like to be able to find truck stops where drivers could shut down, plug in the trucks and power everything from HV/AC systems to microwave ovens, televisions and computers. The technology is available today to dramatically reduce engine idling. What is missing are places to plug in.

Today, approximately 500,000 truck parking sites exist in the United States, with an additional 200,000 sites in non-dedicated parking areas and loading sites around the country. Less than one percent of these sites now provide any electrified parking space equipment. These include both gantry-mounted and pedestal mounted equipment that provides AC power. Each parking space has outlets for connection to an ac source of power. Some provide optional hookups for television and the Internet.

Article xxx Electrified Parking Space Equipment has been developed to identify the infrastructure needs for systems where electrified parking space equipment may be installed for both heavy duty trucks and transport refrigerated units.

1. General

xxx.1. Scope.

xxx.2. Definitions

The additions and changes to this section are primarily editorial and provide consistency with the accepted definitions commonly used by truck stop operators, regulatory agencies, and the trucking and transportation industries.

xxx.3. General Requirements.

xxx.3.A. Systems.

A 120/208 VAC, three-phase, 4 wire system will offer the most economical single-phase system that is both easily balanced and flexible for future three-phase loads. Other voltage systems may be used for different installations. See Appendix A ("Truck Stop Electrification Voltage Specifications: The Appropriate Design of the Power Distribution Infrastructure," EPRI, Palo Alto, CA:
2005: 1010572").

xxx.3.B. Not Covered.

This provision excludes other electric powered equipment on some sites used for cargo handling, loading and unloading, etc. that are not a part of the electrified parking space equipment.

xxx.3.D. Listed or Labeled.

This requirement will insure that Electrified Parking Space Equipment, its related components and interconnection cables comply with accepted requirements for safety.

II. Electrified Parking Space Electrical Wiring System

xxx.7. Secondary Distribution System.

This code article is intended to apply to new installations that have the capability of providing for hotel loads, HVAC, etc. Existing installations for block heater use today have been exempted.

xx.10. Demand Factors.

The method for calculating demand factors for electrified parking spaces differs greatly from the approach used for mobile homes and recreational vehicles for several reasons. Unlike mobile homes and RVs which are plugged in perhaps several dozen times a year, trucks are plugged in almost daily, totaling approximately 300 days a year on average. Moreover, mobile homes remain plugged in for relatively long periods of time, whereas trucks typically plug in for only 10-12 hours at a time.

Another important distinction from mobile homes and RV parks is that most truck stops with electrified parking spaces are filled to capacity or near capacity during the evening rest hours and are virtually empty during the day. For these reasons, a demand factor based on the available number of physical spaces does not accurately reflect the expected demand during the resting times. An electrified parking space facility would have to be designed based on 100% occupancy, hence the demand factor table in Article 551 is not appropriate.

Data was obtained from approximately 24 truck stops nationwide with electrified parking spaces wherein occupancy status, power, energy consumption, outdoor temperature and wind speed, HVAC temperature, and other parameters were monitored continuously. The data, representing over 5 million hours of service, showed that although demand may be affected by occupancy, time of day, and other factors, the single most significant parameter affecting demand is the outside air temperature. The data indicates that the HVAC has the highest power requirement in cold climates, with the heating demand representing the greatest load, which in turn is dependent on outside temperature. In very warm climates, where no heating load is necessary, the cooling load increases as the outdoor temperature rises.

The model used for the proposed demand factors was developed to correlate power and energy with ambient weather conditions. First, it was necessary to categorize different areas across the country according to temperature zones. The US Department of Agriculture (USDA) has developed a commonly used Plant Hardiness Zone map that is publicly available (see Figure 1). The map was created by USDA using an archive of average annual minimum temperature data from about 8,000 stations throughout North America. The map divides the country into 11 major zones based on the average annual minimum temperature. The zones and their respective temperature ranges are also shown in Table 1 below.

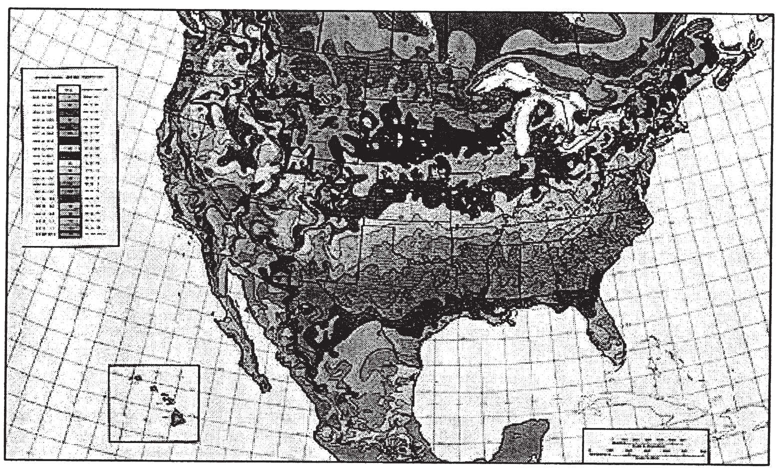


Figure 1 US Department of Agriculture Plant Hardiness Zone Map

Table 1 - USDA Hardiness Zones and Average Annual Minimum Temperature Range

Zone	Fahrenheit	Celsius	Example Cities
1	Below -50 F	Below -45.6 C	Fairbanks, Alaska; Resolute, Northwest Territories (Canada)
2a	-50 to -45 F	-42.8 to -45.5 C	Prudhoe Bay, Alaska; Flin Flon, Manitoba (Canada)
[illegible]	-45 to -40 F	-40.0 to -42.7 C	Unalakleet, Alaska; Pinecreek, Minnesota
3a	-40 to -35 F	-37.3 to -39.9 C	International Falls, Minnesota; St. Michael, Alaska
[illegible]	-35 to -30 F	-34.5 to -37.2 C	Tomahawk, Wisconsin; Sidney, Montana
4a	-30 to -25 F	-31.7 to -34.4 C	Minneapolis/St.Paul, Minnesota; Lewistown, Montana
[illegible]	-25 to -20 F	-28.9 to -31.6 C	Northwood, Iowa; Nebraska
5a	-20 to -15 F	-26.2 to -28.8 C	Des Moines, Iowa; Illinois
[illegible]	-15 to -10 F	-23.4 to -26.1 C	Columbia, Missouri; Mansfield, Pennsylvania
6a	-10 to -5 F	-20.6 to -23.3 C	St. Louis, Missouri; Lebanon, Pennsylvania
6b	-5 to 0 F	-17.8 to -20.5 C	McMinnville, Tennessee; Branson, Missouri
7a	0 to 5 F	-15.0 to -17.7 C	Oklahoma City, Oklahoma; South Boston, Virginia
7b	5 to 10 F	-12.3 to -14.9 C	Little Rock, Arkansas; Griffin, Georgia
8a	10 to 15 F	-9.5 to -12.2 C	Tifton, Georgia; Dallas, Texas
[illegible]	15 to 20 F	-6.7 to -9.4 C	Austin, Texas; Gainesville, Florida
9a	20 to 25 F	-3.9 to -6.6 C	Houston, Texas; St. Augustine, Florida
9b	25 to 30 F	-1.2 to -3.8 C	Brownsville, Texas; Fort Pierce, Florida
10a	30 to 35 F	1.6 to -1.1 C	Naples, Florida; Victorville, California
10b	35 to 40 F	4.4 to 1.7 C	Miami, Florida; Coral Gables, Florida
11	above 40 F	above 4.5 C	Honolulu, Hawaii; Mazatlan, Mexico

Load data from the electrified parking spaces at different geographical locations was recorded for the coldest month (January). The data, in average measured kW per occupied parking space, was correlated with the USDA zones as shown in Figure 2. A baseline load for small appliances, block heater and other amenity loads was then established to reflect the variations in the recorded load attributed to the daily temperature differences during the month. These values were then increased by a margin of approximately 20%. This margin is based on the expected demands of additional devices identified as likely to be used in the truck in the future and anticipates the increased accessory loads as electrified parking spaces become more available. Figure 2 illustrates the high power demand per occupied space in the coldest zones (e.g., zones 1 and 2 to the right of the graph) resulting from load needed to heat the interior cab space. The graph also shows the decrease in load in the warmer zones. However, as the average temperatures increase in the hottest zones (e.g., zones 10 and 11), the load requirements begin to increase reflecting the air conditioning loads.

As seen in the graph, there is a baseline load of about 2.2 kW per occupied space, at the several of the temperate climate zones, with an increasing load as temperatures decrease in colder zones and increase in hotter zones.

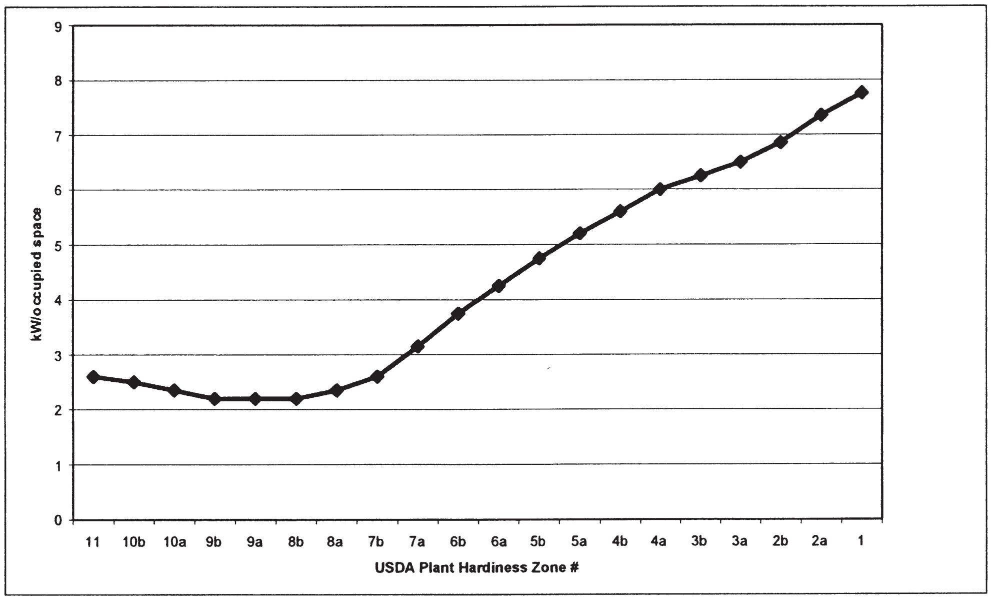


Figure 2 - Distribution Graph of Connected Load Value Based on Climate Zones

Table 2 shows data from five specific truck stops located in different cities in warm, temperate, and colder climates. The fourth column gives the actual average measured kW load per occupied space during the coldest month of January. The fifth column identifies the USDA zone based on the map, and the last column shows the recommended kW per space for that zone. Assuming 100% occupancy, the table confirms that the recommended load capacity per space provides a reasonable margin of safety.

TABLE 2 - Data Summary for Truck Stops in Different Geographical Regions and Climate Zones

Site	State	Number of Occupied Parking Spaces	Average measured kW load per space *	Zone	Recommended kW per space based on zone
Syracuse	NY	20	3.76	4b	5.6
Paulsboro	NJ	80	2.46	6b	3.75
Knoxville	TN	93	1.89	7a	3.15
Atlanta	GA	63	1.73	7b	2.6
Houston	TX	51	1.12	9a	2.2
* Data from the coldest month (January)					

The two 20-ampere and one 30-ampere service receptacles on the electrified parking space supply equipment corresponds to 11 kW of available power. Converting the recommended kW per space to a percentage of the available power results in the demand factor table shown below (Table3), which is the basis for Table xxx.10.

Table 3 - Demand Factors for Services and Feeders

Climate Zone	KW per Space	% of Total (11 kW)
1	7.75	70%
2a	7.35	67%
2b	6.85	62%
3a	6.5	59%
3b	6.25	57%
4a	6	55%
4b	5.6	51%
5a	5.2	47%
5b	4.75	43%
6a	4.25	39%
6b	3.75	34%
7a	3.15	29%
7b	2.6	24%
8a	2.35	21%
8b	2.2	20%
9a	2.2	20%
9b	2.2	20%
10a	2.35	21%
10b	2.5	23%
11	2.6	24%

Additional data from the various truck stops, where electrified parking space equipment has been installed, continues to be collected and would be available for further review. **xxx.11. Calculations.**

Loads for other amenities such as, but not limited to, service buildings, restaurants, and refueling stations shall be sized separately and then be added to the value calculated for the truck stop where they are all supplied by one service.

III. Electrified Parking Space Supply Equipment (Off-board).

xxx.15. Grounding.

xxx.16. Clearance for Overhead Conductors.

Article 225.18 identifies clearances from ground for overhead conductors and cables. These clearances are broken down into four types of installations. For the purposes of this code proposal, the clearances for equipment on public streets, alleys, etc. (Article 225.18(4)) was selected as appropriate for truck stops.

xxx.17. Wiring Methods and Installation.

xxx.17(A). Electrified Parking Space Supply Equipment Type.

There are four generic types of installations that could be provided: pedestal, overhead gantry, raised concrete pad, and speed bump design. The speed bump design was not recommended due to experiences where such a design was used in truck parking sites and proved to be easily damaged by snow removal equipment as well as water and flooding.

xxx.17(B). Mounting Height.

The minimum restriction for the height of the equipment also includes provision for areas where the parking site is located on land in a known flood plain.

xxx.17(E) Facility Disconnecting Means

This requirement provides for a disconnecting means that can shut off and isolate the Electrified Parking Space Supply Equipment in a row, section or area of the truck stop if required. It can be locked in the “Off” position. It shall be provided in addition to the disconnecting means in the electrified parking space equipment located at each parking space.

xxx.18. Overhead Gantry or Cable Management System.

This section covers systems where the means of providing power to the truck are attached to an equipment module that is permanently wired to an overhead electrical system. A provision has been made for a breakaway-type of strain relief mechanism such that there are neither live parts nor damage to the cable.

xxx.19. Protection of Outdoor Equipment.

The electrified parking space equipment and trucks using this equipment will be connected at times when there are adverse environmental conditions, such as snow, rain, wind-blown dust, exposure to very cold temperatures, etc. The use of suitably rated enclosures, components, and other electrical devices is recommended.

xxx.20. Means for Connecting to Electrified Parking Space Supply Equipment

xxx.20(B). Type Receptacles Provided.

Truck OEMs and implementers have recommended that a combination of receptacle outlets be provided to allow connection of the truck to the electrified parking space supply equipment. This section identifies standard receptacles of both general purpose and industrial types. It limits the number of cables permitted to reduce the likelihood of damage to the cable assemblies and other risks associated with the use of multiple cables for connection. An exception allows for legacy type connections for block heaters on existing trucks. It offers the opportunity to connect via a single cable and includes future anticipated loads using a 120/208Y, single-phase supply source.

These receptacles, their mating attachment plugs, connectors, and inlets have been identified so as to limit the use of multiple adapters, user-assembled cables and connector assemblies, or other available configurations such as might be found in RV applications.

xxx.20(D). Switch-Rated or Interlocked Receptacles.

Trucks will be connected and disconnected in adverse weather conditions. Experience shows that the truck operators will not always shut off power at the electrified parking space equipment before disconnecting either the attachment plug or connector. Additionally, standard NEMA receptacles, plugs, connectors and inlets have not been rated for make and break under load and may be damaged as a result of repeated connection or disconnection under load.

The use of an interlock mechanism or a switch rated receptacle or will prevent an arcover, electrical damage to the connection devices and ensure that no live parts are exposed to contact during connection or disconnection.

xxx.20(E). Ground-Fault Circuit Interrupters (GFCI).

Section xxx.20(E) requires GFCI Protection be provided as an integral part of all Electrified Parking Space Supply Equipment. This equipment will be installed in many existing truck stops and used outdoors in many different environment conditions where it can be contacted by persons. This requirement will ensure that people coming in contact with Electrified Parking Space Supply Equipment will be provided with suitable personnel protection that functions to deenergize the equipment within an established period of time when a current to ground exceeds an established predetermined value that may result in a shock hazard and is less than required to operate the overcurrent protective device of the supply circuit.

For trucks parking at residential or commercial locations or at sites not designated as truck parking spaces, the most common locations being commercial and retail parking lots, residential driveways, garages, carports, or streets adjacent these locations, the availability of GFCI protection cannot be assured. It has been recommended that SAE J2698 require GFCI Protection be provided onboard the truck. This would assure that such protection will be available regardless of parking site used.

xxx.21. Separable Power-Supply Assembly.

xxx.21(C). Cord.

Section xxx.21(C) requires that the flexible cord used for the purpose of connecting the truck to the Electrified Parking Space Supply Equipment be of an extra hard usage type, as designated in Table 400-4. The separable power supply cord assembly used will typically be used one or more times daily, and will be subjected to a high level of abuse by being walked on, driven over, coiled up and stored in a truck compartment with other tools, road chains and related equipment. It should also be listed type suitable for use outdoors, in damp and wet conditions, and at cold temperatures found in the northern climates of the USA during winter months. Additionally, the flexible cord shall also be resistant to normal automotive fluids and fuels, notably gasoline and diesel oil.

xxx.21(F). Switch-Rated or Interlocked Truck Coupler.

As indicated in xxx.20(D), trucks will be connected and disconnected in adverse weather conditions. Experience shows that the truck operators will frequently disconnect the attachment plug or the connector before shutting off power at the electrified parking space equipment. Additionally, standard NEMA receptacles, plugs, connectors and inlets have not been rated for make and break under load and may be damaged as a result of repeated connection or disconnection under load. The use of an interlock mechanism at the inlet connection or a switch rated connector-inlet or will prevent an arcover, electrical damage to the connection devices and ensure that no live parts are exposed to contact during connection or disconnection.

xxx.21(G). Truck Coupler.

Presently, the SAE J2698 Truck and Bus Electrical Systems Subcommittee is developing a Recommended Practice that is intended to describe the assembly design of single phase nominal 120 VAC wiring distribution systems and circuits that provide power to truck sleeper cabs for ‘hotel’ loads, other battery charging and cold weather starting aids on heavy duty on-highway trucks.

The present J2698 draft, dated August 12, 2005, (see Appendix A for details), identifies a minimum of two NEMA (5-15 and 5-20) 125 volt connections at the interface between the truck and connector on the separable power-supply cable assembly used to connect the truck to the electrified parking space equipment. Some truck OEMs have suggested that more than two connection points be used to provide additional electrical capacity.

xxx.21(G) limits these connections to no more than two, and permits the alternative of connecting via a 30-ampere, 120/208 volt, single phase connector-inlet combination. By limiting the number of connection points, the volt-ampere load of the equipment can be defined and the opportunity for a fault or hazard occurring from the use of multiple cord sets reduced. The on-board systems being developed today do not anticipate any control circuits or other means to deenergize all of the line connected circuits should one of the connection points at the truck be disconnected. Minor repairs or adjustments are made by the truck operator or local service person at a truck stop. In the event that these involve a line connected electrical circuit, and not all of the ac power connections are disconnected, the risk of contact with a live part can be minimized by limiting the number of connection points to the truck. It also reduces the likelihood of tripping hazards, and injury to persons walking thru the parking spaces, physical damage to the power supply cable assemblies themselves or to the equipment.

The use of an alternative 30-ampere, 120/208Y-volt connection, as requested by some manufacturers of both electrified parking space equipment and heavy duty road equipment, offers greater capacity and the possibility of using a single connection point at the vehicle and an internal (on-board) distribution system for all of the electrical power needs.

xxx.21(H). Overall Length.

Based on a study of truck and trailer sizes, configurations, parking lot design, equipment placement, and the connection point(s) on the truck being located at or near the driver side door, an overall length of 25 feet is adequate for the purpose. This limits the risk of increased damage to the cord set if longer cords were used, decreases the weight carried on-board the truck, reduces voltage drop and lowers the cost of such cord sets. For truck stops where existing parking space configurations, such as back-in sites, have been established that do not permit placement of the electrified parking space equipment in an optimal position to minimize the cord length, the use of longer cord lengths and a cable management system, will minimize the potential damage to the cord or cable.

xxx.21(I). Point of Entrance.

Based on discussions with truck OEMs and recommendations contained in the SAE J2698 draft document, the connection point(s) at the truck will be located on the driver's side of the vehicle, at or near the driver's side door. By identifying this position, the length of the separable power supply cable assembly can be identified. The references to minimum and maximum heights address concerns with ease of connection or disconnection and possible damage caused by flooding or other vehicle operation through standing water.

xxx.22. Loss of Primary Source.

In the event of loss of AC power while connected, power from an APU or other source should not backfeed into the TSE equipment or its wiring systems.

xxx.23. Interactive Systems.

Trucks presently carry alternative on-board power sources, such as batteries, generators and auxiliary power units, to perform various functions during vehicle operation or when stopped.

Future electrical supply needs may utilize these sources of power or on-board generation capabilities as either a standby power source or as a source of power production operating in parallel with a primary source(s) of electricity, in addition to its normal function of charging the truck batteries or operating other on-board equipment. The use of such vehicle or vehicle related equipment for this purpose should comply with all related installation practices and safety regulations in place for similar types of equipment, as well as the requirements of IEEE p1547.

IV. Transport Refrigerated Units (TRU)

xxx.25. Transport Refrigerated Units

Mechanical refrigeration units transport a huge variety of food, household and commercial products that must be chilled, frozen, heated or kept at some specified temperature en route. These TRUs or transport refrigerated units (also known as reefers) are diesel operated and produce exhaust emissions. In some areas, such as California and New York, there are concerns about getting TRUs to shut down their engines when the truck or trailer is standing still. The California Air Resources Board has begun offering pollution-abatement credits to facilities that install and use electric outlets to power reefers.

Reefer manufacturers are getting more inquiries from West Coast customers about standby electric units, which operate on 208-230- or 277/480-volt power. The equipment includes a large motor that runs the compressor so the diesel engine can be shut off. The switchover from diesel to standby electric power is automatic. When the stand-by cord is plugged in, the reefer's microprocessor controls automatically shut off the diesel and its centrifugal clutch disengages, allowing the motor to run the compressor through a belt drive. Unplugging the standby reverses the switchover.

Electric standby equipment is not new. It is widely used in Western Europe, where noise is an issue at distribution centers that have been surrounded by cities. Also, trucks using ferries to cross the English Channel, Baltic Sea and other bodies of water must shut down all engines, including those on reefers, while aboard ferries. The distribution centers and ferry parking decks are provided with plugins.

To our knowledge, there are currently no TRUs that plug in at truck stops. However, at least one TRU manufacturer is planning to have plug- in capabilities in the near future. As lawmakers interested in promoting idle reduction shift their focus to TRUs, other TRU manufacturers may develop the capability to utilize electrified parking spaces for their trailer units. This portion of the proposed Code addresses basic requirements that could be expanded further in future code cycles as the need arises.

xxx.28 Disconnecting Means and Branch-Circuit Protective Equipment.

This section provides some general guidelines and identifies practices similar to those used for heavy duty trucks parked at truck stops. In this case, a transport refrigerated unit (TRU) will be connected to a separate and additional supply source to operate on-board equipment necessary to maintain a perishable cargo. Based on a survey of present TRU equipment and the heating or cooling capacities utilized, two ratings have been recommended at the operating voltage levels most common today.

xxx.29 Power-Supply Cable Assembly.

This section identifies the basic ratings for the flexible cord or cable used in terms of the environmental conditions, exposures to materials, fluids and other contaminants, and physical damage that may occur as a result of daily usage at a truck stop.

It also relates the electrical rating of the power supply cable assembly and attachment plug to the corresponding ratings of the receptacle outlets provided as a part of the electrified parking space equipment.

Appendix A

SAE J2698 Recommended Practice for Primary Single Phase Nominal 120 VAC Wiring Distribution Assembly Design is under development by SAE's Truck and Bus Electrical Systems Subcommittee. It is intended to address the design and application of on-board 120 VAC wiring distribution systems used in trucks to provide power to 'sleeper" cab loads and other vehicle performance functions, such as battery charging, block heater and other cold weather related starting loads when the truck is parked and not idling.

The present draft, in addition to its Scope, Definitions and References, addresses such topics as Insulated Cable, Terminal and Connection Function, Supply Connections, Receptacles, Overcurrent Protection, Switches and Controls, Grounding and Bonding requirements. It also includes recommendations for the manufacturer's factory testing, including a high voltage dielectric test, other tests and visual inspections to ensure proper polarity and continuity, and to verify correct operation of protective devices such as GFCI's and overcurrent protection. Lastly, it addresses Wire Installation and Protection, Markings, Instruction Manual, and Separation of Circuits.

Both the SAE J2698 committee, its members and the Truck Stop Electrification (TSE) Committee have met on several occasions to work together to implement requirements for the offboard Electrified Parking Space Supply Equipment and the on-board truck wiring and distribution systems so that the two are fully functional and compatible.

The Truck Stop Electrification (TSE) Committee has made several suggestions to the SAE J2698 committee for improvements to further align the SAE J2698 Recommended Practice and this code proposal. These comments were related to several of the basic practices and wiring methods identified in the National Electrical Code, and the addition of specific references to Article numbers in the NEC to aid the vehicle designer in better understanding these basic rules. They included improvements to the existing definitions, additional definitions, general references to require all line voltage components and systems to be Listed or Labeled and used in the approved manner when installed, changes to include details relating both external connections and wiring and internal wiring, protection of exposed external wiring and alternative wiring methods, references to the proper use of flexible cord and identification of the types suitable for the application, the use of metallic and/or nonmetallic wiring systems and components, generic dimensional information as a point of reference to locate the position of the inlet(s) on the truck, the need for additional references to other SAE Recommended Practices that define test methods or procedures to evaluate the effects of shock and vibration on the components, identification of bonding requirements, bonding conductor sizing and protection, additional details to better define methods for grounding, to provide grounding continuity, the need to address backfeed from electrical sources on the truck, and so forth.

While the document is still under development, both SAE J2698 committee and the Truck Manufacturers Association (TMA) recognize the need to complete the J2698 document in a timely fashion. It is anticipated that with the support of TMA, the J2698 document can be completed in approximately 12 months and published prior to the adoption of the requirements for Electrified Parking Space Equipment in the National Electrical Code.

Further information regarding SAE J2698 Recommended Practice for Primary Single Phase Nominal 120 VAC Wiring Distribution Assembly Design can be obtained from SAE International, World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096 or SAE International, Automotive Headquarters, 755 West Big Beaver Road, Suite 1600, Troy, MI 48084.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

ARTICLE 626

Electrified Truck Parking Space Equipment

626.1 Scope. The provisions of this article cover the electrical conductors and equipment that connect trucks and transport refrigerated units to a supply of electricity, and the installation of equipment and devices related to electrical installations within an electrified truck parking space.

626.2. Definitions. ~~(See Article 100 for additional definitions.)~~

Cable management system An apparatus designed to control and organize unused lengths of cable or cord at electrified truck parking spaces.

Connector. A device that, by insertion into a truck inlet, establishes an electrical connection to the truck for the purpose of providing power for the on-board electric loads and may provide a means for information exchange. This device is part of the truck coupler.

~~Converter. A device that changes electrical energy from one form to another, as from alternating current to direct current.~~

Electrified Truck Parking Space. A truck parking space that has been provided with an electrical system that allows truckers to "plug in" their vehicles while stopped, and use off-board power sources in order to operate on-board systems such as air conditioning, heating and appliances, without any engine idling.

FPN: An electrified truck parking space may also include dedicated parking areas for heavy duty trucks at travel plazas, warehouses, shipper and consignee yards, depot facilities, border crossings, etc. It does not include areas such as the shoulders of on and off highway ramps and access roads, camping and recreational vehicle sites, residential and commercial parking areas used for automotive parking or other areas where ac power is provided solely for the purpose of connecting automotive and other light electrical loads, such as engine block heaters, and at private residences.

~~Electrified~~ Truck ~~Parking Space Supply Equipment, also known as Truck Stop Electrification Equipment. The conductors, including the ungrounded, grounded and equipment grounding conductors, and the connectors, attachment plugs, and all other fittings, devices,~~ interlocking mechanisms, ~~power outlets, circuit breakers, switches, and fuses, and their~~ related ~~accessories, installed specifically for the purpose of delivering energy from the electrified~~ truck ~~parking space wiring system to the truck service equipment~~ .that is ~~intended to constitute the disconnecting means for the supply to the truck.~~

Electrified Truck Parking Space Wiring Systems. All of the electrical wiring, equipment, and appurtenances related to electrical installations within an electrified truck parking space including the electrified parking space supply equipment.

~~Frame. Chassis rail and any welded addition thereto metal thickness of 1.35 mm (0. 053 in.) or greater.~~

Overhead Gantry A structure consisting of horizontal framework supported by vertical columns spanning above electrified truck parking spaces that supports equipment, appliances, raceway and other necessary components for the purpose of supplying electrical, HVAC, internet, communications and other services to the spaces.

Separable Power Supply Cable Assembly. A flexible cord or cable, including ungrounded, grounded, and equipment grounding conductors, provided with a female connector, an attachment plug and all other fittings, grommets, or devices installed for the purpose of delivering energy from the source of electrical supply to the inlet installed within the truck.

Transport Refrigerated Unit (TRU), also known as Refrigerated Transport Units (RTU). A trailer with integrated heating and/or cooling for the purpose of maintaining the desired environment of temperature-sensitive goods or products.

Truck. ~~A heavy-duty vehicular-type unit primarily designed for commercial transportation of goods and equipment, which has its own motive power. It is built on a permanent chassis, typically designed with but not required to include a sleeper berth and without a permanent foundation where connected to the required utilities and that may include heating, air-conditioning, and electric systems contained therein.~~
Motor vehicle primarily designed for the transportation of goods and equipment.

Truck Coupler. A mating truck inlet and connector set.

Truck Flanged Surface Inlet. The device(s) on the truck into which the connector(s) is inserted for providing electric energy. It may also be used for the exchange of information. This device is part of the truck coupler. For the purposes of this Code, the truck flanged surface inlet is considered to be part of the truck and not part of the electrified truck parking space supply equipment.

~~Truck Parking Space. An area within a truck stop set aside and identified for the accommodation of a truck on a temporary basis.~~

Truck Service Equipment~~,~~. The on-board equipment ~~attached to or connected to~~ of the truck containing the disconnecting means, overcurrent protective devices, and flanged surface inlets or other means for connecting the truck to the electrified truck parking space supply equipment.

~~Truck Stop. A plot of land upon which two or more truck parking sites are located,established, or maintained for occupancy by trucks for resting purposes.~~

626.3 Other Articles. Wherever the requirements of other articles of this Code and Article 626 differ, the requirements of Article 626 shall apply.

626.4 General Requirements
(A) Not Covered. The provisions of this article do not apply to that portion of other equipment in residential, commercial or industrial facilities that require electric power for devices used to load and unload cargo and equipment, operate conveyors, and other devices on the site or truck.
(B) Systems. This article covers 120-, 120/208-, or 120/240-volts, nominal, single- or three-phase, 3 or 4-wire ac power supply systems respectively, with ground. Where a different voltage is required by either design or available power supply system, adjustment shall be made in accordance with other articles and sections for the voltage used.
(C) Connection to Wiring System. The provisions of this article shall apply to the electrified truck parking space supply equipment intended for connection to a wiring system as defined in 626.3(A).
(D) Illumination. Illumination shall be required to facilitate safe use of electrified truck parking spaces.

~~5.5 Listed or Labeled. All electrical materials, devices, appliances, fittings, and other equipment shall be listed or labeled by a qualified testing agency and shall be connected in an approved manner when installed.~~

~~**xxx.1. Reserved**~~
I. Electrified Truck Parking Space Electrical Wiring Systems

~~**6.6 Primary**~~ **Distribution Systems**
(B) Distribution System Voltages. Unless other voltages are specified, the nominal ac system voltages of 120, 120/240, 208Y/120, 240, and 480Y/277, ~~and 480 volts~~ shall be used to supply equipment covered by this article.

~~**4.4 Other Articles**. Whenever the requirements of other articles of this Code and Article xxx differ, the requirements of Article xxx apply.~~

~~**(C) Secondary Distribution**~~ **Parking Space Supply System**. The electrified truck parking space secondary electrical distribution system to electrified truck parking space supply equipment shall be single-phase derived from 208Y/120 ~~120/208~~ volt three-phase, four-wire system or 120/240 volt split single-phase system.

Exception: Existing electrified truck parking space equipment may also be provided with a 120-volt distribution system for use by legacy vehicles.

~~**626.8 Underground Service, Feeder, Branch-Circuit, and Electrified Parking Space Feeder-Circuit Conductors**.~~
~~(A) General. All direct-burial conductors, including the equipment grounding conductor if of aluminum, shall be insulated and identified for the use. All conductors shall be continuous from equipment to equipment. All splices and taps shall be made in approved junction boxes or by use of material listed and identified for the purpose.~~
~~(B) Protection Against Physical Damage. Direct-buried conductors and cables entering or leaving a trench shall be protected by rigid metal conduit, intermediate metal conduit, electrical metallic tubing with supplementary corrosion protection, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, liquidtight flexible metal conduit, or other approved raceways or enclosures. Where subject to physical damage, the conductors or cables shall be protected by rigid metal conduit, intermediate metal conduit, or Schedule 80 rigid nonmetallic conduit. All such protection shall extend at least 450 mm (18 in.) into the trench from finished grade.~~
~~FPN: See 300.5 and Article 340 for conductors or Type UF cable used underground or in direct burial in earth.~~

10.10 Feeder and Service Load Calculations.
(A) General. The calculated load of a feeder or service shall not be less than the sum of the loads on the branch circuits supplied, as determined by Part II of this article, after any applicable demand factors permitted have been applied.
~~FPN: See Examples D1(A) through D10 in Annex D.~~
(B) Demand Factors. Electrified truck parking space electrical wiring systems are based upon the climatic zone in which the equipment is installed.

12.12 Calculations.
(A) Parking Space VA Electrical service and feeders shall be calculated on the basis of not less than 11000 volt-amperes per electrified truck parking space.
(B) Demand Factors. The demand factors set forth in Table ~~xxx.10~~ 626.12(B) shall be the minimum allowable demand factors that shall be permitted in calculating load for service and feeders.
~~Where the electrical supply for a truck parking space has more than one receptacle, the calculated load shall be calculated for all receptacles.~~ No demand factor shall be allowed for any other load, except as provided in this Code.

Table ~~xxx.10~~ 626.12(B) Demand Factors for Services and Feeders

Climatic Temperature Zone (Hardiness Zone)	Demand Factor (percent)
1	70%
2a	67%
2b	62%
3a	59%
3b	57%
4a	55%
4b	51%
5a	47%
5b	43%
6a	39%
6b	34%
7a	29%
7b	24%
8a	21%
8b	20%
9a	20%
9b	20%
10a	21%
10b	23%
11	24%

*****Table 1-USDA Hardiness Zones and Average Annual Minimum Temperature Range and Figure 1-US Department of Agriculture Plant Hardiness Zone Map Here*****

(C) Two or More Vehicles. Where the electrical supply is in a location that serves two or more trucks, the equipment for each site must comply with ~~xxx.10~~ 626.12(A) and the calculated load shall be computed on the basis of each parking site. ~~No demand factor shall be allowed for any other load, except as provided in this Code.~~

(C) Branch ~~Capacity~~ Rating. Truck site branch circuit conductors shall have an ~~capacity~~ ampacity not less than the loads supplied and shall be rated at not less than 30 amperes.

14.14 Overcurrent Protection. Overcurrent protection shall be provided in accordance with Article 240.

16.16 Grounding. All electrical equipment and installations in truck parks shall be grounded as required by Article 250.

~~**16.17 Reserved**~~

II. Electrified Truck Parking Space Supply Equipment (Off-board)

16.16 Grounding.

(A) Exposed Non-Current-Carrying Metal Parts. Exposed non-current-carrying metal parts of fixed equipment, metal boxes, cabinets, and fittings that are not electrically connected to grounded equipment shall be grounded by a continuous equipment grounding conductor run with the circuit conductors from the service equipment or from the transformer of a secondary distribution system. Equipment grounding conductors shall be sized in accordance with 250.122 and shall be permitted to be spliced by listed means.

The arrangement of equipment grounding connections shall be such that the disconnection or removal of a receptacle or other device will not interfere with, or interrupt, the grounding continuity.

~~(B)~~ ~~Secondary~~ Distribution System Grounding. Each secondary distribution system shall be grounded at the transformer.

(C) ~~Neutral~~ Grounded Conductor Not to Be Used as ~~an~~ Equipment Grounding Conductor. The ~~neutral~~ grounded conductor shall not be used as an equipment grounding conductor for trucks or equipment within the truck park.

(C) No Bonding Connection To The Grounded Conductor on the Load Side. No connection to a grounding electrode shall be made to the neutral conductor on the load side of the service disconnecting means except as covered in 250.30(A) for separately derived systems and 250.32(B)(2) for separate buildings.

~~20.20~~ ~~Clearance for~~ Overhead Conductors~~s~~ Clearance

(A) Conductors Not Over 600 Volts. Open conductors of not over 600 volts, nominal, shall have a vertical clearance of not less than 5.5 m (18 ft.) measured from the surface of the parking lot and a horizontal clearance of not less than 900 mm (3 ft.) in all areas subject to truck movement. In all other areas, clearances shall conform to 225.18 and 225.19.

(B) Conductors Over 600 Volts.

FPN: For clearances of conductors over 600 volts, nominal, see 225.60 and 225.61.

22.22 Wiring Methods and ~~Installation~~ Materials

(D) Electrified Truck Parking Space Supply Equipment Type. The electrified truck parking space supply equipment shall be provided in one of the following forms:

(1) Pedestal.
(2) Overhead Gantry.
(3) Raised Concrete Pad.

(E) Mounting Height. Pedestal and raised concrete pad types of electrified truck parking space supply equipment shall be not less than 600 mm (2 ft.) above ground. ~~or the height of the flood plain level, whichever is greater.~~

(C) Access and Working Space. All electrified truck parking space supply equipment shall be accessible by an unobstructed entrance or passageway not less than 600 mm (2 ft.) wide and not more than 2.0 m (6 ft. 6 in.) high.~~Working Space.~~ Sufficient space shall be provided and maintained about all electrical equipment to permit ready and safe operation, in accordance with 110.26.

~~(D)~~ ~~Facility~~ Disconnecting Means. A disconnecting switch or circuit breaker shall be provided to disconnect one or more electrified truck parking space supply equipment sites from a remote location in the site supply equipment for disconnecting the power supply to a section of the truck stop. The facility disconnecting means shall be provided and installed in a readily visible and accessible location and shall be capable of being locked in the open position.

24.24 Overhead Gantry or Cable Management System

Electrified truck parking space equipment provided from either overhead gantry or cable management systems may be provided with a permanently attached power supply cable. It may also include or be separate from optional hybrid data, communications, optical fiber cables, shielding, etc. The cable or cables terminate in an electrified truck parking space supply equipment module that contains receptacles as described in 626.28 (B). The power supply cable shall be connected directly to the terminals of the panelboard or conductors within a junction box in the equipment and provided with a means to prevent strain from being transmitted to the terminals.

The power supply cable shall be provided with a means to de-energize the cable conductors and power service delivery device upon exposure to strain that could result in either cable damage ~~rapture~~ or separation of the cable from the power service delivery device and exposure of live parts.

26.26 Enclosure Type for Parking Space Equipment and Meters ~~Protection of Outdoor Equipment Wet Locations~~. All switches, circuit breakers, receptacles, control equipment, and metering devices located in wet locations or outside of a building shall be weatherproof equipment. (See section 100-1.) ~~**Meters.**~~ If secondary meters are installed, meter sockets without meters installed shall be ~~blanked off~~ covered with a means identified for the purpose.~~with an approved blanking plate.~~

28.28 Means for Connecting to Electrified Truck Parking Space Supply Equipment

(D) General. Trucks shall be supplied from electrified truck parking space supply equipment through not more than two suitable extra hard service cables or cords. Each connection to the equipment shall be by a single separable power supply cable assembly.

~~(B)~~ ~~Type~~ Receptacles Provided –NEMA Configurations. All receptacles shall be of the grounding type. A maximum of three receptacles shall be provided. Every truck parking space with electrical supply shall be equipped with:

(1) Two 20-ampere, 125-volt single receptacles, NEMA type 5-20R, and

FPN: Complete details of the 15- or 20-ampere plug and receptacle configuration can be found in the National Electrical Manufacturers Association Standard for Dimensions of Attachment Plugs and Receptacles, ANSI/NEMA WD 6 -2002, Figure 5-20.

(2) One 30-ampere, 120/208-volt, 3-pole, 4-wire receptacle.

FPN 1: Complete details of the 30-ampere plug and receptacle configuration can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Parts C2.10 or C3.

FPN 2: See Figure 626.30 (C) for details regarding receptacle types.

Exception: Where electrified truck parking space supply equipment provides the air-conditioning and comfort cooling function without requiring a direct electrical connection at the truck, only the two receptacles identified in 626.21(B)(1) need be provided.

~~Additional receptacles shall be permitted for the connection of electrical equipment outside the truck within the electrified truck parking space.~~

–FPN: For Transport Refrigerated Units (TRU), see Part V~~I~~

(D) Disconnecting Means. The electrified truck parking space supply equipment shall be provided with a ~~disconnecting~~ switch or circuit breaker for disconnecting the power supply to the individual truck service equipment.

~~(E)~~ ~~Switch-Rated or Interlocked Receptacles.~~ Means to Prevent Connection or Disconnection Under Load Each receptacle provided by the electrified truck parking space supply equipment shall be either a switch rated receptacle-plug combination, include an interlocked receptacle with an associated switching device of an interlocking type, or provided with an equivalent means to prevent connection or disconnection under load. The switching device shall be marked with a short circuit current rating.~~rated to close-into and withstand short circuit fault currents of at least 35kA~~. The switch rated receptacle-plug combination, the interlocked plug and receptacle combination, or other means provided shall ensure that the user has no access to live parts.

(E) Ground-Fault Circuit Interrupters (GFCI). The electrified truck parking space equipment shall be designed and constructed such that all receptacle outlets are provided with GFCI protection.

30.30 Separable Power-Supply Cable Assembly.

Where a separable power-supply cable assembly consisting of a cord with a female connector and attachment plug is provided, the vehicle shall be equipped with a permanently mounted, flanged surface inlet in accordance with **626.32(A),** wired directly to the panelboard by an approved wiring method. The attachment plug shall be of a listed type. The power-supply cable assembly or assemblies shall be identified ~~OEM (factory) supplied or OEM or factory approved~~, and be of one of the following types and rating specified herein. Cords with adapters and pigtail ends, extension cords, and similar items shall not be attached to, provided or shipped with a truck.

A. Rating(s).

(1) Twenty-Ampere Power-Supply Assembly. Trucks wired with a 20-ampere, 125-volt truck inlet, in accordance with 626.21(F)(1), shall use a listed 20-ampere power-supply assembly.

Exception: A listed separable power supply cable assembly, either hard-service or extra hard service and rated 15- amperes, 125 volts may be provided for connection to an engine block heater for legacy vehicles.

(2) Thirty-Ampere Power-Supply Assembly. Trucks wired with a 30-ampere, 120/208-volt truck inlet, in accordance with 626.21(F)(2) shall use a listed 30-ampere main power-supply assembly.

(F) Listed Cord Assemblies

(1) Conductors. The cord shall be a listed type with three or four conductors, for single phase connection, one of which shall be identified by a continuous green color for use as the equipment grounding conductor.

Exception: A separate listed three conductor separable power supply cable assembly, having one conductor identified by a continuous green color for use as the equipment grounding conductor, and rated 15 amperes, 125-volts may be provided for connection to an engine block heater for legacy vehicles.

(2) Cord. Extra-hard usage flexible cords and cables rated not less than 194°F (90°C), 600 volts; listed for both wet locations and sunlight resistance; and having an outer jacket rated to be resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids, and chemicals shall be permitted where flexibility is necessary between the electrified truck parking space supply equipment and the panelboard and inlet(s) on the truck.

Exception: Cords for the separable power supply cable assembly for 15 and 20 A connections may be a hard-service type.

(3) Attachment Plug. The attachment plug(s) shall be listed, by itself or as part of a cord set, for the purpose and shall be molded to or installed on the flexible cord so that it is secured tightly to the cord at the point where the cord enters the attachment plug. If a right-angle cap is used, the configuration shall be oriented so that the grounding member is farthest from the cord. Where a flexible cord is provided with an equipment grounding conductor and equipped with an attachment plug, the attachment plug shall comply with 250.138(A) and 250.138(B).

(3) Connection to a 20-Ampere Receptacle. A separable power supply cable assembly for connection to a truck having a 20-ampere inlet shall have an attachment plug that shall be 2-pole, 3-wire, grounding type, rated 20 amperes, 125 volts and intended for use with the 20-ampere, 125-volt receptacle, conforming to the configuration shown in Figure ~~xxx.21(e).~~ 626.30(c)

Exception: A separable power supply cable assembly, rated 15A, provided for the connection of an engine block heater only, shall have an attachment plug that shall be 2-pole, 3-wire, grounding type, rated 15 amperes, 125 volts, conforming to the configuration shown in Figure 626.30(c)~~xxx.21(d)~~.

FPN: Complete details of the 15- or 20-ampere plug and receptacle configuration can be found in the National Electrical Manufacturers Association Standard for Dimensions of Attachment Plugs and Receptacles, ANSI/NEMA WD 6 -2002, Figure 5-15 or 5-20.

(4) Connection to a 30-Ampere Receptacle. A separable power supply cable assembly for connection to a truck having a 30-ampere inlet shall have an attachment plug that shall be 3-pole, 4-wire, grounding type, either:

(a) rated 30 amperes, 120/208 volts and intended for use with the 30-ampere, 120/208-volt receptacle, conforming to the configuration shown in Figure 626.30 and intended for use with 120/208-volt switched receptacle configuration conforming to the configuration shown in Figure 626.30, or

(b) rated 30 amperes, 125/250 volts and intended for use with the 30-ampere, 125/250-volt receptacle, conforming to the configuration shown in Figure 626.30 and intended for use with 125/250-volt receptacle configuration conforming to the configuration shown in Figure 626.30.

FPN: Complete details of the 30-ampere plug and receptacle configuration can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Parts C2.10 or C3.

(MOVE TO 626.30(B))~~The attachment plug(s) shall be listed, by itself or as part of a cord set, for the purpose and shall be molded to or installed on the flexible cord so that it is secured tightly to the cord at the point where the cord enters the attachment plug. If a right-angle cap is used, the configuration shall be oriented so that the grounding member is farthest from the cord.~~

Figure ~~xxx.21~~626.30(c) - Receptacle, Connector, Attachment Plug and Inlet Configurations, 2-Pole,
3-Wire and 3-Pole, 4-Wire Grounding-Types, Used for Electrified Truck Parking Space Supply Equipment, Separable Power Supply Cable Assemblies and Truck Inlets.

~~Connector~~

~~**(1)** The connector for a separable power supply cable assembly, as specified in xxx.21(A)(1), shall be a 2-pole, 3-wire grounding type, rated 20 amperes, 125 volts.~~

~~Exception: The connector for a separable power supply cable assembly, rated 15A, provided for the connection of an engine block heater only, shall have an attachment plug that shall be 2-pole, 3-wire, grounding type, NEMA 5-15R configuration, rated 15 amperes, 125 volts.~~

~~**(2)** The connector for a separable power supply cable assembly, as specified in xxx.21(A)(2), shall be a 3-pole, 4-wire grounding type, either:~~

~~**(c)** rated 30 amperes, 120/208 volts, switched inlet-connector type, conforming to the configuration shown in Figure xxx.21(c) and intended for use with 120/208-volt switched inlet, conforming to the configuration shown in Figure xxx.21(g), or~~

~~**(d)** rated 30 amperes, 125/250 volts, conforming to the configuration shown in Figure xxx.21(b) and intended for use with 125/250-volt inlet, conforming to the configuration shown in Figure xxx.21(f).~~

~~FPN: Complete details of the 30-ampere plug and receptacle configuration can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Parts C2.10 or C3.~~

~~FPN: The connector in xxx.21(E)(2)(b) may be used on a 120/208-volt, single-phase circuit.~~

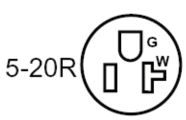
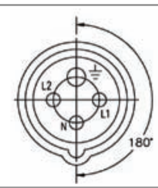
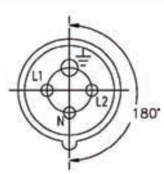
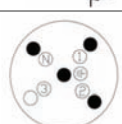
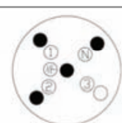
–(5) Switch-Rated or Interlocked Truck Coupler. Each connector provided by the separable power-supply assembly for use with the electrified truck parking space supply equipment shall be a part of either a switch rated connector-inlet combination, be used with an interlocked connector-inlet combination with an associated switching device of an interlocking type, or provided with an equivalent means to prevent connection or disconnection under load. The switching device shall be marked with a short circuit current rating.~~rated to close-into and withstand short circuit fault currents of at least 35kA.~~

The switch rated connector-inlet combination, the interlocked connector and inlet combination, or other means provided shall ensure that the user has no access to live parts.

32.32 Truck/Vehicle Coupler.

(A) Inlet Rating and Configuration.~~Truck Inlet~~.

(1) Each truck shall be provided with not more than two inlets corresponding to the type and rating of connector of the power-supply cable

Receptacles & Connectors		Plugs & Vehicle Inlets		
(a)	 20-A,125-V, 2-pole, 3wire, grounding type	(d)		15-A, 125-V, 2-pole, 3-wire, grounding type
		(e)		20-A, 125-V, 2-pole, 3-wire, grounding type
(b)		(f)		30-A, 125/250-VAC, 1-phase, 3-pole, 4-wire, grounding type 12 o’clock position
(c)		(g)		30-A, 120/208-V, 1 phase, 3-pole, 4-wire, switched, grounding type

assemblies provided and the rating of the receptacle in the electrified truck parking space supply equipment to which it is intended to be connected. See 626.30(C)

~~(2) Construction and Installation.~~ The truck coupler shall be constructed in accordance with 626.30(C) and be installed so as to guard against inadvertent contact by persons with parts made live from the electrified truck parking space supply equipment or truck. ~~Grounding Pole.~~ The truck coupler shall be provided with a grounding pole, unless part of a system identified and listed as suitable for the purpose in accordance with Article 250. ~~Grounding Pole Requirements.~~ The truck coupler shall be so designed that the grounding pole connection is the first to make and the last to break contact.

(B) Cord ~~Overall~~ Length. The exposed cord length shall be measured from the face of the attachment plug to the point of entrance to the truck or the face of the flanged surface inlet or to the point where the cord enters the truck. The overall length of the cable shall not exceed 7.5 m (25 ft) unless equipped with a cable management system that is listed as suitable for the purpose.

(C) ~~Point of Entrance.~~ Truck/Vehicle Inlet Location The point of entrance of the separable power supply cable assembly to the truck or location of the truck inlet shall be in the exterior wall, either in front of or behind the driver door located at a height of not less than 600 mm (24 in.) and not more than 1.6 m (5.2 ft) above the parking surface.

~~(D) Protection Against~~ Corrosion and Mechanical Damage. Permanent provisions shall be made for the protection of the inlet and truck distribution panel, attachment plug of the power-supply cord and any connector cord assembly or receptacle against corrosion and mechanical damage if such devices are in an exterior location while the truck is in transit.

34.34 Loss of Primary Power ~~Source~~. Means shall be provided such that, upon loss of voltage from the utility or other electric system(s), energy cannot be back fed through the truck and the truck supply equipment to the electrified truck parking space wiring system unless permitted by 626.36.

36.36 Interactive Systems. Electrified truck parking space supply equipment and other parts of a system, either on-board or off-board the vehicle, that are identified for and intended to be interconnected to a vehicle and also serve as an optional standby system or an electric power production source or provide for bi-directional power feed shall be listed as suitable for that purpose. When used as an optional standby system, the requirements of Article 702 shall apply, and when used as an electric power production source, the requirements of Article 705 shall apply.

~~**Reserved**~~

III. Transportation Refrigerated Units (TRU)

38.38 Transport Refrigerated Units. A number of electrified truck parking spaces with electrical supply may each be equipped with additional ac grid power capacity to provide for operation of the heating/refrigeration units. For electrified truck parking space equipment covered by Parts I – III, a separate receptacle shall be provided for Transport Refrigerated Units. This receptacle would be used in addition to the three receptacles mentioned in 626.30(C).

(A) General Requirements ~~Systems.~~ This part covers 208Y/120 ~~120/208~~, 480Y/277 ~~277/480~~-volts, three-phase, 3 or 4-wire ac power supply systems respectively, with ground. Where different voltage is required by either design or available power supply system, adjustment shall be made in accordance with other articles and sections for the voltage used.

(B) Electrified Truck Parking Space Supply Equipment. The electrified truck parking space supply equipment, or portion thereof, providing electrical power for the operation of transport refrigerated units shall comply with Part VI.

~~**(E) Reserved.**~~

40.40 Disconnecting Means and Branch-Circuit Protective Equipment

(A) Disconnecting Means. Disconnecting means shall be provided to isolate each refrigerated unit from its supply connection.

(B) Permitted Disconnect Types. The disconnecting means shall be permitted to consist of a circuit breaker, motor circuit switch, or both, and shall be properly identified as to which receptacle it controls.

(C) Disconnect Location. The disconnecting means shall be readily accessible, located not more than 762 mm (30 in.) from the receptacle it controls, and shall be located in the supply circuit ahead of the receptacle. Circuit breakers or switches located in power outlets complying with this section shall be permitted as the disconnecting means.

(D) Means to Prevent Connection or Disconnection Under Load ~~Switch-Rated or Interlocked Receptacles.~~ Each receptacle provided by the electrified truck parking space supply equipment shall be either a switch rated receptacle-plug combination, include an interlocked receptacle with an associated switching device of an interlocking type, or provided with an equivalent means to prevent connection or disconnection under load. The switching device shall be marked with a short circuit current rating.~~rated to close-into and withstand short circuit fault currents of at least 35kA.~~The switch rated receptacle-plug combination, the interlocked plug & receptacle combination, or other means provided shall ensure that the user has no access to live parts.

(E) NEMA Configuration Receptacle Requirements. ~~Type Receptacles Provided.~~ All receptacles shall be of the grounding type. Every electrified truck parking space intended to provide an electrical supply for transport refrigerated units shall be equipped with either a:

(1) 30 ampere, 480-volt, 3-phase receptacle, or
(2) 60 ampere, 208-volt, 3-phase receptacle.

~~These electrical supplies shall be permitted to include additional receptacles that have configurations in accordance with xxx.21(B).~~

42.42 Power Supply Cable Assembly. Where a power supply cable assembly, consisting of a cord with an attachment plug is provided, it shall be wired directly to the panelboard by an approved wiring method. The attachment plug shall be of a listed type. The power supply cable assembly or assemblies shall be OEM (factory) supplied or OEM or factory approved, and be of one of the following types and rating specified herein. Cords with adapters and pigtail ends, extension cords, and similar items shall not be attached to, provided or shipped with a truck.

(A) Rating(s). The power supply cable assembly shall be listed and rated:
(1) 30 ampere, 480-volt, three phase, or
(2) 60 ampere, 208-volt, three phase.

42.42 Power Supply Cable Assembly ~~Conductors.~~

(A) Listed Cord Assemblies. The cord shall be a listed type with four conductors, for three phase connection, one of which shall be identified by a continuous green color for use as the grounding conductor. ~~Cord.~~ Extra-hard usage cables rated not less than 194°F (90°C), 600 volts; listed for both wet locations and sunlight resistance; and having an outer jacket rated to be resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids, and chemicals shall be permitted where flexibility is necessary between the electrified truck parking space supply equipment and the panelboard and inlet(s) on the truck.

(B) Listed Attachment Plug(s). Where a flexible cord is provided with an equipment grounding conductor and equipped with an attachment plug, the attachment plug shall comply with 250.138(A) and 250.138(B). An attachment plug for the connection of a truck or trailer shall be either:

(1) rated 30 ampere, 480-volt, three phase and intended for use with a 480-volt, three phase receptacle, or

(2) rated 60 ampere, 208-volt, three-phase and intended for use with the 60-ampere, 208-volt, three phase receptacle and intended for use with 208-volt, three phase receptacle.

FPN: Complete details of the 30-ampere and 60-ampere plug configurations can be found in the Standard for Pin and Sleeve Configurations, UL 1686, Configurations section, Part C2 and Part C3.

The attachment plug(s) shall be listed, by itself or as part of the power supply cable assembly, for the purpose and shall be molded to or installed on the flexible cord so that it is secured tightly to the cord at the point where the cord enters the attachment plug. If a right-angle cap is used, the configuration shall be oriented so that the grounding member is farthest from the cord.

(C) Truck/Vehicle ~~Point of~~ Entrance Location. The point of entrance of the power supply cable assembly to the truck or location of the transport refrigerated unit inlet shall be located at a height of not less than 600 m (24 in.) above the parking surface.

~~(D) Protection Against~~ Corrosion and ~~Mechanical~~ Physical Damage. Permanent provisions shall be made for the protection of the power supply cable assembly, attachment plug and any other exposed portions of the transport refrigeration unit distribution system against corrosion and mechanical damage if such devices are in an exterior location while the truck or trailer is in transit.

~~**(E) Reserved.**~~

Panel Statement: The committee agrees with the addition of this new article and has modified its content to follow the NEC style.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 9 Negative: 1

Explanation of Negative:

HEDGES, T.: After doing more research, it appears that with the exception of the definition and use of the coupler between the vehicle and the premises equipment all of the requirements in the proposed article are already a part of the NEC and this new article would only bring them all together in one place for the convenience of the installer and only add cumbersome redundancy to the existing NEC. In addition, this would only help every other special interest group to have their own dedicated section. The designer of these “Electrified Truck Parking Spaces” should have no problem designing an installation to conform with the NEC requirements.

Comment on Affirmative:

LOTTMANN, T.: NEMA is concerned that the 30A 120/208 Volt configuration may be limited to a proprietary configuration of one manufacturer.

ARTICLE 630 — ELECTRIC WELDERS

12-82 Log #2170 NEC-P12 **Final Action: Reject**
(630.11(B))

Submitter: Dann Strube, Strube Consulting
Recommendation: Revise text to read as follows:
"Minimum conductor ampacity shall be permitted to be based...".
Substantiation: The current language requires the use of the demand factors for groups of welders. This restrictive language will now allow the use of larger feeders to provide for future added loads. This requirement is far too restrictive.
Panel Meeting Action: Reject
Panel Statement: The requirement in Section 630.11(B) is for the minimum conductor ampacity. The current language does not require the use of demand factors, it describes the method to be used in order to determine the minimum conductor ampacity. Nothing in this section prohibits the use of larger feeders to provide for future loads; please refer to Section 90.1(B).
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 640 — AUDIO SIGNAL PROCESSING, AMPLIFICATION, AND REPRODUCTION EQUPMENT

12-83 Log #2360 NEC-P12 **Final Action: Accept in Principle**
(640.2)

Submitter: John H. Schmidt, ABC Television Network
Recommendation: In the definition for Abandoned Audio Distribution Cable, after the words "and not identified for future use with a tag" add the new text "or in a database."
Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 12-94.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
QUAVE, D.: Abandoned cables are widely considered to be products of combustion and should be removed. Any one can install a tag on a cable without ever intending to use it. The term, "or in a database", would be impossible to enforce. Who is responsible for the database and how and where is it to be kept?

12-84 Log #3030 NEC-P12 **Final Action: Accept**
(640.2)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: 640.2 Definitions.
Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.
Keep this definition unchanged for consistency.
Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:
640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.
725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.
The additional wording in this definition causes confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
QUAVE, D.: Abandoned cables are widely considered to be products of combustion and should be removed. Anyone can install a tag on a cable without ever intending to use it.

12-85 Log #2685 NEC-P12 **Final Action: Accept in Principle**
(640.2. Abandoned Audio Distribution Equipment Cable)

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Revise 640.2 Abandoned Audio Distribution Cable to read:
Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag which is of a material impervious to the deleterious effects of temperature and dampness. The tag shall be resistant to the effects of gnawing by rodents. The tag shall contain the following information:
(1) Date tag was installed.
(2) Date of intended use of disconnected cable.
(3) Drawing or file number containing information relating to intended future use of disconnected cable.
The date of intended use of disconnected cable shall not exceed 90 days from date of disconnection.
Substantiation: Abandoned cables are a growing problem in the industry. These cables are left for others to deal with when present users discontinue their operation. Understanding this problem, the removal of abandoned cables, is required by Articles 640, 645, 725, 760, 770, 800, 820 and 830. 640.3(A) requires the removal of abandoned audio distribution cables. Tagging of cables intended for future use without a method of ensuring the intention of future use invites tagging of cables to avoid the responsibility of their proper removal.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 12-94.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
QUAVE, D.: See Explanation of Negative for Proposal 12-84.
WHITE, K.: My vote is negative because of the following restrictions:
● providing a tag that is gnawing rodents resistant
● A cable that is identified for future use is usually not defined when the use will occur and how it will be used.
Comment on Affirmative:
JOHNSON, R.: See my Explanation of Negative Vote on Proposal 12-94.

12-86 Log #2246 NEC-P12 **Final Action: Reject**
(640.3)

Submitter: Keith Campbell, K.B. Campbell & Associates, Inc. DE Camb, Inc. B.E.S.I.
Recommendation: Regarding: Article 640, Section 3, subsection 3 - that: Chapter 5 relating to 600 volt machines, on direct current (DC) mains, linked to school AC systems – freon gases – off: 600 volts machine control centers: On AC.
Substantiation: That, systems linked to neurological equipment/appliances, as per: Article 640, Section 3, subsection (j) of the NEC-2005.
For the National Fire Protection Assoc. (NFPA), that factors ruled by the: U.S. NEC but not in compliance with: subterranean electrical grids, roadways and sidewalks.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The proposed changes fail to comply with Section 4-3.3 of NFPA Regulations Governing Committee Projects. A clear recommendation fails to exist.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-87 Log #3002 NEC-P12 **Final Action: Accept in Principle**
(640.3)

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
640.3 Locations and Other Articles.
Circuits and equipment shall comply with 640.3(A) through 640.3(L), as applicable.
(A) Spread of Fire or Products of Combustion. ~~The accessible portion of abandoned~~ Abandoned audio distribution cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components. See 300.21.
Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in "inaccessible spaces". This is not conducive to safe electrical practice; this the key change is the elimination of the words "the accessible portion of".
If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is

obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.

Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.

For information, see the relevant definitions in the NEC.

Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.

Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.

Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 12-94.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-88 Log #3105 NEC-P12 **Final Action: Reject**

(640.3)

Submitter: Donald Hall, Corning Cable Systems

Recommendation: Revise text to read as follows:

640.3 Locations and Other Articles.

Circuits and equipment shall comply with 640.3(A) through 640.3(L) as applicable.

(A) Spread of Fire or Products of Combustion. 300.21 shall apply. ~~The accessible portion of a~~ Abandoned audio distribution cables shall be removed.

Also, add the following FPN to 640.3(A):

<u>FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.</u>

Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.

The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 12-94.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-89 Log #2804 NEC-P12 **Final Action: Accept**

(640.3(A))

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Revise text to read as follows:

640.3 Locations and Other Articles. No change

(A) Spread of Fire or Products of Combustion. ~~The accessible portion of abandoned audio distribution cables shall be removed. See~~ 300.21 <u>shall apply.</u>

Substantiation: The requirements for removal of abandoned audio distribution cable would be better suited in appropriate code section within Article 640. I have submitted another proposal that would move the abandoned audio distribution cable requirements to 640.5 - Mechanical Execution of Work. The abandoned audio distribution cable requirements are out of place in 640.3 - Other Articles. The requirements are not part of another Article as they are part of Article 640 and are located within Article 640.

The addition of the words “shall apply” would incorporate language that is consistent with 800.3, 820.3 and 830.3.

Similar proposals have been submitted for 725.3, 760.3, 770.3, 800.3, 820.3, and 830.3 to revise these sections as well.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-90 Log #1068 NEC-P12 **Final Action: Reject**

(640.4)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete present text and substitute: Amplifiers, loudspeakers, and other equipment shall be protected where subject to physical damage and shall be identified as suitable for the environment in which they are installed.

Substantiation: Environmental exposure is not identified. Re: exposure type; unless hermetically sealed all equipment is exposed to the environment. Environmental exposure or physical damage that might result in shock, fire, or personal hazard is subjective and cannot be specifically determined.

Panel Meeting Action: Reject

Panel Statement: The current requirement does not require protection from “environmental exposure.” It requires protection against “environmental exposure such as might result in fire, shock, or personal hazard”.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-91 Log #887 NEC-P12 **Final Action: Accept in Principle**

(640.6)

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Revise 640.6 as follows:

“...Cables installed exposed ~~on the surface of ceilings and sidewalks~~ shall be supported in such a manner...The installation shall conform to 300. ~~4~~ (D) and 300.11.” (other portions to remain unchanged.)

Substantiation: Current cable support rules apply only to cables exposed to view (on surfaces). Cables above ceilings are “exposed” as defined, but such cables are only required to be “neat and workmanlike.” All of 300.4 should apply. There is no reason to require physical protection only for cables run parallel to framing.

Panel Meeting Action: Accept in Principle

The panel accepts the deletion of “(D)” from “300. 4” and adds “(A)” after “300.11”

Panel Statement: The panel agrees with the intent and editorially corrected the reference to 300.4. The panel added the condition (A) to “300.11”

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-92 Log #1362 NEC-P12 **Final Action: Accept**

(640.6)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Add “Cable Ties” to the list of approved supporting methods

640.6 Mechanical Execution of Work.

Equipment and cables shall be installed in a neat workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported in such a manner that the cables will not be damaged by normal building use. Such cables shall be supported by straps, staples, <u>cable ties,</u> hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall conform to 300.4(D) and 300.11.

Substantiation: This is being proposed in an effort to create uniform language with the chapter three cable wiring method support sections, specifically, 230.30(A), 330.30(A) and 334.30. Similar proposals are also being made to 725.8, 760.8, 770.24, 800.24, 820.24 and 830.24

Panel Meeting Action: Accept

Panel Statement: This change is in addition to the changes made in Proposal 12-94.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

LOTTMANN, T.: NEMA is in agreement with the panel action and offers the following additional comments. UL1565 provides requirements for listed cable ties intended for primary support of flexible conduits and cables in accordance with the NEC. Such cable ties must have a minimum loop tensile strength rating of 23 kg (50 lbs) or greater. Accept the proposed addition in the third sentence, but add the following new fourth sentence. <u>Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs).</u>

NEMA also recommends that the Technical Correlating Committee submit a comment to Code Panel 7 suggesting that the following be considered during the ROC stage.

320.30(A) Add new second sentence as follows:

<u>Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.)</u>

330.30(A) Add new second sentence as follows:

<u>Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.)</u>

334.30(A) Add new third sentence as follows:

<u>Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.)</u>

12-93 Log #1859 NEC-P12 **Final Action: Accept in Principle**

(640.6)

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: In the final sentence, delete the reference to 300.11 as follows:

“The installation shall also conform with 300.4(D) ~~and 300.11~~ .”

Substantiation: The requirement added by Panel 12 during the 2005 revision cycle is overly restrictive and inappropriate for audio conductors. The Fine Print Note associated with 640.6 presently directs the reader to the appropriate installation practices for such wiring and cabling. Section 300.11 is directed toward power cable assemblies that are heavier, larger and operate at greater voltage and current levels than audio cables. Deletion of the reference to 300.11 will yield consistency throughout the NEC as Panel 3 did not see fit to adopt this reference in Articles 760 and 725.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 12-94.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-94 Log #3049 NEC-P12 **Final Action: Accept in Principle in Part (640.6)**

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

The Technical Correlating Committee will have a Task Group appointed to review the issues raised in this proposal.

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Revise 640.6 as follows:

640.6 Mechanical Execution of Work

(A) Neat and Workmanlike Manner. Audio signal processing, amplification, and reproduction equipment, cables and circuits shall be installed in a neat and workmanlike manner.

(B) Installation of Audio Distribution Cables . Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the audio distribution cables will not be damaged by normal building use. Such cables shall be secured by listed straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D) and 300.11.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling,* and other ANSI-approved installation standards.

(C) Abandoned Audio Distribution Cables. Abandoned audio distribution cables shall be removed.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved standards which provide cable installation that facilitates the removal of abandoned cables.

Substantiation: This proposal revises this section into a practical working tool which will assist in making 640.6 a clear, usable and enforceable code. Each first level subdivision contains a code rule that requires action and the required action has been presented in clear, usable and enforceable manner.

In the electrical industry, the electrician, contractor and AHJ have been taught the importance and significance of the concept of mechanical execution of work. I am an electrical instructor who teaches this important concept to the people involved. This in one of the basis for 90.1(A) which serves as the purpose of this Code. The Code's purpose is to provide a safe installation from hazards arising from the use of electricity.

The revised text in 640.6(A) will require all audio signal processing, amplification, and reproduction equipment, cables and circuits to be installed in a neat and workmanlike manner.

640.6(B) is an editorial change with additional language to require the means of securing and supporting to be listed for the purpose.

The addition of 640.6(C) would replace the requirement that was in 640.3(A). It makes sense to have the requirements of both the installation of cable and the removal of cable in the same Code section. This would provide the proper guidance to everyone involved. The installer, contractor and the AHJ would gain from this revised section as the rules are centrally located in one Code section. If audio distribution cable is installed properly then the removal of audio distribution cable should be no problem if it is not needed anymore or abandoned. The proposed FPN will provide useful guidance and information to everyone involved regarding correct installation practices which would facilitate the removal of the cable as well.

Similar proposals have been submitted for 725.8, 760.8, 770.24, 800.24, 820.24, and 830.24.

Panel Meeting Action: Accept in Principle in Part

Revise 640.6 to read as follows:

640.6 Mechanical Execution of Work

(A)Neat and Workmanlike Manner. Audio signal processing, amplification, and reproduction equipment, cables, and circuits shall be installed in a neat and workmanlike manner.

(B)Installation of Audio Distribution Cables. Cables installed exposed on the surface of ceilings and sidewalls shall be supported in such a manner that the audio distribution cables will not be damaged by normal building use. Such cables shall be secured by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4 and 300.11(A).

(C) Abandoned Audio Distribution Cables. Abandoned audio distribution cables shall be removed.

(D) Installed Audio Distribution Cable Identified for Future Use.

(1) Cables identified for future use shall be marked with a tag in accordance with the following:

(a) Tag is impervious to the effects of temperature and dampness

(b) Tag is resistant to the effects of gnawing by rodents

(2) Cables shall have the following information on the tag or in a database:

(a) Date cable was identified for future use

(b) Date of intended use

(c) Information relating to the intended future use of cable

Panel Statement: This action combines several proposals addressing similar issues about abandoned audio distribution cables.

The pharse "by the building structure" was deleted because the present wording of Section 640.6 does not include these words. During the 2005 NEC revision cycle CMP, 12 deleted this requirement because some AHJs were interpreting this to mean that only the structural building components could be used to support cables, thus eliminating support to materials such as sheetrock.

The reference to Section 300.11 was modified to reflect that subsection (A) and all of 300.4 would apply.

The fine print notes were deleted because numerous standards and installation manuals exist and to only mention one does not adequately inform the public about accepted industry practices. The NEC is not intended to be an instruction manual for untrained persons.

Part (D) was inserted in this section so that all the requirements for "Installed Audio Distribution Cables Identified for Future Use" could be contained in one place.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 9 Negative: 3

Explanation of Negative:

JANIKOWSKI, R.: Tagging of abandoned Audio Distribution cable. What is "resistant to gnawing by rodents"? How do I enforce?

Information on abandoned cables kept in a database. Inspector has no idea which abandoned cables are in the database. Inspector has no access to database and an electronic database can be easily modified.

JOHNSON, R.: Delete the proposed 640.6(D)(1)(6).

~~(b) Tag is resistant to the effects of gnawing by rodents~~ .

The need for this requirement has not been justified. Resistance criteria have not been established. With this change I would support the panel action. I request the correlating committee address the consistency of abandoned cable requirements with other code sections and recent panel actions.

WHITE, K.: My vote is negative because of the following restrictions:

• providing a tag that is gnawing rodents resistant

• A cable that is identified for future use is usually not defined when the use will occur and how it will be used.

Comment on Affirmative:

QUAVE, D.: The panel action to accept in principle in part is proper, however, the panel should have accepted the submitter's proposal that the securing of these cables should be listed straps, staples, hangers, or similar fittings...If these supports are not required to be listed, string fishing line, duct tape and other items would all be acceptable if the present wording is used. Part D should be eliminated. Abandoned cables are widely considered to be products of combustion and should be removed. Anyone can install a tag on a cable without ever intending to use it. The term, "or in a database", would be impossible to enforce. Who is responsible for the database and how and where is it to be kept?

12-95 Log #2885 NEC-P12 **Final Action: Accept in Principle (640.6, FPN)**

Submitter: Ron Alley, ELECTRICO

Recommendation: Delete the following FPN:

~~FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI approved installation standards.~~

Substantiation: Numerous consensus standards from organizations such as Electronics Industry Association (EIA), Telecommunication Industry Association (TIA), Underwriters Laboratories Inc. (UL), NEMA and IEEE and IEC/ISO could be added as a Fine Print Note throughout the Code to assist the reader of the NEC as the existing FPN notes do. There are just as many publications such as Telecommunications Cabling Installation, Network Cabling, Telecommunications Cable Splicing, Communications Cabling, Telecommunications Internetworking and too many others to mention, that could be listed in a FPN that would benefit the reader. Also, there are safety regulations, pertaining to telecommunication systems such as OSHA 1910 and OSHA 1926 that could be added as a Fine Print Note to assist readers to make their companies and workers safer. Adding a Fine Print Note for the purpose of informing the reader of all related standard and publications would be cumbersome. The NEC should list all prominent standards and publications in a FPN or it should list none.

The particular standard mentioned in the FPN, (ANSI/NECA/BICSI 568-2001 (Installing Commercial Building Telecommunications Cabling) contains only 46 pages. The Standard mentioned in the FPN is very basic. It lists only a small percentage of the terminations used in the industry. Also, only a limited number of communications cables are shown and their limitations are not discussed.

The standard does not contain enough information to be used as a stand alone document without the use of other standards and text books that are not mentioned in the FPN. In my opinion the ANSI standard listed in the FPN should never be used instead of manufacturer's instructions.

Manufacturer's instructions are sometimes required to be included as a condition of listing or labeling of telecommunications equipment and are sent with the listed or labeled products or can be requested from the manufacturer prior to installation. Manufacturers instructions are updated as needed to keep up with product improvements. The FPN in the 2005 Code most likely will not be as up to date as the manufacturer's instructions.

If the committee decides to keep the FPN, please consider modifying the FPN as follows:

ANSI/NECA/BICSI 568-2001 Standard for Installing Commercial Building Telecommunications Cabling is one source of many that can be used along with manufacturer's instructions.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 12-94.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-96 Log #1760 NEC-P12 **Final Action: Accept in Principle**
(640.6 Exception)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Accept in Principle" to correlate with the Panel Actions on Proposals 12-94 and 12-91.
Submitter: Percy E. Pool, Verizon NS
Recommendation: Add the following exception to 640.6:
"Exception: 300.1(C) shall not apply."
Substantiation: 300.11(C) is clearly not applicable to audio cabling. Audio cables are typically lashed together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. Audio cables are physically smaller, lighter and carry less voltage and current than power cables. It is overly restrictive to prohibit lashing of audio cables together to form a cable assembly. Audio cables secured in this manner have adequate support (see 300.11(A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposals 12-94 and 12-91.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-97 Log #1062 NEC-P12 **Final Action: Reject**
(640.7(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "in accordance with the requirements of Article 250".
Substantiation: Edit. To comply with the Style Manual. Article 250 already applies per 90.3.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-15.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-98 Log #921 NEC-P12 **Final Action: Reject**
(640.7(A) and (C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: In the first sentence of (A) delete "In accordance with the requirements of Article 250".
In (C) delete " in compliance with Article 250."
Substantiation: The Style Manual indicates references should not be made to entire Articles. 90.3 indicates Articled 250 applies unless amended.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-15.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-99 Log #1033 NEC-P12 **Final Action: Reject**
(640.8)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Insulated conductors of different systems grouped or bundled ~~so as to be in close~~ with physical contact between different systems conductors, or in the same raceway, cable tray, auxiliary gutter , or enclosure, ~~or in portable cords or cables~~ shall comply with 300.3(C)(1).
Substantiation: Edit. A physical contact by definition has to be "close". Cable tray is not a raceway and auxiliary gutters may not be deemed a raceway (see definition of raceway). Portable cables (inferred to be flexible cords) of 640.21 for power supply conductors are not permitted by 640.9(A) and (B).
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any definitive technical substantiation that a problem exists with the present wording. The panel disagrees with the submitter's substantiation that the change is editorial in nature.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-100 Log #1034 NEC-P12 **Final Action: Reject**
(640.9(A)(2)and (3) and (B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: In (A) change "Article 647" to "647.3".
Revise (3):
OTHER WIRING . All wiring not ~~connected to~~ parts of the premises power wiring system ~~or to a wiring system separately derived from the premises wiring system~~ shall comply with Part I, II, and III of Article 725, as applicable .
In (B) insert "Parts I, II, and III" ahead of "Article 725".
Delete the last sentence.
Substantiation: Edit. References should not be made to entire articles. In (3), unless wiring is supplied from a stand alone power system it will be connected to the premises wiring system whether directly connected or through transformers, rectifiers, etc. (see definition of premises wiring system in Article 100). The last sentence of (B) is covered by 90.3.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any definitive technical substantiation that a problem exists with the present wording. The panel disagrees with the submitter's substantiation that the change is editorial in nature.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-101 Log #31 NEC-P12 **Final Action: Accept in Principle**
(640.11 (New) & 640.3(A))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
640.11. Abandoned Cables. The accessible portion of abandoned audio distribution cables shall be removed.
640.3(A) Spread of Fire or Products of Combustion. T ~~he accessible portion of abandoned audio distribution cables shall be removed~~ . See 300.21.
Substantiation: The title of Section 640.3 is "Locations and Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 640. It is out of place in section 640.3. This proposal will move it to a new section of Article 640.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 12-94.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-102 Log #2647 NEC-P12 **Final Action: Reject**
(640.30)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Move to a new section:
640.30 Abandoned Cables. The accessible portion of abandoned audio distribution cables shall be removed.
Remove wording in 640.3(A) "The accessible portion of abandoned audio distribution cables shall be removed."
Substantiation: The title of Section 640.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 640. It is out of place in section 640.3. This proposal will move it to a new section of Article 640.
Panel Meeting Action: Reject
Panel Statement: The moving of this portion of 640.3(A) to 640.30 would then only require that cabling for permanent audio systems be removed and allowing portable and temporary installations to remain. It is widely accepted that abandoned cables are combustible materials and should be treated as such, removed, whether deemed permanent or portable. See panel action and statement on Proposal 12-94.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 645 — INFORMATION TECHNOLOGY EQUIPMENT

12-103 Log #2330 NEC-P12 **Final Action: Reject**
(645(D)(5)(d) (New))

Submitter: Ronald Marts, Telcordia Technologies / Rep. Bellsouth, Cincinnati Bell, SBC, Ameritech, PacBell, Qwest, Southern New England Telephone
Recommendation: Add a new 645(D)(5)(d) as follows:
(d) Power supply cord of listed information technology equipment plugged into receptacles under the raised floor when only the portion of the cord required to make the connection occupies the plenum free air space.
Substantiation: The current wording of 645.5(D) is reasonable for long runs of power supply circuits, interconnecting cables and communications cables. It is not appropriate for extremely short connections of cord sets extending only a few inches below the floor in order to plug a single item of information technology (IT) equipment into a receptacle. Although the safety issue seems to be intuitive, I can find no substantiation that such short lengths of cords constitute a safety hazard. A review of NFPA fire reports on data center fires, which are infrequent, does not suggest that cord sets have contributed to the spread of either fire or products of combustion.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-114.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:
JOHNSON, R.: The panel has refused to prohibit and also refused to allow flexible power cords under raised floors. Submitters have requested resolution of this ambiguous issue for many code cycles. The panel should vote to accept this commonly used practice which has been shown to be safe in practice.
SATO, C.: See Reason for Negative vote on panel action on Proposal 12-114.
Comment on Affirmative:
CROUSHORE, T.: The National Electrical Code does not prohibit power supply cords from listed information technology equipment from being plugged into the receptacles beneath the raised floor.
JONES, R.: This issue of power supply cords of listed information technology equipment has been going on for several years. The IT industry has done a very poor job in addressing the problem of power supply cords being allowed under raised floors. A presentation was made at the ROP meeting and additional information was given to panel members. The ROP meeting is not the proper place to be presenting new information. The IT industry should have requested a Task Group be formed with members of CMP 12, members of NFPA 75, and individuals within the IT industry.

12-104 Log #2648 NEC-P12 **Final Action: Reject**
(645.2)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Add new text to read:
645.2 Definitions
Abandoned Audio Distribution Cable. The definition in 640.2 shall apply.
Abandoned Class 2, Class 3, and PLTC Cable. The definition in 725.2 shall apply.
Abandoned Fire Alarm Cable. The definition in 760.2 shall apply.
Abandoned Optical Fiber Cable. The definition in 770.2 shall apply.
Abandoned Communications Cable. The definition in 800.2 shall apply.
Abandoned Coaxial Cable. The definition in 820.2 shall apply.
Abandoned Network-Powered Broadband Communications Cable. The definition in 830.2 shall apply.
Abandoned Type DP Cable. Installed Type DP cable that is not terminated at equipment and not identified for future use with a tag.
Substantiation: Article 645 has a requirement for removal of abandoned cables without a definition of abandoned cables. Sections 640.2, 725.2, 760.2, 770.2, 800.2, 820.2 and 830.2 already have definitions for the types of cables used within their articles. Accordingly, this proposal references the existing abandoned cable definitions and proposes a new definition for “abandoned Type DP cable”. Referencing the existing definitions in other articles of the code will bring about correlation.
Panel Meeting Action: Reject
Panel Statement: With the exception of Type DP cable, these cable types are not referenced in Article 645.
See panel action and statement on Proposal 12-116.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-105 Log #3028 NEC-P12 **Final Action: Accept in Principle**
(645.2)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Add text to read as follows:
645.2 Definitions.
Abandoned Cable. Installed cable that is not terminated at equipment and not identified for future use with a tag.
Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:
640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.
725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.
The additional wording in the definitions in articles 760, 770, 800, 820 and 830 cause confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 (the present one) and into article 100.
Panel Meeting Action: Accept in Principle
.**Panel Statement:** See panel action and statement on Proposals 12-106 and 12-116.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
QUAVE, D.: See my Explanation of Negative on Proposal 12-84.

12-106 Log #2687 NEC-P12 **Final Action: Accept in Principle in Part**
(645.2. Abandoned Supply Circuits and Interconnecting Cables)

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Add new 645.2 Definitions. Abandoned Supply Circuits and Interconnecting Cables to read:
Installed supply circuits and interconnecting cables that are not terminated at equipment and not identified for future use with a tag which is of a material impervious to the deleterious effects of temperature and dampness. The tag shall be resistant to the effects of gnawing by rodents. The tag shall contain the following information:
(1) Date tag was installed.
(2) Date of intended use of disconnected cable.
(3) Drawing or file number containing information relating to the intended future use of disconnected cable.
The date of intended use of disconnected cable shall not exceed 90 days from date of disconnection.
Substantiation: Abandoned cables are a growing problem in the industry. These cables are left for others to deal with when present users discontinue their operation. Understanding this problem, the removal of abandoned cables, is required by Articles 640, 645, 725, 760, 770, 800, 820, and 830. 645.5(D)(6) requires the removal of abandoned cables but Article 645 does not define abandoned cables. Tagging of cables intended for future use without a method of ensuring the intention of future use invites tagging of cables to avoid the responsibility of their proper removal.
Panel Meeting Action: Accept in Principle in Part
The panel accepts the definition revised to read:
Abandoned Supply Circuits and Interconnecting Cables. Installed supply circuits and interconnecting cables that are not terminated at equipment and not identified for future use with a tag.
The panel rejects the remainder of the proposal.
Panel Statement: The new definition is added to define abandoned cables. See the panel action and statement on Proposal 12-116.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 9 Negative: 3
Explanation of Negative:
JOHNSON, R.: Delete as shown: “ ~~The tag shall be resistant to the effects of gnawing by rodents~~ .” The need for this requirement has not been justified. Resistance criteria has not been established. With this change I would support the panel action.
QUAVE, D.: See my Explanation of Negative on Proposal 12-84.
WHITE, K.: My vote is negative because of the following restrictions:
- providing a tag that is gnawing rodents resistant
- A cable that is identified for future use is usually not defined when the use will occur and how it will be used.

12-107 Log #2378 NEC-P12 **Final Action: Reject**
(645.4, FPN)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Revise as follows:

~~FPN: For further information on room construction requirements, see~~ NFPA 75 ~~-2003,~~ ~~*Standard for the Protection of Information Technology Equipment* , Chapter 5.~~

FPN: Use of Article 645 is based on the assumption that construction, furnishings, and operation of the information technology equipment (ITE) room complies with NFPA 75, *Standard for the Protection of Information Technology Equipment.* For those ITE rooms constructed, furnished, and operated in accordance with NFPA 75, Article 645 contains electrical installation requirements that are less stringent than the requirements in the first four chapters of the *Code* and Articles 725, 760, 770, 800 and 820 . Application of these provisions is contingent on the ITE room construction and equipment meeting all five provisions specified in 645.4, as well as meeting furnishing and operation requirements of NFPA 75. For example, the provisions for wiring installations in the space beneath the raised floor of an ITE room where that space is also used for environmental air are less stringent than those in Chapters I through 4 and Articles 725, 760, 770, 800 and 820 for that same type of space. The less restrictive provisions in Article 645 cannot be taken advantage of if any one of the conditions specified in 645.4 is absent.

Substantiation: The scope of article 645 is not understood by many users. Some users want the less stringent requirements of this article without meeting **all** the special requirements of 645.4. While the existing fine print note is useful, the explanatory material in the NEC Handbook provides additional useful information and is unequivocal in explaining that dispensations of this article are not available unless all the requirements of 645.4 are met. The Handbook also clearly states the underlying assumption in Article 645- that the room is constructed to comply with NFPA 75 whereas the existing fine print note only states "For further information on room construction requirements, see NFPA 75 -2003.. " NFPA 75 also contains requirements for the furnishing and operations within the ITE room that are necessary in order for the requirements of Article 645 to apply.

The proposed text is based on the NEC Handbook but is not an exact excerpt.

Panel Meeting Action: Reject

Panel Statement: The revised FPN does not add clarity. The first sentence of 645.5 states "This article shall apply, provided all of the following conditions are met." The five conditions are listed. The existing FPN is very clear as written. Also NFPA 75 defines ITE room construction, requirements, and furnishings and operations within the ITE room. The submitter has not presented any definitive technical substantiation supporting a problem with the current text of the FPN.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-108 Log #1706 NEC-P12 **Final Action: Accept**
(645.4(6))

TCC Action: The Technical Correlating Committee understands that this new Section follows the existing FPN to 645.4(5). The Technical Correlating Committee directs that the panel add a title to the new section. This action will be considered by the Panel as a Public Comment.

Submitter: Charles M. Trout, Maron Electric Company
Recommendation: Add a new 645.4(6) to read:

Except for lighting and its controls no electrical distribution equipment or wiring, other than that which supplies the information technology equipment and its associated equipment and a dedicated heating/ventilating/air-conditioning (HVAC), shall be installed in the information technology room.

Exception: Communications systems such as telephone, shall be permitted to be installed.

Substantiation: Relaxation of the rules relating to plenum wiring as shown in 300.22 were made based on the limited wiring methods shown in 645.5. The disconnecting means required by 645.10 is based on an emergency condition where all electrical wiring within the ITE room would be easily and conveniently deenergized.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

JOHNSON, R.: The panel should reject this proposal. This prohibits the use of security, fire alarm and similar wiring. It introduces new restrictions not involved with the under floor wiring which are considered acceptable in normal areas. This can make the computer room an impenetrable barrier to any conduit going from one part of the building to another.

12-109 Log #3109 NEC-P12 **Final Action: Reject**
(645.5(C)(6))

Submitter: Donald Hall, Corning Cable Systems
Recommendation: Add the following FPN after 645.5(D)(6):

FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.

Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.

The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.

Panel Meeting Action: Reject

Panel Statement: Numerous standards and installation manuals exist and to only mention one does not adequately inform the public about accepted industry practices. The NEC is not intended to be an instruction manual for untrained persons. The standard referenced does not contain information about the removal of cables as they become abandoned.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-110 Log #2301 NEC-P12 **Final Action: Reject**
(645.5(D) and 645.5(E) New)

Submitter: Gary Stanitis, Daikin America, Inc.
Recommendation: Revise text to read as follows:

Modify 645.5(D), insert new 645.5(E) and renumber existing 645.5(E) to 645.5(F).

645.5(D) Under Raised Floors with Sprinklers or Fire Suppression: Power cables, communications cables, connecting cables, interconnecting cables, and receptacles associated with the information technology equipment shall be permitted under a raised floor that has automatic sprinklers or other fire suppression under the floor, provided the following conditions are met:

[Remainder of 645.5(D) is unchanged]

645.5(E) Under Raised Floors without Sprinklers or Fire Suppression: Power cables, communications cables, connecting cables, interconnecting cables, and receptacles associated with the information technology equipment shall be permitted under a raised floor, provided the following conditions are met:

(1) The raised floor is of suitable construction, and the area under the floor is accessible.

(2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, electrical nonmetallic tubing, metal raceway, nonmetallic raceway, surface metal raceway with metal cover, nonmetallic surface raceway, flexible metal conduit liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit, Type MI cable, Type MC cable, or Type AC cable. These supply conductors shall be installed in accordance with the requirements of 300.11.

(3) Ventilation in the underfloor area is used for the information technology equipment room only, except as provided in 645.4(2). The ventilation system shall be so arranged, with approved smoke detection devices, that upon detection of fire or products of combustion in the underfloor space the circulation of air will cease.

(4) Openings in raised floors for cables protect cables against abrasions and minimize the entrance of debris beneath the floor.

(5) Cables, other than those covered in (E)(2) and those complying with (E)(5)(a), (E)(5)(b), or (E)(5)(c), shall be listed as Type DPP cable having adequate fire resistance and smoke producing characteristics suitable for use under raised floors of an information technology equipment room when sprinklers or fire suppression are not installed under the raised floor.

(a) interconnecting cables enclosed in a raceway.

(b) Interconnecting cables listed with equipment manufactured prior to July 1, 1994, being installed with that equipment.

(c) Cable type designations Types CL2P, CL3P, and PLTCP (Article 725; Types NPLFP and FPLP (Article 760); Types OFCP and OFNP (Article 770; Type CMP (Article 800); and Type CATVP (Article 820). Green, or green with one or more yellow stripes, insulated single conductor cables, 4 AWG and larger, marked "for use in cable trays" of "for CT use" shall be permitted for equipment grounding.

FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical smoke density of 0.5 or less, and an average optical smoke density of 0.15, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handlling Spaces.*

Substantiation: Article 645 of the Code is constructed so that it interrelates with NFPA 75, *Standard for the Protection of Information Technology Equipment.* The close, interactive relationship between these two documents can be observed in the Scope statement of Article 645 where there is a FPN specifically referencing NFPA 75, as well as in section 1.6 of NFPA 75 that states "Chapter 10 contains test extracted from NFPA 70, *National Electrical Code* , Article 645.

When these two standards are taken together, it becomes clear that there is a huge discrepancy between how cabling materials are considered, from a fire safety perspective, compared with any other materials, either construction or other wise, within the Information Technology Equipment Room or Area (ITEA). Examples of fire resistance of materials as described by NFPA are:

1. "Structural supporting members for raised floors shall be of **noncombustible** material."

2. "Decking for raised floors shall be one of the following:"

i. **"Noncombustible"**

ii. "Pressure impregnated, fire retardant treated...having a **flame-spread rating of 25 or less** in accordance with NFPA 255...

iii. "Wood or similar core material that is encased on the top and bottom with sheet, cast or extruded metal... that has an assembly **flame-spread rating of 25 or less** in accordance with NFPA 255..."

3. "Small supervisory offices and similar light-hazard occupancies...shall be permitted... **if noncombustible containers are provided for combustible material.** "

4. "Office furniture in the information technology equipment room shall be of **metal construction** "

5. "Only approved **self-extinguishing-type trash receptacles** shall be used in the information technology equipment area.

6. "Paper stock, inks, unused recording media, and other **combustibles...shall be restricted to the absolute minimum necessary** for efficient operation. Any such materials...shall be kept in totally enclosed metal file cases or cabinets..."

7. "Reserve stocks of paper, inks unused recording media, and **other combustibles shall be stored outside** of the information technology equipment room."

8. "Enclosures of floor-standing equipment having external surfaces of combustible materials of such size that they can contribute to the spread of an external fire shall have a **flame-spread rating of 50 or less.** Equipment conforming to the requirement of UL 478...UL 1950...or UL60950...shall be considered as meeting the requirements."

9. "All sound-deadening material...does not **increase the potential of fire damage to the unit** or the **potential of fire propagation from the unit.** "

10. "All **duct insulation** and **linings** , including **vapor barriers** and **coatings** , shall have a **flame spread rating not over 25** without evidence of continued progressive combustion and **a smoke developed rating non higher than 50** ."

When compared with the concern about flame spread, smoke, and combustible loading associated with all non-cabling materials within Information Technology Equipment Areas, the flame-spread, smoke and combustibility requirements associated with cabling used in concealed spaces, such as raised floors, used for environmental air is completely inappropriate and inconsistent. This is particularly true when one considers that the quantity of cable present in a typical ITEA is very large when compared with these other materials. There is no logical reason to treat cables differently than the other materials and equipment present. And, although NFPA 75 lists sprinklers or other fire suppression as an option under raised floors, it is not mandated in all instances, so the performance of cables listed in Article 645 must address concealed spaces that have no fire protection.

Section 800.179 of the *Code* states "...communications plenum cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistance and low smoke-producing characteristics", with a FPN stating "One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.* Additionally, even if airflow is discontinued under the raised floor or in the ceiling cavity, experience has shown that combustion in horizontal hidden voids is not significantly reduced ["However research has shown that in hidden voids combustion proceeds to the same degree whether under forced or natural convection" *Fire Performance of Communications Cable in Buildings* - IEC TR 6222].

All materials of significance in ITEAs should be consistent in their fire performance requirements. It would be inappropriate to reduce the fire and smoke performance of all non-cabling materials since ITEAs are important to protect the business function, as well as life and safety in many instances. But, if **MINIMUM** fire performance cabling is allowed in Article 645 of the *Code,* then the same must be true for all materials. A better option would be to require cabling to be consistent in fire performance with other materials currently described in Article 645. Cabling should meet the requirements of Section 800.179 of the *Code* (plenum rating), or Section 300.22 of the Code (General Purpose cable installed properly in sealed conduit). If, in addition to these two appropriate cabling methodologies, the Panel wishes to list allowable cable types to be installed within ITEAs that conform to all NFPA 75 requirements, including underfloor or above ceiling sprinklers or fire suppression , then the cable type suitable for this installation methodology should be clearly defined within Section 645. Under floor and ITEA room sprinkler density requirements in NFPA 75 should be consistent with the combustible loading presented by the cable type allowed. Also, it should be clearly identified that these three (i.e. plenum rated cable, cable in conduit, or cable directly protected by sprinklers or fire suppression within ITEAs conforming to all requirements of NFPA 75) cable installation methodologies are distinct , yet suitable for ITEAs.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The provisions of this proposal cannot be enforced. There is not sufficient technical substantiation provided to include new requirements on sprinkler systems. For information, NFPA 75, Section 8.1.1.2, requires sprinklers or gaseous fire suppression in the underfloor areas of ITE (computer) rooms.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-111 Log #2218 NEC-P12 **Final Action: Reject**

(645.5(D)(2))

Submitter: Kyle Cope, Prysmian Cables and Systems

Recommendation: Revise as follows:

"... liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit, Type MI cable, Type MC cable, Type PA cable , or Type AC cable. These supply...".

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (645.5(D)(2)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Type PA cable has not been recognized by the NEC as suitable at this time. No substantiation has been provided that this product has been listed by a qualified testing laboratory. The proposed article relating to this product has not been accepted at this time. Without the requirements necessary for the use of this product being in force, the panel cannot accept its inclusion in Article 645.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-112 Log #2379 NEC-P12 **Final Action: Accept**

(645.5(D)(5))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation:

Revise as follows:

c. Cable type designations shown in Table 645.5 shall be permitted. ~~Type TC (Article 336); Types CL2, CL3, and PLTC (Article 725); Type ITC (Article 727); Types NPLF and FPL (Article 760); Types OFC and OFN (Article 770); Type CM (Article 800); and Type CATV (Article 820). These designations shall be permitted to have an additional letter P or R or G.~~ Green, or green with one or more yellow stripes, insulated single conductor cables, 4 AWG and larger, marked "for use in cable trays" or "for CT use" shall be permitted for equipment grounding.

Table 645.5 Cable Types Permitted Under Raised Floors

Article	Plenum	Riser	General Purpose
336			TC
725	CL2P & CL3P	CL2R & CL3R	CL2, CL3 & PLTC
727			ITC
760	NPLFP & FPLP	NPLFR & FPLR	NPLF & FPL
770	OFNP & OFCP	OFNR & OFCR	OFN & OFC
800	CMP	CMR	CM & CMG
820	CATVP	CATVR	CATV

Substantiation: This is an editorial proposal. The current wording "These designations shall be permitted to have an additional letter P or R or G." requires the user to have an in-depth knowledge of the cable types in the code. It might even lead the user to search for nonexistent cables types such as TCP, TCR, TCG, ITCP, ITCR, ITCG, NPLFG, FPLG, OFNG, OFCG or CATVG. It's easier for the user to have a table to look up the permitted cable types. Acceptance of this proposal will bring about compliance with the NEC Style Manual.

Section 3.3.1 (2) of the 2003 NEC Style Manual states:

"2. Use simple declarative sentence structure, and keep sentences short. Writing rules in long sentences full of commas, dependent clauses, and parenthetical expressions often creates confusion and misunderstanding. The requirement can be written in two or more short sentences, expressed using a list or table, or both."

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-113 Log #1418 NEC-P12 **Final Action: Accept**
(645.5(D)(5)(c), FPN)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:

FPN: One method of defining "fire resistance" is by establishing that the cables do not spread fire to the top of the tray in the " UL Flame Exposure , Vertical Tray Flame Test" ~~referenced~~ in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords~~ . UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.

Another method of defining fire resistance is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables.

Substantiation: The revised wording is an update of the standard references and not a change in the test method. UL 1581 references UL 1685 for the text of the test method.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-114 Log #2339 NEC-P12 **Final Action: Reject**
(645.5(D)(5)(d) (New))

Submitter: Stephen McCluer, American Power Conversion Corp
Recommendation: Add a new 645.5(D)(5)(d) as follows:

(d) Power supply cord of listed Information Technology Equipment plugged into receptacles under the raised floor when only the portion of the cord required to make the vertical connection occupies the plenum free air space. Cords shall be protected from damage and shall not be permitted to lie on the subfloor.

Substantiation: The current wording of 645.5(D) is reasonable for long runs of power supply circuits, interconnecting cables and communications cables. It is inappropriate for extremely short connections of cord sets extending only a few inches below the floor in order to plug a single item of information technology (IT) equipment into a receptacle. Although the safety issue seems to be intuitive, no Code Making Panel or floor testimony that I am aware of has presented substantiation that such short lengths of cords actually constitute a safety issue. A review of NFPA fire reports on data center fires, which are infrequent, does not suggest that cord sets have substantially contributed to the spread of fire or products of combustion.

Following is rebuttal to arguments that have been put forward to justify why cord sets must be treated the same as power supply, interconnecting and communication cables that are run throughout the space under a raised floor of an Information Technology Equipment room.

1. "The length of the cord set can be up to 15 ft."

Although a 15-ft cord set is theoretically possible, the language of this proposal stipulates that only the length of cord necessary to make the connection is permitted beneath the floor. It would require excess cord length to be handled in an acceptable manner above the floor. The proposal also requires the cords to be protected from damage, such as sharp edges of a floor cut-out. IT equipments with short cord sets (e.g., only 2-5 ft in length) are readily available.

2. "There is no limitation on the number of pieces of equipment that may be installed in an IT equipment room. One hundred or even more pieces of information technology equipment requiring power supply cords could be located in one ITE room. This equates to a possible 1500 ft or more of power supply cord that may be used under a raised floor."

The underlying premise is flawed. Because raised floors are typically no more than 3 ft high in an IT equipment room, and because the language of this proposal does not permit excess cable under the floor (as described in #1 above), the theoretical amount of materials in the hypothetical example is actually not 1500 ft but only 300 ft. But that begs the issue. It assumes that all 100+ cables will be consumed in fire and will contribute to the fire and smoke. In an electrical fire, IF a piece of IT equipment overloads and the current causes the cord to heat up, AND IF the circuit protective device for that particular circuit simultaneously falls to interrupt the circuit and remove the source of energy, AND IF the under-floor smoke detectors required in 645(D)(3) fall to activate the Disconnecting Means required in 645.10, THEN the length of the cord that is under the floor might contribute some products of combustion. The other 100+ cables in the space would not contribute to the problem. The two or three feet of cord under the floor would represent a very small cord length in a very large volume of space. It would be a very low density of flammable material in the air space. The cords are discontinuous. The multiple short lengths of cords are not a risk for spreading fire from one area to another.

3. "DP cable was not intended to replace the flexible cords of Article 400. DP cable was intended to be used as a power supply cord only if it was intended to be used as a power supply cord under a raised floor in an ITE room. Power supply cables listed as having fire-resistant characteristics can be developed and surely would have been developed in accordance with the demand if the present rules were properly enforced."

No such power cord exists today, despite the existence of these rules and of IT equipment rooms for many years. The reason is that adding flame retardants to the PVC or synthetic rubber compounds used for cable jackets makes the cable prone to damage if used in an exposed area. The flame retardant outer jacket will not be able to spring back after being bent or crushed. The jacket would not resist damage from sharp objects as well as a standard flexible cord.

Basically, the requirements for a cord or cable for exposed use conflict with the requirements for cords and cables that have better flame ratings. If the cord has flame retardants to pass a vertical wire test, it will be too prone to damage to use in an exposed area. If it has the flexibility to allow its use in an exposed area, it will not have as good of a flame rating.

Manufacturers today do not create products specifically for use above or below a floor because they do not know where and how a piece of IT equipment will be used. It is unreasonable to force manufacturers to create twice as many products when there is no substantiated evidence of a problem. Separate above- and below-floor designs would significantly increase the cost of products for little or no perceived benefit. The Code should not mandate the use of technology that does not exist based on the assumption that it might exist some day.

The assertion that the present codes have not been properly enforced is disingenuous. NEC 90.4 specifically allows an AHJ to "permit alternative methods where it is assured that equivalent objectives can be achieved by establishing and maintaining effective safety." Given the excellent safety record in ITE rooms, it is safe to say that cord sets plugging into receptacles under the floor are a safe and effective method.

4. "The receptacles could be installed above the floor with the cables being protected from physical damage as is required for interconnecting cables under 645.5(C)."

This has been tried in a number of data centers. It is extremely cumbersome. It frequently results in cables and receptacle boxes obstructing aisle ways because many equipment rack designs cannot accommodate the equipment. Receptacles above the floor should be fixed in place; if not, they are susceptible to damage. Above floor receptacles are unsightly, unreliable and unsafe. There might not be space in a cabinet for the receptacle box or to allow adequate bend radius for the cord. The ITE PDU cord is often forced to bend at an angle that causes it to break and create a hazardous condition.

5. "The proposal does not enhance or maintain safety. It is a serious degradation of a requirement designed to protect persons and property from the hazards of fire."

This proposal at worst introduces an insignificant degradation in safety. The argument should be made that this proposal actually increases safety. The Code, as written today, actually forces an unreasonable and nearly impossible requirement upon equipment manufacturers and imposes a major financial burden upon users. The benefit does not justify the cost. "Work-arounds" (such as described in #4 above) sometimes introduce new hazards. In reality, there already are tens of thousands of data centers with millions of pieces of IT equipment connected via cord sets to receptacles under the raised floor. This proposal legitimizes a practice that has been industry standard procedure for at least two decades. In the absence of substantiated data that the practice is unsafe, the practice should be permitted.

Panel Meeting Action: Reject
Panel Statement: The wording "when only the portion of the cord required to make the vertical connection occupies the plenum free air space" would require the receptacle to be located directly under the floor penetration. This would require the ITE equipment being supplied to be located directly above the floor penetration to comply with the recommendation that "cords shall not be permitted to lie on the subfloor." This would make unnecessary the requirement shown in 645.5(B)(1) allowing a flexible cord and attachment plug not to exceed 15 feet. The power cords would then be required not to exceed the depth of the underfloor space. The wording in the recommendation "and shall not be permitted to lie on the subfloor" is in direct conflict with 645.5(B)(2).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

SATO, C.: The panel action on this proposal should have been "accept in principle." The following wording should have been accepted as a reasonable compromise.

"(d) Power supply cords of listed information technology equipment plugged into receptacles under the raised floor when only the portion of the cord required to make the ~~vertical~~ connection occupies the ~~plenum free air space~~ area under the raised floor . Cords shall be protected from damage and shall not ~~be permitted to~~ lie on the subfloor."

Listed power supply cords have been installed in the underfloor areas of ITE (computer) Rooms since the 1960s. It remains common practice today. The Special Requirements for ITE Rooms in Section 645.4 - including restricted occupancy, separation from other areas of occupancy by fire-rated constructions, and provision of separate HVAC systems (or common HVAC systems with additional fire/smoke dampers) – serve to limit any potential impact of using Listed power supply cords in these areas and distinguish such areas from other areas covered by Section 300.22 (C). Also, the long history and use of Listed power supply cords in the underfloor areas of ITE Rooms has not demonstrated a history of field incidents supporting the need for more onerous flammability requirements for these cords.

The proposed wording no longer implies a need for a direct vertical drop of the power supply cord from the equipment to the subfloor mounted receptacle and is not in direct conflict with Section 645.5(B)(1). Within an ITE Room environment, 15 feet is not a long distance. The power supply cord needs to be able to be routed without damage from the equipment located on top of the raised floor, though an opening in the raised floor, to a receptacle mounted on the subfloor. UL 60950-1, which is used for Listing ITE, contains the 4.5 m (15 ft) length as a "maximum" requirement, which is a length that may be necessary for above floor ITE Room applications and installation of ITE outside of ITE Rooms. For underfloor applications, the manufacturer may choose to provide a shorter length of flexible power supply cord, as necessary.

Section 645.5(B)(2) currently only addresses above floor installations and is not in conflict with the proposal.

Comment on Affirmative:

CROUSHORE, T.: The National Electrical Code does not prohibit power supply cords from listed information technology equipment from being plugged into the receptacles beneath the raised floor.

JANIKOWSKI, R.: I am in favor of allowing short lengths of power supply cords of listed equipment to make a vertical penetration in the plenum free air space for connection of IT equipment. Current codes force a lot cords and cables to lie on top of the raised floor. Current codes permit receptacle outlets to be installed under raised floors but it's very difficult to provide an approved cord set to use them. Required smoke detection under raised floors will quickly alert personnel if problems are encountered.

JONES, R.: See my comments on Proposal 12-103.

12-115 Log #2380 NEC-P12 **Final Action: Reject**
(645.5(D)(5), FPN 2 (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Renumber the existing FPN to No.1 and add a new FPN No. 2:

FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: Article 645 of the *Code* is directly correlated with NFPA 75 as identified by the FPN in the Scope Section 645.1 that states "For further information, see NFPA 75-2003, *Standard for the Protection of Information Technology Equipment* ." NFPA 75-2003, Chapter 8 covers fire protection. Section 8.1.1 requires that an ITE room in a sprinklered building have sprinkler protection. Section 8.1.2 requires that the sprinkler system be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.* NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics*** . I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where tire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of Article 645 and NFPA 75 need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or alternately avoid the buildup of combustible cables that would result in a combustible loading.

Sections 770.154(A), 800.154(A) and 820.154(A) of the 2005 NEC have fine print notes referring to NFPA 13.

Panel Meeting Action: Reject

Panel Statement: The definition for "concealed" in Article 100 in the 2005 NEC does not apply to the proposed fine print note. The area below raised floors are not considered by the NEC to be a concealed space. The definition of concealed does not exist in NFPA 13, but it alludes to the area above a drop ceiling as being concealed, which does not match the definition used in Article 100. The reference to NFPA 13 does not seem appropriate in a new 645.5(D)(5) FPN at this time.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

QUAVE, D.: We agree with the panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the Submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a Comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read: "Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc...can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1). For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined."

In the NFPA 13 Committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

12-116 Log #2649 NEC-P12 **Final Action: Accept in Principle**
(645.5(F))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

The Technical Correlating Committee will have a Task Group appointed to review the issues raised in this proposal.

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Move 645.5(D)(6) to new 645.5(F) Abandoned cables shall be removed unless contained in metal raceways.

Substantiation: The requirement should not just be for under raised floors.

Panel Meeting Action: Accept in Principle

Revise proposal as follows:

645.5(F) **Abandoned Supply Circuits and Interconnecting Cables.** Abandoned supply circuits and interconnecting cables shall be removed unless contained in a metal raceway.

Add:

645.5(G) **Installed Supply Circuits and Interconnecting Cables Identified for Future Use** .

(1) Supply circuits and interconnecting cables identified for future use shall be marked with a tag in accordance with the following:
(a) Tag is impervious to the effects of temperature and dampness
(b) Tag is resistant to the effects of gnawing by rodents
(2) Supply circuits and interconnecting cables shall have the following information on the tag or in a database:
(a) Date identified for future use
(b) Date of intended use
(c) Information relating to the intended future use

Panel Statement: This combines several proposals addressing similar issues about abandoned cables.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 8 Negative: 4
Explanation of Negative:
JANIKOWSKI, R.: Tagging of abandoned Audio Distribution cable. What is "resistant to gnawing by rodents"? How do I enforce?
Information on abandoned cables kept in a database. Inspector has no idea which abandoned cables are in the database. Inspector has no access to database and an electronic database can be easily modified.
JOHNSON, R.: Delete the proposed 645.5(G)(1)(b).
~~(b) Tag is resistant to the effects of gnawing by rodents~~ .
The need for this requirement has not been justified. Resistance criteria have not been established. With this change I would support the panel action. I request the correlating committee address the consistency of abandoned cable requirements with other code sections and recent panel actions.
QUAVE, D.: Part G should be eliminated. Abandoned cables are widely considered to be products of combustion and should be removed. Anyone can install a tag on a cable without ever intending to use it. The term, "or in a database", would be impossible to enforce. Who is responsible for the database and how and where is it to be kept?
WHITE, K.: My vote is negative because of the following restrictions:
• providing a tag that is gnawing rodents resistant
• A cable that is identified for future use is usually not defined when the use will occur and how it will be used.

12-117 Log #2381 NEC-P12 **Final Action: Accept**
(645.6, FPN)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Revise as follows:
FPN: For signaling circuits, refer to Article 725; for optical fiber cables and raceways ~~optic~~ ~~circuits~~ , refer to Article 770; and for communications circuits, refer to Article 800. For fire alarm systems, refer to Article 760.
Substantiation: The terminology used to describe optical fiber cables in this article should correlate with the terminology used in Article 770, Optical fiber Cables and Raceways. There are no circuits in Article 770, only raceways and nonelectrical cables.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-118 Log #2828 NEC-P12 **Final Action: Reject**
(645.7)

Submitter: John Kacpenski, Western Telecommunications Consutling (WTC)
Recommendation: Revise text to read as follows:
645.7 Penetrations.
Penetrations of the fire-resistant room boundary shall be in accordance with 300.21. The accessible portion of abandoned information technology cables shall not be permitted to remain.
Substantiation: This addition will harmonize the text with: 725.3(B), 760.3(A), 770.3(A), 800.3(C), 820.3(A), and 830.3(A).
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-116 because the entire abandoned cable is required to be removed not just the accessible portion.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-119 Log #554 NEC-P12 **Final Action: Reject**
(645.10)

Submitter: William Davis, Eastman Kodak Co.
Recommendation: Insert the word "electrical" in the first sentence to read:
A means shall be provided to disconnect power to all electrical and electronic equipment in the information technology equipment room.
OR
Add a fine print note to state:
Feeders or branch circuits not supplying electronic equipment such as panelboards, disconnect switches, luminaries, or other similar utilization equipment are not required to be disconnected by this means.
Substantiation: Feeders or branch circuits that enter an ITE room may terminate in a panelboard, disconnect, or other electrical equipment not considered, "electronic equipment". Some of these feeders, panelboards, disconnects, etc. could be substantial in size. These feeders and branch circuits should be disconnected as well as the electronic equipment in the room. NFPA 75 requires emergency lighting in the ITE room that would take care of lighting in the event the lighting branch circuit is disconnected. I'm unsure of the intent of CMP-12. If they have substantiated that only electronic equipment needs to be powered down, then add the fine print note to clarify other electrical equipment need not be included in the disconnecting requirement.
Panel Meeting Action: Reject
Panel Statement: There is no need to turn off lights, fire alarms, phones, and other critical systems.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-120 Log #1714 NEC-P12 **Final Action: Reject**
(645.10)

Submitter: Stephen McCluer, American Power Conversion Corp
Recommendation: 1) Revise 645.10 as noted.
2) Add new paragraph 645.10(1).
1) Revise 645.10 to add an exception and number the exceptions.
Exception No. 1: Installations qualifying under the provisions of Article 685.
Exception No. 2: Installations qualifying under the provisions of Paragraph 645.10(1).
2) Add new paragraph 645.10(1):
645.10(1) Zone disconnect means. An approved disconnect-means shall be permitted to disconnect power only to an isolated portion of the information technology room when the following conditions are met:
(1) The disconnect-means shall completely remove all power to the isolated portion of the room (which can be one equipment or a common group of equipments) with a single means of disconnect
(2) Manual or automatic disconnect-means shall be permitted
(3) Manual disconnect means shall be accessible in a manner acceptable to the authority having jurisdiction
FPN: The disconnect means may include an approved method to prevent accidental or unauthorized activation
(4) Manual disconnect means shall be clearly identified with signage so that emergency procedure operating points are identified
(5) Method of operation shall be well documented and staff shall be trained
(5) The location of all zoned disconnect-means in the IT room shall be identified in such a manner that they are easily located by emergency responders
(6) All zones with an isolated disconnect-means shall contain an approved method of preventing the spread of smoke and products of combustion beyond the perimeter of the zone
Substantiation: The existing requirement in 645.10 for a disconnect-means that de-energizes all of the equipment in an IT room is an artifact from technology that was in use more than twenty years ago. It is inappropriate for the state of technology and IT room design practices that exist today. The risks of unplanned interruption of mission-critical operations far exceed any benefits to be gained by shutting down an entire information technology center. Whereas 20 years ago IT equipment was primarily for "data," today it has a very large component of "control" and, increasingly, communications. The ramifications of a sudden, unplanned interruption have huge financial consequences and very frequently life and human safety ramifications. 645.10 suffers from the "law of unintended consequences." The history of the past quarter century shows that the room disconnect has rarely been used or needed for its intended purpose, but it has actually been the cause of countless catastrophic events. On its surface the disconnect sounds like a logical and good thing to have, but in practice it is more often a bad thing. Disrupting the operation of hundreds of IT devices when only one has a problem cannot be justified when the means exist to deal adequately with the problem.
This proposal acknowledges the need to shut down the energy to a unit or an area of electrical equipment when it is overheated or when personnel safety is jeopardized. This proposal permits de-energizing only the equipment at risk while allowing other equipment to maintain mission-critical operations. The AHJ can premit "localized" shutdown when certain safety criteria are met. Briefly stared, emergency responders must be able to easily find the appropriate disconnect-means, procedures must be well documented, personnel must be trained, and smoke or other elements of combustion must not be allowed to spread beyond the affected equipment area.
This proposal also permits the use of an automatic disconnect-means, such as automatically de-energizing a piece of affected equipment upon activation of a smoke detection system.
This proposal defaults to the use of a room disconnect when, in the opinion of the AHJ, the alternative method fails to satisfy the intent:
This proposal solves several problems, including:
a) It minimized unintended consequences of IT shutdown. Computers are so integrated into our lives today that any interruption of IT operation can have both personnel safety and business continuity implications. It is seldom easy to identify all of the safety hazards associated with IT equipment shutdown.
b) It eliminates the disconnect-means as a single failure point for the entire IT space. Emergency Power Off (EPO) activation is the single largest cause of unintended shutdown of IT equipment.
c) It reduces the risk of damage to the IT equipment caused by "hard shutdown" and restart.
d) It increases reliability and safety.
Panel Meeting Action: Reject
Panel Statement: The proposal is too complicated and would be difficult to enforce. If desired or required, a single ITE room can be divided into multiple rooms per this and other NFPA standards.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

Comment on Affirmative:

JANIKOWSKI, R.: I am in favor of some sort of exceptions for the basic rule that mandates the disconnect required in IT rooms take everything off line. Current technology has far more critical applications than the 20-year old data-only machines. History has proven that the unplanned interruption of mission-critical operations far exceed any benefits to be gained by shutting down an entire IT center. Today's IT rooms control functions that "MUST" remain on line such as "911" centers, Internet and company Intranet operations. This rule is an artifact of 20-year old technology.

JONES, R.: During the 2002 code cycle I wrote a comment on a similar proposal about the EPO. I even wrote a magazine article about the EPO button for the IAEI. No one from the IT industry has bothered to contact me about problems with this requirement in 645.10. At the ROP meeting, we listened to a very informative presentation about how nearly all EPOs that are activated are done so in error and cause business/financial losses and how no one can document an incident where the EPO was used for its intended purpose. Panel members were given approximately 25 pages of information concerning the EPO activations and resulting damage to data operations. This information was given to panel members prior to the vote on the proposal. When were we supposed to study this information and form an intelligent opinion? As I have stated before, the IT industry needs to request a Task Group to be formed with members of CMP 12, NFPA 75 members, and members of the IT industry.

12-121 Log #1063 NEC-P12 **Final Action: Reject**
(645.15)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "in accordance with the requirements of Article 250".
Substantiation: Edit. To comply with the Style Manual. Article 250 already applies per 90.3.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-15.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 647 — SENSITIVE ELECTRONIC EQUIPMENT

12-122 Log #1363 NEC-P12 **Final Action: Reject**
(647)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Change title of Article 647 to "Technical Power Systems"
Substantiation: This is the current wording in 647.7(A)(2)
(occurrences of "technical power" have been bolded for emphasis)
WARNING — **TECHNICAL POWER**
Do not connect to lighting equipment.
For electronic equipment use only.
60/120 V. 1ac
GFCI protected

(3) A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet having one of its current-carrying poles connected to a grounded circuit conductor shall be located within 1.8 m (6 ft) of all permanently installed 15- or 20-ampere-rated 60/120-volt **technical power-system** receptacles.

(4) All 125-volt receptacles used for 60/120-volt **technical power** shall have a unique configuration and be identified for use with this class of system. All 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted in machine rooms, control rooms, equipment rooms, equipment racks, and other similar locations that are restricted to use by qualified personnel.

This proposal brings the title of the article in alignment with the body of the article.
Panel Meeting Action: Reject
Panel Statement: Section 647.1 (Scope) indicates the purpose of this article is not the power aspect, but the installation and wiring of the equipment. The submitter has provided no substantiation that a problem exists with the present wording. The 647.1 scope refers to sensitive electronic equipment. Technical power refers to the voltage limitations relating to sensitive electronic applications.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-123 Log #627 NEC-P12 **Final Action: Accept**
(647.4(C))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(C) ~~Color Coding~~ Conductor Identification . All feeders and branch-circuit conductors installed under this section shall be identified as to system at all splices and terminations by color, marking, tagging, or equally effective means. The means of identification shall be posted at each branch-circuit panelboard and at the disconnecting means for the building.
Substantiation: This section includes other means of identification for conductors in addition to just color coding. The more appropriate title of the subsection is Conductor Identification. No technical changes are proposed to this section.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-124 Log #626 NEC-P12 **Final Action: Accept**
(647.5)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
647.5 Three-Phase Systems. Where 3-phase power is supplied, a separately derived 6-phase "wye" system with 60 volts to ground installed under this article shall be configured as three separately derived 120-volt single-phase systems having a combined total of no more than six ~~main~~ disconnects.
Substantiation: The use of the word "main" in this section is an indication that the disconnects referred to in this section are always "service disconnects". 647.1 indicates that these systems are separately derived systems. These disconnects are for protection of the system conductors and equipment and not the service.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-125 Log #624 NEC-P12 **Final Action: Accept**
(647.7(2))

TCC Action: The Technical Correlating Committee understands that only the word "receptacle" is being added and the remainder of the Section is unchanged.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(2) All receptacle outlet strips, adapters, receptacle covers, and faceplates shall be marked with the following words or equivalent:
WARNING - TECHNICAL POWER
Do not connect to lighting equipment
For electronic equipment use only
60/120 V. 1ac
GFCI protected
Substantiation: Outlet is defined in Article 100 as "A point on the wiring system at which current is taken to supply utilization equipment." The use of the word "outlet" is more broad than what appears to be covered by the requirements in this section. Receptacle outlet strips or receptacle strips appears to be more appropriate based on the definition of outlet.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-126 Log #625 NEC-P12 **Final Action: Accept**
(647.7(3))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(3) A 125-volt, single-phase, 15- or 20-ampere-rated receptacle ~~outlet~~ having one of its current-carrying poles connected to a grounded circuit conductor shall be located within 1.8 m (6 ft) of all permanently installed 15- or 20-ampere-rated 60/120-volt technical power-system receptacles.
Substantiation: This section appears to be referring to connections to the receptacle and not the outlet the receptacle is installed in. This change is for clarity in this section.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-127 Log #1364 NEC-P12 **Final Action: Accept**
(647.7(A)(4))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete, or change, reference to standard receptacles
(4) All 125-volt receptacles used for 60/120-volt technical power shall have a unique configuration and be identified for use with this class of system. ~~All 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted in machine rooms, control rooms, equipment rooms, equipment racks, and other similar locations that are restricted to use by qualified personnel.~~
Substantiation: This sentence is either about standard receptacles on standard branch circuits, in which case it doesn't belong in this article, or the sentence is intended to mean that standard receptacles can be used for technical power in these locations. If the latter is the case, the sentence should be re-written as follows:
All 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted to be used for technical power in machine rooms, control rooms, equipment rooms, equipment racks, and other similar locations that are restricted to use by qualified personnel.
Panel Meeting Action: Accept

Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-128 Log #1999 NEC-P12 **Final Action: Reject**
(647.7(B))

Submitter: Robert Schuerger, EYP Mission Critical Facilities, Inc.
Recommendation: Revise as follows:

647.7(B) ~~Isolated~~ Insulated Grounding Receptacles. ~~Isolated~~ Insulated grounding receptacles shall be permitted as described in 250.146(D); however, the branch circuit equipment grounding conductors shall be terminated as required in 647.6(B).

Substantiation: The use of the term "isolated" has caused confusion which has led to improper and unsafe installations in which a separate grounding electrode and grounding system is installed isolated from the rest of the grounding system of the building. Since the separate grounding system is not properly bonded to the grounding system of the building, a hazardous voltage can be developed between the two grounding systems by an electrical fault or lightning strike.

There have been many cases of this type of installation in the past, with data procession equipment, machine tools and other sensitive electronic equipment. The 2005 edition of IEEE Standard 1100, Recommended Practice for Powering and Grounding Electronic Equipment has "insulated ground receptacle" as the recommended terminology and has recommended the "isolated ground" and "isolated ground receptacle" be avoided.

Panel Meeting Action: Reject

Panel Statement: The term "insulated" indicates only that the conductor cannot be bare and is already addressed in 250.146(D). The use of the term "insulated grounding receptacles" will only add more confusion.

The UL Guide Information for Receptacles for Plugs and Attachment Plugs (RTRT) defines an Isolated Ground Receptacle as follows: "Isolated Ground Receptacles — Grounding-type receptacles in which the grounding terminals are purposely insulated from the mounting means of receptacles and associated metal cover plates as permitted by Section 250.146(D) (formerly Exception No. 4 to Section 250-74) of the NEC are so identified by an orange triangle marked on the face of the receptacle." The NEC and UL definitions should correlate.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:

PRICHARD, R.: Looking to Merriam – Webster and NFPA Glossary for guidance on word usage in the NEC, per the NEC style manual; the term 'isolated' refers to the state of being separated or occurring alone, while the term 'insulated' extends the concept of being separate to be separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current or to separate from conducting bodies by means of nonconductors so as to prevent transfer of electricity. The level or description of the isolation state is more a function described in an equipment specification or in a design specification.

In the UL Guide Information for Receptacles for Plugs and Attachment Plugs (RTRT);
'Isolated Ground Receptacles' is defined as a Grounding-type receptacles in which the grounding terminals are purposely insulated from the mounting means of receptacles and associated metal cover plates as permitted by Section 250.146(D) (formerly Exception No. 4 to Section 250-74) of the NEC are so identified by an orange triangle marked on the face of the receptacle." UL standards are often an equipment or device specification which in this instance is referring to an equipment definition that correlates with the required use in 647.7(B) Isolated Grounding Receptacles.

The discussion in [IEEE STD 1100 20005 (proposed) "IEEE Recommended Practice for Powering and Grounding Electronic Equipment" (Emerald Book)] 2.2.9 insulated equipment ground, speaks to the application of isolated grounding receptacle device's application within an insulated equipment ground design. This is consistent with the purpose of this IEEE Standard.

The NEC is a safety standard not an equipment specification standard nor a design specification, and is describing an isolated ground receptacle device's required function without specifying the requisite insulation properties; In the NEC article 647 "Sensitive Electronic Equipment", section "647.7(B) Isolated Grounding Receptacles", description is consistent with the stated purpose of the NEC (see 90.1 "Purpose").

As a point of reference an Isolated Grounding Receptacle (device) may or may not be applied to a design that includes insulated ground circuitry (though an isolated grounding receptacle is often applied in an insulated ground design). The use does not change the state of isolation within the device as it stands regardless its application. The ground receptacle is not connected (isolated) internally to the devices mounting means (yoke) or the threads for the faceplate screw, a practice for nominal (typical) grounding receptacle (devices). Isolated grounding receptacle names the device that is required to be used, further text and references define how it is to be applied (used).

12-129 Log #349 NEC-P12 **Final Action: Accept in Principle**
(647.8(A))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:

647.8 Lighting Equipment. Lighting equipment installed under this article for the purpose of reducing electrical noise originating from lighting equipment shall meet the conditions of 647.8(A) through (C).

(A) Disconnecting Means. All luminaires (lighting fixtures) connected to separately derived systems operating at 60 volts to ground and associated control equipment, if provided, shall have a disconnecting means that simultaneously opens all ungrounded conductors. The disconnecting means shall be located within sight of the luminaire (lighting fixture) or be capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.

Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.

Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-130 Log #2052 NEC-P12 **Final Action: Accept in Principle**
(647.8(A))

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:

647.8(A) Disconnecting Means All luminaires (lighting fixtures) connected to separately derived systems operating at 60 volts to ground, and associated control equipment if provided, shall have a disconnecting means that simultaneously opens all ungrounded conductors. The disconnecting means shall be located within sight of the luminaire (lighting fixture) or be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

Substantiation: The problem with the present wording of this section is that the disconnect for lighting equipment in sensitive electronic equipment applications in many cases is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where Article 647 installations occur we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for lighting equipment in sensitive electronic equipment applications.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.

Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

ARTICLE 660 — X-RAY EQUIPMENT

12-131 Log #2134 NEC-P12 **Final Action: Accept**
(660.3)

Submitter: Russell LeBlanc, Peterson School of Engineering
Recommendation: Replace the word "approved" with the word identified .
Substantiation: To clarify the intent of the requirement based on the definitions in Article 100.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-132 Log #1246 NEC-P12 **Final Action: Reject**
(660.5)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text: A d ~~isconnecting means~~ switch or circuit breaker that simultaneously disconnects all ungrounded conductors with an ampere rating not less than...(remainder unchanged).
Substantiation: Edit. To conform to many Code sections which specify the type of disconnecting means and to specify simultaneous opening of all ungrounded conductors. The definition of disconnecting means covers a broad spectrum of devices, such as plug/receptacle, links, terminals, wire connectors, etc.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-137.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-133 Log #1472 NEC-P12 **Final Action: Reject**
(660.9)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in 600.9.
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: "Fixtures wires" is the proper term at this time. If the title of Article 402 is changed to "Luminaire wires", then this section can be changed. While the term fixture as relating to lighting fixtures has been changed to luminaire, the term for fixture wires applies to conductors that serve appliances or other devices and not just luminaires.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

12-134 Log #1509 NEC-P12 **Final Action: Reject**
(660.48)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Insert "Part VI" ahead of "Article 250."
Substantiation: Edit. To comply with the Style Manual.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-15.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

ARTICLE 665 — INDUCTION AND DIELECTRIC HEATING EQUIPMENT

12-135 Log #1188 NEC-P12 **Final Action: Reject**
(665.11)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete the first sentence and "This" in the second sentence.
Substantiation: Edit. To comply with Style Manual, already covered in 90.3.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 12-15.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-136 Log #348 NEC-P12 **Final Action: Accept in Principle**
(665.12)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
665.12 Disconnecting Means. A readily accessible disconnecting means shall be provided to disconnect each heating equipment from its supply circuit. The disconnecting means shall be located within sight from the controller or be capable of being locked in the open position. The provisions for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not. Portable means for adding a lock to the switch or circuit breaker shall not be permitted. The rating of this disconnecting means shall not be less than the nameplate rating of the heating equipment. Motor-generator equipment shall comply with Article 430, Part IX. The supply circuit disconnecting means shall be permitted to serve as the heating equipment disconnecting means where only one heating equipment is supplied.
Substantiation: This proposed change in wording is to provide consistency between other similar rules in the NEC that also call for disconnecting means to be capable of being locked in the open position. The phrase "capable of being locked in the open position" is used over 25 times in the NEC and the purpose is the same in every instance. Electrical safety rules for the worker should be consistent and the wording and requirements should be consistent where this phrase is used. The last sentence is being proposed because there are claims that some of the portable units available for snapping on to circuit breakers do remain with the switch or circuit breaker after they are installed on the breakers when the lock is not installed, but they are portable. The actions by CMP 11 in the 2002 cycle in 430.102(B) Exception were fairly clear that the provisions for adding a lock should be more substantial and not portable units.
Panel Meeting Action: Accept in Principle
Revise proposed text to read:
The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.
Panel Statement: See panel action and statement on Proposal 12-9.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-137 Log #1245 NEC-P12 **Final Action: Reject**
(665.12)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text: A readily accessible ~~disconnecting means~~ switch or circuit breaker that simultaneously disconnects all ungrounded conductors shall be...(remainder unchanged).
Substantiation: Edit. To provide a specific type disconnecting means as is done in many sections. The definition of disconnecting means includes many devices other than switches and circuit breakers.
Panel Meeting Action: Reject
Panel Statement: The proposal unduly restricts the disconnecting means to a switch or circuit breaker with no technical substantiation for such restriction. Other types of disconnecting means are permitted.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-138 Log #2053 NEC-P12 **Final Action: Accept in Principle**
(665.12)

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
665.12 Disconnecting Means
A readily accessible disconnecting means shall be provided to disconnect each heating equipment from its supply circuit. The disconnecting means shall be located within sight from the controller or be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. The rating of this disconnecting means shall not be less than the nameplate rating of the heating equipment. Motor-generator equipment shall comply with Article 430, Part IX. The supply circuit disconnecting means shall be permitted to serve as the heating equipment disconnecting means where only one heating equipment is supplied.
Substantiation: The problem with the present wording of this section is that the disconnect in many installations of induction and dielectric heating equipment applications is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.

This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where induction and dielectric heating equipment are involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for induction and dielectric heating equipment.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

<u>The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</u>

Panel Statement: See panel action and statement on Proposal 12-9.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

12-139 Log #2054 NEC-P12 **Final Action: Accept in Principle**

(665.22)

Submitter: James T. Dollard, Jr., IBEW Local 98

Recommendation: Revise text to read as follows:

665.22 Access to Internal Equipment

Access doors or detachable access panels shall be employed for internal access to heating equipment. Access doors to internal compartments containing equipment employing voltages from 150 volts to 1000 volts ac or dc shall be capable of being locked closed or shall be interlocked to prevent the supply circuit from being energized while the door(s) is open. <u>The provision for locking or adding a lock to the access doors or detachable access panels shall be installed on or at the access door or access panel and shall remain in place with or without the lock installed.</u> Access doors to internal compartments containing equipment employing voltages exceeding 1000 volts ac or dc shall be provided with a disconnecting means equipped with mechanical lockouts to prevent access while the heating equipment is energized, or the access doors shall be capable of being locked closed and interlocked to prevent the supply circuit from being energized while the door(s) is open. Detachable panels not normally used for access to such parts shall be fastened in a manner that makes them inconvenient to remove.

Substantiation: The problem with the present wording of this section is that the means of lockout may be considered to be a portable device not directly associated with the equipment.

This existing requirement for providing a lock is for the safety of the installer/maintainer of the equipment. This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where induction and dielectric heating equipment are involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that happens to the access door or access panel in an installation.

Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances

The same level of safety is needed for these disconnecting means for induction and dielectric heating equipment.

Panel Meeting Action: Accept in Principle

Revise proposed text to read:

<u>The provision for locking or adding a lock to the access doors shall be installed on or at the access door and shall remain in place with or without the lock installed.</u>

Panel Statement: The panel agrees with the intent, but disagrees that detachable access panels need to be locked. Detachable panels not normally used for access to such parts shall be fastened in a manner that makes them inconvenient to remove.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

QUAVE, D.: Comment on Affirmative for Proposal 12-9.

ARTICLE 668 — ELECTROLYTIC CELLS

12-140 Log #1025 NEC-P12 **Final Action: Reject**

(668.3(B))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Insert the word "directly" between "not" and "electrically".

Substantiation: Edit. Primary and secondary windings are connected (electromagnetic).

Panel Meeting Action: Reject

Panel Statement: The term "electrically connected" is defined in 668.2, and adding the term "directly" does not clarify 668.3(B).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-141 Log #995 NEC-P12 **Final Action: Reject**

(668.3(C)(3))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

Equipment located or used within the electrolytic cell line working zone or associated with the cell line dc power circuits shall not be required to <u>be grounded</u> ~~comply with the provisions of Article 250~~ <u>except as provided in 668.11(B).</u>

Substantiation: Edit. Presumption is that only the provisions REQUIRING grounding are intended, since other provisions such as in 668.11(C) are required.

Panel Meeting Action: Reject

Panel Statement: The submitter has not presented any definitive technical substantiation supporting a problem with the current text.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-142 Log #1023 NEC-P12 **Final Action: Reject**

(668.15)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

For equipment, apparatus, and structural components that are ~~required~~ to be grounded ~~by provisions of Article 668, the provisions of Article 250 shall apply except a water pipe electrode shall not be required to be used.~~ any electrode or combination of electrodes described in 250.52 shall be <u>used</u> . ~~permitted~~ .

Substantiation: Edit. Reference should not be made to an entire article. It appears the only grounding requirements are in 668.11(B) and inferred in 668.3(B). The last sentence of this section makes the reference to a water pipe electrode superfluous. The word "permitted" does not REQUIRE any of the electrodes in 250.52.

Panel Meeting Action: Reject

Panel Statement: The change suggested by the submitter does not add clarity to the requirement. The panel disagrees with the submitter's substantiation that the proposal is editorial.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

12-143 Log #933 NEC-P12 **Final Action: Reject**

(668.21(A))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise second, third, and fourth sentences:

Power for these circuits shall be supplied through isolating transformers with <u>an ungrounded secondary.</u> Primaries of such transformers shall operate at not more than 600 volts, <u>nominal</u> , between conductors and shall be provided with proper overcurrent protection. The secondary of such transformers shall not exceed 300 volts, <u>nominal</u> , between conductors and all secondary circuits shall be ungrounded and have an approved overcurrent device of proper rating in each conductor.

Substantiation: Edit. Unless specified to have an ungrounded secondary, an isolating transformer may have a grounded secondary and supply ungrounded circuits, such as a 120/240 volt grounded secondary supplying 240 volt ungrounded circuits. The isolating transformer of (B) is specified to have an ungrounded secondary but that requirement is not a definition for wherever the term "isolating transformer' is used.

Panel Meeting Action: Reject

Panel Statement: The previous sentence in this section specifies that the

circuits be ungrounded. The last sentence also specifies the secondary of the transformer be ungrounded: “The secondary voltages of such transformers… from such secondaries shall be ungrounded….”
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-144 Log #991 NEC-P12 **Final Action: Reject**
(668.30(D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Insert “overcurrent” between “circuit” and “protection”.
Substantiation: Edit. The type of protection (physical, overcurrent, overload), is not specified but has to be assumed.
Panel Meeting Action: Reject
Panel Statement: The submitter has not presented any definitive technical substantiation supporting a problem with the current text.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

12-145 Log #899 NEC-P12 **Final Action: Reject**
(668.43(E)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
The provisions of a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG ~~solid~~ .
Substantiation: Edit. This section doesn’t literally require a solid conductor, only one that is not smaller than 8 AWG solid; a 6 AWG stranded copper conductor literally complies.
Panel Meeting Action: Reject
Panel Statement: The section referred to does not exist.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 669 — ELECTROPLATING

12-145a Log #CP1202 NEC-P12 **Final Action: Accept**
(669.5)

Submitter: Code-Making Panel 12,
Recommendation:
Change the reference in the last sentence of 669.5 from “366.10” to “366.23”
Substantiation:
To reflect the correct location of the information.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 670 — INDUSTRIAL MACHINERY

12-146 Log #142 NEC-P12 **Final Action: Accept**
(670.1, FPN 1 (New))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal adds FPN No. 1 with the text recommended in the Proposal and that FPN No. 2 will contain only the first sentence in the existing FPN; the second sentence will be deleted.
Submitter: Jay Tamblingson, Rockwell Automation
Recommendation: Add fine print note:
FPN No. 1: For further information, see NFPA 79-2002, Electrical Standard for Industrial Machinery. Change existing FPN to FPN No. 2.
Substantiation: This proposal restores an important FPN information reference to NFPA 79 which, prior to 2005, had existed in Article 670 since 1968. The 2005 version changed this reference to be more restrictive, indicating only that NFPA 79-2002 should be sought for information on workspace requirements. By restoring the previous FPN text, users of the NEC will be properly guided to NFPA 79 for further information on the many important details of safe electrical design for industrial machinery.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

12-147 Log #2171 NEC-P12 **Final Action: Accept**
(670.2)

TCC Action: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Committee on Electrical Equipment of Industrial Machinery for information.
Submitter: Dann Strube, Strube Consulting
Recommendation: Delete the definition of “Industrial Manufacturing System”.
Substantiation: This definition must be a carry over from earlier code, but the term is not used in the NEC today.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

12-148 Log #402 NEC-P12 **Final Action: Reject**
(670.3)

Submitter: Sam Marcovici, NY City Buildings Dept.
Recommendation: Revise text to read as follows:
670.3 Machine Nameplate Data.
(A) Permanent Nameplate. A permanent nameplate shall be attached to the control equipment enclosure or machine and shall be plainly visible after installation. The nameplate shall include the following information:
(1) Supply voltage, phase, frequency, and full-load current
(2) Maximum ampere rating of the short-circuit and ground-fault protective device
(3) Ampere rating of largest motor, from the motor nameplate, or load
(4) Short circuit current rating of the machine industrial control panel based on one of the following:
a. Short circuit current rating of a listed and labeled machine control enclosure or assembly
b. Short circuit current rating established utilizing an approved method
FPN: UL 508A-2001, Supplement SB, is an example of an approved method.
(5) Electrical diagram number(s) or the number of the index to the electrical drawings
The full-load current shown on the nameplate shall not be less than the sum of the full-load currents required for all motors and other equipment that may be in operation at the same time under normal conditions of use. Where unusual type loads, duty cycles, and so forth require oversized conductors or permit reduced-size conductors, the required capacity shall be included in the marked “full-load current.” Where more than one incoming supply circuit is to be provided, the nameplate shall state the preceding information for each circuit.
Both OEM and refurbished machines shall have a permanent nameplate.
FPN: See 430.22(E) and 430.26 for duty cycle requirements.
(B) Overcurrent Protection. Where overcurrent protection is provided in accordance with 670.4(B), the machine shall be marked “overcurrent protection provided at machine supply terminals.”
Substantiation: When industrial equipment usually get refurbished, the replacement motor is sometimes larger than the original one, thus increasing the full-load current of the machine. Accordingly, the refurbishing companies should comply with the nameplate requirement just as the OEMs are.
Panel Meeting Action: Reject
Panel Statement: The proposed revision to 670.3 is already covered by the existing text which requires a nameplate for all machines. Refurbished machines are required to have accurate data on the nameplate.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

12-149 Log #647 NEC-P12 **Final Action: Accept**
(670.3(A)(1))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Revise text to read as follows:
670.3(A)(1):
(A) Permanent Nameplate. A permanent nameplate shall be attached to the control equipment enclosure or machine and shall be plainly visible after installation. The nameplate shall include the following information:
(1) Supply voltage, number of phase s , frequency, and full-load current.
Substantiation: Clarification of existing text.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

12-150 Log #2835 NEC-P12 **Final Action: Reject**
(670.4 Exception (New))

Submitter: Russell A. Tiffany, York International Corp.
Recommendation: Where one or more of the motors of the group are powered from an equipment mounted variable frequency drive, the ampere rating of the drive and/or drives shall be permitted in the summation of the full-load current ratings of the group.
Substantiation: UL allows the equipment wiring lugs to be sized per the nameplate ampacity on equipment based on the ampacity of the drive/drives, but 430.24 only considers the motors, but does not consider the drives. By allowing the smaller conductors, you allow the designer to increase the impedance of the circuit, now reducing the available fault current and helping reduce the risk of injury if a fault occurs.
Panel Meeting Action: Reject
Panel Statement: The change proposed by the submitter would create a conflict with the requirements in 430.122(A) and UL 508C without sufficient technical substantiation to mandate a different method of sizing.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

12-151 Log #1644 NEC-P12 **Final Action: Reject**
(670.4(C))

Submitter: Francois Tanguay, Pyradia, Inc
Recommendation: Add new text as follows:
Branch circuits and branch circuit protection for all electrical circuits in the furnace heating system shall be provided in accordance with NFPA 70 or with NFPA 79. The requirements for resistance heaters larger than 48 amperes to be broken down into subdivided circuits not to exceed 48 amperes shall not apply to industrial ovens and furnaces.
Substantiation: My problematic comes with the fact that CSA INTERNATIONAL which does our equipment certification for the US market are telling us that all our control panels for our ovens and furnaces shall have branch circuit for resistance heating elements divided in 48 A load, which is impossible to do on many ovens and furnaces. The company I work for, PYRADIA, manufactures industrial ovens and furnaces; some of which have heating power as high as 2.2 MW (2200 kW). It is impossible to design that kind of equipment with subdivided heating load of 48 A.
Certification agencies uses UL 499 Electrical Heating Appliances (at article 17.6) and UL 508A Industrial Control Panels (at 31.6), both of which have branch circuit requirements based on 422.11(F) and 424.22(B) of NFPA 70. In mind they both do not apply to industrial ovens and furnaces. Overcurrent protection for resistance heating elements as per 422.11(F) is for appliances.
NFPA 70 defines appliance as “Utilization equipment, generally other than industrial, that is normally built in standardized sizes or types and is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, and so forth”. Which would exclude industrial ovens and furnaces.
Overcurrent protection for resistance heating elements as per article 424.22(B) is for fixed electric space-heating equipment. Which would exclude industrial ovens and furnaces.
670.4(C), which covers Industrial Machinery, does not specify limitation for overcurrent protection.
In NFPA 86 version 2003, Standard for Ovens and Furnaces;
It is written at the article 7-18.1.3 that:
“Branch circuits and branch circuit protection for all electrical circuits in the furnace heating system shall be provided in accordance with NFPA 70, National Electrical Code, and with NFPA 79, Electrical Standard for Industrial Machinery.
Exception: The requirements for resistance heaters larger than 48 amperes to be broken down into subdivided circuits not to exceed 48 amperes shall not apply to industrial ovens and furnaces.”
Even though NFPA 86 at article 7.18.1.3 specify that the 48A breakdown is not required for industrial ovens and furnaces, the certification agencies (UL or CSA) do not base their certification of that NFPA code, which is a problem for us. And, it seems UL standards 499 and 508A can only be modified if NFPA 70 is modified to permit that exception.
Panel Meeting Action: Reject
Panel Statement: Although the concern with compatibility with modern industrial equipment designs and NFPA 86 has merit, the proposal does not contain specific requirements for equipment that cannot be subdivided into 48A loads.
In a shortcircuit, large amounts of energy are released in the form of both heat and magnetic energy. As stated in the commentary for the NEC Handbook for Section 424.22 (B), the existing subdivision size was selected to use a maximum size fuse holder of 60 amps or a 60-ampere circuit breaker, since each 48-ampere load would be protected at 125% X 48 amps or 60 amps. An example of the amount of energy that may be generated in a shortcircuit involving one of these boilers or ovens can be seen by using the formula I2t where I2 is the current squared times the time the energy is permitted to exist in the fault.
The following is the example used in the 2005 NEC Handbook. “By using the UL Electrical Construction Equipment Directory (Green Book), the energy let-through of a 350-ampere fuse can be compared to the energy let-through of a 60-ampere fuse. In the fuse section (JCQR), the let-through energy, approximated by the current squared and then multiplied by the time, or I2t, is provided for various fuse classes (UL). A 600-volt, 60-ampere Class T fuse could have a let-through, I2t, as high as 30,000 ampere squared seconds. But a 600-volt, 350-ampere Class T fuse could have a let-through, I2t, as high as 1,100,000 ampere squared seconds. That means the 350-ampere fuse could let through 36.67 times as much damaging energy as the 60-ampere fuse during a short circuit.”
As can be seen by this example, by increasing the size of the fuse or circuit breaker from the 60 ampere subdivided heating element to a 350 ampere fuse protecting a much larger set of heating elements, the energy let through and the potential for damage is much greater. If an exception is to be made to the general protection rule, the proposal should contain alternative overcurrent protection sizing limits and accompanying rationale for those limits.
Higher limits were previously accepted for certain fixed electric space-heating equipment (boiler constructions) as described in Section 424.22(B) and 424.72(A), as both UL 499 (Electric Heating Appliances) and UL 197 (Commercial Electric Cooking Appliances) allow larger circuits involving resistance heating elements that cannot be subdivided into 48A loads, but limit the circuits to those not exceeding 120 A and protected at not more than 150A. Similarly, Section 7.2.11.2 of NFPA 79 and subclause 31.6 of UL 508A contain alternate provisions for heater circuits that cannot be subdivided into 48A loads.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

ARTICLE 675 — ELECTRICALLY DRIVEN OR CONTROLLED IRRIGATION MACHINES

19-137 Log #2046 NEC-P19 **Final Action: Accept**
(675.8(B))

Submitter: James T. Dollard, Jr., IBEW Local 98
Recommendation: Revise text to read as follows:
675.8(B) Main Disconnecting Means The main disconnecting means for the machine shall provide overcurrent protection, shall be at the point of connection of electrical power to the machine or shall be visible and not more than 15 m (50 ft) from the machine, and shall be readily accessible and capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. This disconnecting means shall have a horsepower and current rating not less than required for the main controller.
Substantiation: The problem with the present wording of this section is that the disconnect in many installations of electrically driven or controlled irrigation machines is a circuit breaker in a panelboard or a switch that is not made with permanent provisions for locking the circuit breaker or switch in the open position.
This requirement for a disconnect is for the safety of the installer/maintainer of the equipment. Permanent provisions for making circuit breakers and switches capable of being locked in the open position are readily available from circuit breaker and switch manufacturers.
This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
Where electrically driven or controlled irrigation machines are involved we know that maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have enough different types of devices and hopefully one that that happens to fit the circuit breaker or switch in an installation.
Note that this language was accepted by CMP-11 and is a present requirement, in the 2002 NEC, when a circuit breaker or switch is used as a disconnecting means not within sight of a motor. Also included in the 2005 NEC is the same language in 422.31 for appliances
The same level of safety is needed for these disconnecting means for electrically driven or controlled irrigation machines.
Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7
Comment on Affirmative:
BERNSON, J.: There should be consistency between similar rules in the NEC that call for the disconnecting means to be capable of being locked in the open position. New language accepted by Panel 12 should also be adopted here to clarify that portable units are unacceptable. A new sentence should be added before the last sentence as follows: “Portable means for adding a lock to the disconnecting means shall not be permitted.” See language accepted by Panel 12 (Proposal 12-136) for this same purpose.

19-138 Log #3419 NEC-P19 **Final Action: Accept**
(675.8(B) Exception No. 2)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the word “fusible”.
Substantiation: There is no apparent reason for the fusible requirement in a disconnecting means that must do that and nothing more, that is, disconnect the motor. For any other motor, 430.109(A)(3) does not require a molded case switch to be fusible, and no substantiation was submitted on this point when the proposal was presented.
Panel Meeting Action: Accept
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

19-139 Log #980 NEC-P19 **Final Action: Reject**
(675.8(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text:
“A ~~disconnecting means~~ switch or circuit breaker shall be provided to disconnect all ungrounded conductors for each motor and its controller and shall be...” (remainder unchanged)

Substantiation: Edit. The type of disconnecting means is not specified; a disconnecting means per definition in Article 100 includes many devices such as plug/receptacle, wire connectors, lugs, relays, links (669.8(B)) etc.
Panel Meeting Action: Reject
Panel Statement: Requirements are given in 675.8(A) and 675.8(B) for the main controller and the main disconnecting means. No evidence is presented to indicate that the supplementary disconnecting means for individual motors needs to be a switch or circuit breaker. Each motor is not required by 675.8(A) to have its own controller.
Number Eligible to Vote: 7
Ballot Results: Affirmative: 7

ARTICLE 680 — SWIMMING POOLS, FOUNTAINS, AND SIMILAR INSTALLATIONS

17-58 Log #3636 NEC-P17 **Final Action: Reject**
(680)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.
Recommendation: Revise text:

Article 680 Swimming Pools

The grounding, equipotential planes, bonding, wiring and other items need drastic review and re-thinking, as many of the ideas are incorrect.

Therefore, it is strongly suggested that an Ad Hoc Committee be formed to completely revised the Article eliminating the equipotential planes, incorrect voltage gradient statement along with new simplified ground / bonding requirements.

Substantiation: See D. W. Zipse's other proposals.

The problem is that the Underwater Luminaries are "grounded" and there is electrical connections directly back to the high voltage primary side of the pole mounted or pad mounted or underground transformer. The details of this connection will be described later. This electrical connection from the underwater luminaries is a path for the continuously flowing stray current emanating from the utility companies multigrounded neutral electrical distribution systems that has the neutral connected to earth at least 4 times per mile. It is this current that enters the swimming pool to complete the electrical circuit. Bear in mind that the current may be flowing in the opposite direction. The direction is arbitrary.

In addition to the above multigrounded neutral electrical distribution system earthing, there is a second electrical circuit. The second circuit is the bastardized electrical connection between the high voltage primary neutral and the secondary neutral allowing primary high voltage electricity to flow directly into the residence, commercial or industrial facility using the secondary neutral which is bonded to the green equipment grounding conductor. Now this green color equipment grounding conductor is connected to the underwater luminaries metal frame allowing stray continuous flowing dangerous and hazardous current to complete the circuit.

What the above bastardize electrical connection does is allow the direct electrical connection of any lightning strike to nearby distribution system to flow directly into your own home and destroy the sensitive electrical equipment, which is not an act of God or Mother Nature, but directly attributable to the utility since 1932.

With the approval of Code Making Panel # 5's acceptance of the dangerous and hazardous multigrounded neutral distribution system, stray current has been measured flowing within swimming pools, hot tubs, showers, etc.

The Electric Power Research Institute (EPRI) an organization of utilities companies states that 40 to 60 percent of the return neutral current from the high voltage electrical circuit returns over or through the earth. We have measured as high as eighty-eight (88) percent of the neutral current returning over the earth and thus through dairies, back yards of homes through hot tubs, swimming pools, etc.

Ohm's Law states that **Voltage = Current X Resistance**

It is impossible to eliminate voltage gradients, except in your imagination as long as current is flowing continuously through the concrete and re-bar, which is happening in the real world.

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the equipotential bonding will have some resistance. The concrete is semi-conductive being wet and especially since the concrete had a metallic mesh within it. Any current flowing over and through the equipotential bonding will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

It must be noted that the human body has approximately the same internal resistance as a cow. The electrical principle is the same for equipotential planes and equipotential bonding. The following will show conclusively that there is high voltage electric current flowing in the earth. In one court case, there were 18.5 amperes on the high voltage phase conductor and only 3.5 amperes on the multigrounded neutral electrical distribution system. Simple math shows that 15 amperes of return current in that case was flowing uncontrolled over the earth.

In another case, an engineering firm measured 5 amperes returning to the substation flowing over the earth shocking persons.

What happens is the swimming pool with its water soaked concrete is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. With the underwater luminaries connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the high voltage primary neutral thus completing the connection to the primary electrical circuit back to the substation completing the circuit.

Thus, in order to eliminate this dangerous and hazardous electrical connection the underwater luminaries must be completely removed.

There must be no electrical connection from the water in the pool back to the high voltage primary electrical system. The metallic frame of the pump motor need to be connected to the equipment grounding conductor and system in order to provide a low impedance path back to the service panel in order to trip the protective device, circuit breaker or fuse.

As the electrical load increases more and more stray current will enter the earth resulting in more and more shocking incidents. It is opined that as the electrical load increases to a critical level that may last for only an hour or a day, in any one multigrounded neutral electrical distribution system, someone will be electrocuted or drown because the persons muscles froze and they sank to the bottom of the pool and drowned. It may have already occurred.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).

The submitter is encouraged to review and resubmit for the ROC with specific proposed text.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-59 Log #3201 NEC-P17 **Final Action: Reject**
(680.1)

TCC Action: The Technical Correlating Committee advises that Article Scope statements and Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
Submitter: Donald Cook, Shelby County Development Services
Recommendation: 680.1 Scope. The provisions of this article apply to the construction and installation of electrical wiring for and equipment in or adjacent to all swimming, wading, therapeutic, and decorative pools; hot tubs; spas; <u>baptisteries;</u> and hydromassage bathtubs, whether permanently installed or storable, and to metallic auxiliary equipment such as pumps, filters, and similar equipment. Second sentence not changed.
Substantiation: Baptisteries are not currently covered by this article or any other special equipment requirements of the NEC. Many involve immersion of the user and the same electrical hazards as pools, hot tubs, spas, hydromassages, and other vessels included in Article 680. Currently, nothing in the NEC requires bonding of metal parts, GFCI protection of equipment, separation of electrical and electronic devices from the vessel. This and companion proposals address that lack of coverage. The attached newspaper article related to the death of a user is submitted for substantiation that requirements are needed.

- Based on NEC 90.2(A) and (B), the distribution system is within the scope of the NEC.
- The service point, which is defined in Article 100 is the line of demarcation and separates the "utility system" from the "premises wiring". See definitions for service point and premises wiring. The combination of those definitions and the information in 90.2 clearly places this installation within the scope of the NEC.
- The value of the Fine Print Notes (FPN) to the enforcement of the installation can be determined by reading NEC 90.5(C).
- Based on 90.2(C), the authority having jurisdiction (Shelby County) may grant exceptions to the requirements found in the NEC for outdoor distribution work.
- Little or none of the equipment utilized in distribution installations has been evaluated by any NRTL.
- Although the NEC has some rules for installations over 600 volts, it was not developed to evaluate overhead distribution systems.
- After discussing this type installation with respected inspection agencies all over the US, with respected NEC experts all over the country, with NFPA staff, we have agreed to provide that exception based on the owner providing a third party evaluation of the equipment and the installation.
- We also provided an option of transferring ownership of the distribution system back to Alabama Power. If that choice was made, the service point would be re-located to each well site and the NEC would be much easier to use.
- We can not use the NESC. That document has not been adopted in this jurisdiction. We can accept an evaluation from an acceptable third party agency. Since the approval of any installation is the responsibility of the AHJ, it is the responsibility of Shelby County to determine what third party agency we will approve.

90.2 Scope.

(A) Covered. This Code covers the installation of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

FPN to (2): For additional information concerning such installations in an industrial or multibuilding complex, see ANSI C2-2002, National Electrical Safety Code.

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center.

(C) Special Permission. The authority having jurisdiction for enforcing this Code may grant exception for the installation of conductors and equipment that are not under the exclusive control of the electric utilities and are used to connect the electric utility supply system to the service-entrance conductors of the premises served, provided such installations are outside a building or terminate immediately inside a building wall.

90.5 Mandatory Rules, Permissive Rules, and Explanatory Material.

(A) Mandatory Rules. Mandatory rules of this Code are those that identify actions that are specifically required or prohibited and are characterized by the use of the terms shall or shall not.

(B) Permissive Rules. Permissive rules of this Code are those that identify actions that are allowed but not required, are normally used to describe options or alternative methods, and are characterized by the use of the terms shall be permitted or shall not be required.

(C) Explanatory Material. Explanatory material, such as references to other standards, references to related sections of this Code, or information related to a Code rule, is included in this Code in the form of fine print notes (FPNs). **Fine print notes are informational only and are not enforceable as requirements of this Code.**

ARTICLE 100 Definitions

Approved. Acceptable to the authority having jurisdiction.

Premises Wiring (System). That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed, that extends from the service point or source of power, such as a battery, a solar photovoltaic system, or a generator, transformer, or converter windings, to the outlet(s). Such wiring does not include wiring internal to appliances, luminaires (fixtures), motors, controllers, motor control centers, and similar equipment.

Service Point. The point of connection between the facilities of the serving utility and the premises wiring.

110.2 Approval. The conductors and equipment required or permitted by this Code shall be acceptable only if approved.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: A change to the scope is not required.

See panel action on Proposal 17-60.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-60 Log #3202 NEC-P17 **Final Action: Accept in Principle**
(680.2)

Submitter: Donald Cook, Shelby County Development Services

Recommendation: Add a new definition for Baptistery. A vessel installed for religious ceremonies with all water-circulating, heating, and control equipment associated with the unit and designed for the immersion of users.

Substantiation: Baptisteries are not currently covered by this article or any other special equipment requirements of the NEC. Many involve immersion of the user and the same electrical hazards as pools, hot tubs, spas, hydromassages, and other vessels included in Article 680. Currently, nothing in the NEC requires bonding of metal parts, GFCI protection of equipment, separation of electrical and electronic devices from the vessel. This and companion proposals address that lack of coverage. The attached newspaper article related to the death of a user is submitted for substantiation that requirements are needed.

●Based on NEC 90.2(A) and (B), the distribution system is within the scope of the NEC.

●The service point, which is defined in Article 100 is the line of demarcation and separates the “utility system” from the “premises wiring”. See definitions for service point and premises wiring. The combination of those definitions and the information in 90.2 clearly places this installation within the scope of the NEC.

●The value of the Fine Print Notes (FPN) to the enforcement of the installation can be determined by reading NEC 90.5(C).

●Based on 90.2(C), the authority having jurisdiction (Shelby County) may grant exceptions to the requirements found in the NEC for outdoor distribution work.

● Little or none of the equipment utilized in distribution installations has been evaluated by any NRTL.

● Although the NEC has some rules for installations over 600 volts, it was not developed to evaluate overhead distribution systems.

● After discussing this type installation with respected inspection agencies all over the US, with respected NEC experts all over the country, with NFPA staff, we have agreed to provide that exception based on the owner providing a third party evaluation of the equipment and the installation.

● We also provided an option of transferring ownership of the distribution system back to Alabama Power. If that choice was made, the service point would be re-located to each well site and the NEC would be much easier to use.

● We can not use the NESC. That document has not been adopted in this jurisdiction. We can accept an evaluation from an acceptable third party agency. Since the approval of any installation is the responsibility of the AHJ, it is the responsibility of Shelby County to determine what third party agency we will approve.

90.2 Scope.

(A) Covered. This Code covers the installation of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

FPN to (2): For additional information concerning such installations in an industrial or multibuilding complex, see ANSI C2-2002, National Electrical Safety Code.

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center.

(C) Special Permission. The authority having jurisdiction for enforcing this Code may grant exception for the installation of conductors and equipment that are not under the exclusive control of the electric utilities and are used to connect the electric utility supply system to the service-entrance conductors of the premises served, provided such installations are outside a building or terminate immediately inside a building wall.

90.5 Mandatory Rules, Permissive Rules, and Explanatory Material.

(A) Mandatory Rules. Mandatory rules of this Code are those that identify actions that are specifically required or prohibited and are characterized by the use of the terms shall or shall not.

(B) Permissive Rules. Permissive rules of this Code are those that identify actions that are allowed but not required, are normally used to describe options or alternative methods, and are characterized by the use of the terms shall be permitted or shall not be required.

(C) Explanatory Material. Explanatory material, such as references to other standards, references to related sections of this Code, or information related to a Code rule, is included in this Code in the form of fine print notes (FPNs). **Fine print notes are informational only and are not enforceable as requirements of this Code.**

ARTICLE 100 Definitions

Approved. Acceptable to the authority having jurisdiction.

Premises Wiring (System). That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed, that extends from the service point or source of power, such as a battery, a solar photovoltaic system, or a generator, transformer, or converter windings, to the outlet(s). Such wiring does not include wiring internal to appliances, luminaires (fixtures), motors, controllers, motor control centers, and similar equipment.

Service Point. The point of connection between the facilities of the serving utility and the premises wiring.

110.2 Approval. The conductors and equipment required or permitted by this Code shall be acceptable only if approved.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Change three (3) definitions in 680.2 as follows:

Permanently Installed Swimming, Wading, Immersion, and Therapeutic Pools. Those that are constructed in the ground or partially in the ground, and all others capable of holding water in a depth greater than 1.0 m (42 in.), and all pools installed inside of a building, regardless of water depth, whether or not served by electrical circuits of any nature.

Pool. Manufactured or field-constructed equipment designed to contain water on a permanent or semipermanent basis and used for swimming, wading, immersion, or other purposes.

Storable Swimming, Wading or Immersion Pool. Those that are constructed on or above the ground and are capable of holding water to a maximum depth of 1.0 m (42 in.), or a pool with nonmetallic, molded polymeric walls or inflatable fabric walls regardless of dimension.

Panel Statement: A separate definition of b aptistery is not required. The panel revised three (3) definitions in 680.2; these changes meet the submitter’s intent.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-61 Log #1305 NEC-P17 **Final Action: Reject**
(680.2.Fountain)

Submitter: Jim Davis, Electrical Education Services, LLC
Recommendation: Revise text as follows:
Fountain. ~~Fountains, ornamental pools, display pools, and reflection pools.~~ A mechanically assisted discharge of liquid to serve any one or more of a variety of purposes, usually containing a basin or pool. The definition does not include drinking fountains.
Substantiation: This proposed change intends to resolve a conflict with the NEC Style Manual as well as to provide a more complete description of the many various constructed forms that are currently found in contemporary fountains. In section 2.2.2 of the 2003 edition of the NEC Style Manual, the rule is that definitions **shall not** contain the term that is being defined. The present text also contains a disagreement in number as the "Fountain" is singular, and the items used to define it are plural (fountain s , ornamental pool s , display pool s , and reflection pool s). Revision of this definition will help clarify appropriate application of the NEC.
Panel Meeting Action: Reject
Panel Statement: The proposed definition is too vague and does not add clarity to the text.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-62 Log #3421 NEC-P17 **Final Action: Reject**
(680.2.Maximum Water Level.)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise to read as follows:
Maximum Water Level. The highest water level that water can reach based on the design of the water circulation and drainage system for the contained body of water.
Substantiation: The extra few inches provided by a definition based on spill over height add essentially nothing to safety since water at the spillover level would be an extremely transient condition. This definition had very thin substantiation to begin with, and it raises hob with many settled rules in Article 680. Consider for example 680.24(A)(2)(a). With the maximum water level now effectively equal to the deck height in most instances, the allowance for a reduction in height for the swimming pool junction box to 4 inches above the deck is now meaningless, and the boxes must be raised to 8 inches above the deck. When this change was made (allowing 4 inches above the deck), it was done to make a box position under a diving board feasible, so the box wouldn't be needlessly disturbed. Remember that swimming pool junction box covers must be lifted some distance vertically in order to gain access to the box interior.
Panel Meeting Action: Reject
Panel Statement: If the water circulation fails, the water can rise to the point where it spills out.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-63 Log #1935 NEC-P17 **Final Action: Reject**
(Table 680.3)

TCC Action: The Technical Correlating Committee directs that the Panel reconsider and correlate with the Panel Action on Proposals 8-53 and 8-78. This action will be considered by the Panel as a Public Comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise Table 680.3 as follows:

Table 680.3 Other Articles

Topic	Section or Article
Wiring	Chapters 1 – 4
Junction box support	314.23
Rigid nonmetallic conduit	315.12, 353.12, 355.12
Audio Equipment	Article 640, Parts I and II
Adjacent to pools fountains	640.10
Underwater speakers*	

*Underwater loudspeakers shall be installed in accordance with 680.27(A)

Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC Conduit and the new Article 355 for RTRC. It clarifies that broad designation of rigid nonmetallic conduit (Type RNC) includes PVC, HDPE and RTRC, each of which will now have a separate Article, and includes references to the respective Articles.
Panel Meeting Action: Reject
Panel Statement: These articles are nonexistent; as such, the panel cannot determine the appropriateness of these materials.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-64 Log #2718 NEC-P17 **Final Action: Reject**
(680.6)

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
680.6 Grounding. Electrical equipment shall be grounded in accordance with Parts V, VI, and VII of Article 250 and connected by wiring methods of Chapter 3, except as modified in this article. The following equipment shall be grounded:
(1) Through-wall lighting assemblies and underwater luminaires (lighting fixtures), other than those ~~low-voltage~~ systems listed for the application without a grounding conductor.
(remainder of 680.6 unchanged)
Substantiation: Problem. Item (1) of the list of equipment in 680.6 provides for through-wall lighting assemblies and underwater luminaires to not have a grounding conductor and to not be grounded only if they are low voltage. This requirement unnecessarily prevents development and use of 120 V through-wall lighting assemblies and underwater luminaires that do not have a grounding conductor, even if they do not have non-current-carrying metal parts requiring grounding. The unnecessary low voltage limitations of item (1) of 680.6 prevents luminaire manufacturers, pool builders, owners, and users from gaining the benefits of 120 V luminaires that do not require or have provision for grounding.
Substantiation: During the evaluation for the required listing [Section 680.23(A)(8) and 680.33] of through-wall lighting assemblies and underwater luminaires, it can be determined if a 120 volt lighting assembly or underwater luminaire without a grounding conductor limits the risks of electric shock as is required for (a) low-voltage designs without a grounding conductor and (b) 120 V designs with a grounding conductor.
The 120 V designs without a grounding conductor can be designed so "that, where the luminaire (fixture) is properly installed without a ground-fault circuit-interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping)" 1 . Test techniques for determining compliance with this NEC requirement are well developed and are effective for evaluating 120 V designs without a grounding conductor just as they are for designs permitted by 680.6 120 V designs without grounding and that limit the risks of electric shock can both be practical and comply with all safety requirements, including the limit for escape current conducting into the swimming pool water under damaged lens or gasket conditions and other applicable fault conditions required in the UL Standard for Underwater Luminaires and Junction Boxes, UL 676
Footnote
[1] Quoted text is from 680.23(A)(1), Underwater Luminaires (Lighting Fixtures); General; Luminaire (Fixture) Design, Normal Operation.
Panel Meeting Action: Reject
Panel Statement: See the panel action on Proposal 17-65.
The term "low voltage" is retained for safety considerations.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
BLEWITT, T.: Proposal should have been Accepted in Part. The Submitter did not make it clear that a system of double insulation was required in the absence of a grounding conductor.
UL 676, the Standard for Underwater Luminaires, specifies construction and performance requirements for line-voltage double-insulated luminaires. Therefore the low voltage restriction for luminaires not requiring grounding is no longer necessary.
Revised text of 680.6(1) should be amended as follows:
(1) Through-wall lighting assemblies and underwater luminaires (lighting fixtures), other than those ~~low-voltage~~ systems listed for the application with an approved system of double insulation ~~without a grounding conductor~~ .
Comment on Affirmative:
HIRSCH, B.: The NEC should encourage new technology and not be so restrictive as to discourage industry changes. Only through testing, however, can we validate the safety of new devices. UL needs to supply compelling substantiation including test requirements and test results that verify the ability of 120 volt pool luminaires and double insulated pool equipment to meet all safety requirements.

17-65 Log #2720 NEC-P17 **Final Action: Accept**
(680.6)

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
680.6 Grounding. Electrical equipment shall be grounded in accordance with Parts V, VI, and VII of Article 250 and connected by wiring methods of Chapter 3, except as modified in this article. The following equipment shall be grounded:
(1) Through-wall lighting assemblies and underwater luminaires (~~lighting fixtures~~), other than those low-voltage ~~systems~~ lighting products listed for the application without a grounding conductor.
(remainder of 680.6 unchanged).

Substantiation: A low-voltage through-wall lighting assembly or underwater luminaire is often a single object, permanently connected to a 15 V supply circuit. In this form, it is not part of a "system" of field-assembled discrete parts or products from the lighting product manufacturer. The only product is the discrete low-voltage through-wall lighting assembly or underwater luminaire. The use of the term "system" sometimes leads readers to unnecessarily expect other nonexistent and not required separate parts or products from the manufacturer of the low-voltage through-wall lighting assembly or underwater luminaire. For these discrete low-voltage lighting assemblies and underwater luminaires, a listed swimming pool and spa transformer (required by 680.23(A)(2)) of any transformer manufacturer can be field acquired and installed for the supply circuit for the low voltage lighting assembly or luminaire. While both the transformer and the supplied lighting assembly or luminaire are listed, they are not listed as a "system".
The term "lighting products" are proposed to replace the term "system". A lighting product is more likely to be understood by the reader to refer to either a discreet single product or a system of parts or products.

In those situations where the lighting product consists of multiple field-assembled separate parts from the manufacturer that need to be used together as a system, the listing can require the multiple parts to be marked to identify that they need to be used together (as a system).

Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-66 Log #987 NEC-P17 **Final Action: Reject**
(680.7)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:

"and attachment plug" after "flexible cord".

Substantiation: Edit. To be consistent with the heading. Present literal wording does not permit an underwater lighting fixture to be cord connected.
Panel Meeting Action: Reject
Panel Statement: This requirement is already included in 680.7(B).

The panel does not agree with the submitter's substantiation.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-67 Log #1302 NEC-P17 **Final Action: Accept**
(680.7)

Submitter: Jim Davis, Electrical Education Services, LLC
Recommendation: Revise text as follows:

Fixed or stationary equipment, other than underwater luminaire s (~~lighting fixture~~ s) , for a permanently installed pool shall be permitted to be connected with a flexible cord to facilitate the removal or disconnection for maintenance or repair.

Substantiation: This proposed change intends to resolve a conflict with the 2003 NEC Style Manual as well as to provide increased sentence flow and clarity. By adding two commas, one after the word EQUIPMENT and another after the word FIXTURE (in parenthesis), this parenthetical element "other than underwater luminaire (lighting fixture)" is set off more clearly and distinctly as being not covered by the rules of 680.7. Also, by changing luminaire to luminaire s , plural, the text agrees with the NEC Style Manual in 3.3.3.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-68 Log #2119 NEC-P17 **Final Action: Reject**
(680.7)

Submitter: Bud Swathwood, Bud Swathwood Consulting
Recommendation: Add new last sentence to 680.7 after the last sentence to read:

The cord and plug may be factory assembled or field installed. If field installed, the cord and plug shall meet the requirements of 680.7(A), (B), and (C).

Substantiation: Many inspectors require the cord and plug installation be done at the manufacturing facilities of the equipment. This addition to the text will make it clear that a field installed cord and plug will be acceptable. (See proposals for 680.21(5)).
Panel Meeting Action: Reject
Panel Statement: The submitter's substantiation does not include the requrement for a cord-and-plug listed for the purpose.

Not all equipment is listed for cord-and-plug connection.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-69 Log #2722 NEC-P17 **Final Action: Reject**
(680.7(B))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:

680.7 Cord- and Plug-Connected Equipment. Fixed or stationary equipment other than an underwater luminaire (lighting fixture) for a permanently installed pool shall be permitted to be connected with a flexible cord to facilitate the removal or disconnection for maintenance or repair.

(A) Length. For other than storable pools, the flexible cord shall not exceed 900 mm (3 ft) in length.

~~(B) Equipment Grounding. The flexible cord shall be a copper equipment grounding conductor sized in accordance with 250.122 but not smaller than 12 AWG. The cord shall terminate in a grounding type attachment plug.~~

(B) Equipment Grounding.

(1) Lighting Assemblies for Storable Pools. Equipment grounding shall comply with 680.33.

(2) Other Equipment. The flexible cord shall have a copper equipment grounding conductor sized in accordance with 250.122 but not smaller than 12 AWG. The cord shall terminate in a grounding-type attachment plug.

Substantiation: The submitter requests and intends that this proposal for 680.7(B) be considered with the submitter's separate proposal for 680.33 to address the equipment grounding conductor requirements for lighting assemblies for storable pools.

Problem: 680.7(B) requires the jacketed flexible cords that are part of a (stationary) lighting assembly for storable pools to be sized in accordance with 250.122 but not smaller than 12 AWG. No other requirement in Article 680 Part I General or Part III Storable Pools modifies this requirement for lighting assemblies for a storable pool. The standard for Underwater Luminaires and Junction boxes, UL 676, requires the flexible cord extending away from the luminaire at the pool wall to be minimum 25 ft. Where involved safety issues remain addressed, permitting the flexible cord to be smaller than 12 AWG would provide for less expense for luminaire manufacturers and users and less bulk and weight for lighting assemblies that otherwise require only a smaller equipment grounding conductor in a flexible cord.

Substantiation for Proposal. 680.33 requires, in part, the luminaire at the storable pool wall to have no exposed metal parts. In the event of an electrical fault to grounded metal inside the luminaire, this internal grounded metal may exhibit a nonzero voltage potential with respect to the local earth or the pool water for the period of time until the circuit overcurrent protection device functions to de-energize the circuit supplying the luminaire. Because there are no exposed grounded metal parts on the luminaire and the luminaire has an impact-resistant lens and luminaire body, it is unlikely that a pool occupant will be able to contact a grounded metal part exhibiting any voltage potential that exists until the circuit overcurrent protection device de-energizes the circuit.

If a lens gasket or other water barrier part can fail and lead to the pool water flooding the luminaire, the Standard for Underwater Luminaires and Junction Boxes, UL 676, requires testing be completed to determine if the luminaire design limits the amount of electric current that conducts through the water and out of the luminaire into the pool. In the flooded condition, grounded metal inside the luminaire is sometimes relied upon to collect electric current from the water within the luminaire. This collected electric current conducts out of the luminaire through the equipment grounding conductor in the flexible cord. For some luminaire designs, and equipment grounding conductor in this flexible cord of less than 12 AWG is capable of enabling the luminaire to comply with this UL 676 escape current test requirement.

Therefore, the lighting assembly's equipment grounding conductor needs only to be sized to have the following characteristics:

(A) The conductor has impedance low enough to facilitate operation of the circuit overcurrent protection device.

(B) The conductor is capable of conducting the possible ground-fault current until operation of the circuit overcurrent protection device.

(C) The conductor has impedance low enough to enable the flooded luminaire to limit the amount of electric current that conducts out of the luminaire into the pool as specified in the Standard for Underwater Luminaires and Junction Boxes, UL 676.

Revising 680.7(B) as proposed excludes lighting assemblies for storable pools from the existing requirement that their equipment grounding conductors be 12 AWG or greater and, instead, refers the reader to (proposed revised) 680.33 to establish the minimum size of the equipment grounding conductor. The minimum size for an equipment grounding conductor in the flexible cords of an underwater luminaire is better addressed in 680.33.

Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 17-136.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:

BLEWITT, T.: The Panel indicated that the proposal would reduce the mechanical integrity of the equipment grounding conductor. However, UL 676, the Standard for Underwater Luminaires, addresses the likelihood of damage to cords and equipment grounding conductors.

17-70 Log #2724 NEC-P17 **Final Action: Reject**
(680.7(B))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise as follows:

680.7 Cord- and Plug-Connected Equipment. Fixed or stationary equipment other than an underwater luminaire (lighting fixture) for a permanently installed pool shall be permitted to be connected with a flexible cord to facilitate the removal or disconnection for maintenance or repair.

(A) Length. For other than storable pools, the flexible cord shall not exceed 900 mm (3 ft) in length.

~~(B) Equipment Grounding. The flexible cord shall be a copper equipment grounding conductor sized in accordance with 250.122 but not smaller than 12 AWG. The cord shall terminate in a grounding type attachment plug.~~

(B) Equipment Grounding.

(1) Lighting Assemblies for Storable Pools. Equipment grounding shall comply with 680.33.

(2) Other Equipment. The flexible cord shall have a copper equipment grounding conductor sized in accordance with 250.122 but not smaller than 12 AWG. The cord shall terminate in a grounding-type attachment plug.

Substantiation: The submitter requests and intends that this proposal for 680.7(B) be considered with the submitter's separate proposal for 680.33 to address the equipment grounding conductor requirements for lighting assemblies for storable pools.

Problem: Section 680.7(B) requires the jacketed flexible cords that are part of a (stationary) lighting assembly for storable pools to be provided with an equipment grounding conductor. No other requirement in Article 680 Part I General or Part III Storable Pools modifies this requirement for lighting assemblies for a storable pool. The Standard for Underwater Luminaires and Junction Boxes, UL 676, requires the flexible cord extending away from the luminaire at the pool wall to be minimum 25 ft. Some underwater luminaires for storable pools do not have non-current-carrying metal parts requiring grounding. Using flexible cord with an equipment grounding conductor when not required results in additional product bulk and weight and significant additional expense for both the lighting assembly manufacturers and users.

Substantiation for Proposal. It is unnecessary to require an equipment grounding conductor in the flexible cord extending from the luminaire at the pool wall if the luminaire does not have noncurrent-carrying metal parts requiring grounding. If provided, the equipment grounding conductor in the flexible cord for such a luminaire remains unconnected at the luminaire end.

If an entire 120 volt lighting assembly covered by 680.33(B) does not have noncurrent-carrying metal parts requiring grounding and, therefore, does not have an equipment grounding conductor, the manufacturer of a lighting assembly may choose to use an integral GFCI with a 2-wire polarized attachment plug instead of a GFCI with a 3-wire grounding-type attachment plug.

Revising 680.7(B) as proposed excludes lighting assemblies for storable pools from the existing requirement that their flexible cord have an equipment grounding conductor and, instead, refers the reader to (proposed revised) 680.33 to establish the need for an equipment grounding conductor. The need for an equipment grounding conductor in the flexible cord of an underwater luminaire is better addressed in 680.33.

Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 17-136.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:

BLEWITT, T.: The Panel indicated that the proposal would reduce the mechanical integrity of the equipment grounding conductor. However, UL 676, the Standard for Underwater Luminaires, addresses the likelihood of damage to cords and equipment grounding conductors.

17-71 Log #602 NEC-P17 **Final Action: Reject**
(680.8)

Submitter: Vincent Metallo, Sr., Baltimore County, MD / Rep. Baltimore County Electrical Inspections
Recommendation: Revise text to read:

680.8 Overhead Conductor Clearances (For Permanently Installed Swimming Pools.)

Substantiation: Add the wording for "permanently installed swimming pools." The intent of the rule was that long hand held extension type skimmer handles would have proper clearances from overhead lines when in use. This would remove the requirement that storable pools and outside hot tubs are governed by 680.8. Long hand held extension type skimmers are not used for storable pools or outside hot tubs.

Panel Meeting Action: Reject
Panel Statement: Long handle skimmers are also used on storable pools. This poses a safety hazard.

The panel disagrees with the substantiation that this is not the only reason for the requirement.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-72 Log #1549 NEC-P17 **Final Action: Accept**
(680.8)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 680 and revise text as shown for the affected NEC sections.

680.8, Table 680.8: Insulated Cables, 0–750 Volts to Ground, Supported on and Cabled Together with an ~~Effectively~~ Solidly Grounded Bare Messenger or ~~Effectively~~ Solidly Grounded Neutral Conductor.

Substantiation: 680.8, Table 680.8: The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." The proposal suggests replacing "effectively" with "solidly" to emphasize that cable has to be grounded solidly.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-73 Log #2898 NEC-P17 **Final Action: Reject**
(680.8 Exception (New))

Submitter: Jim M. Schmer, Boise, ID
Recommendation: Add an exception to read as follows:

680.8(A) Power. With respect... Figure 680.8.

Exception: Self-Contained Spa or Hot Tub. The minimum clearances for overhead conductors shall be reduced to 3.0 m (10 ft) above the water level for Self-Contained Spa(s) or Hot Tub(s).

Substantiation: There is no reason for the overhead conductors to be over 3.0 m (10 ft) above the water level, because when it comes to clean the spa/hot-tub you can reach across it.

Panel Meeting Action: Reject
Panel Statement: The panel disagrees with the substantiation that long handle skimmers are not used on spas or hot tubs. The methods of cleaning the spa or hot tub is not the only reason for this requirement.

This poses a safety hazard.

The panel does not want to decrease the level of safety already established.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-74 Log #2202 NEC-P17 **Final Action: Reject**
(680.9)

Submitter: Thomas L. Harman, Univ. of Houston Clear Lake
Recommendation: Replace the first sentence of 680.9 with the following:

"The circuits supplying Listed instantaneous water heaters employing resistance-type immersion electric heating elements shall be permitted to be subdivided into circuits as defined in 422-11(F)(3)."

Substantiation: Due to the technological advances in tankless (instantaneous) water heater design, I believe that 680.9 should not apply as presently written to instantaneous electric water heaters that are protected within their rating. If an instantaneous water heater is a listed (UL or other organization) product that has been field tested with a variety of supply circuits, there is no technical or safety reason to limit the branch circuit protection to 60 amperes or cause the loads to be subdivided to 48 amperes.

This requirement for water heaters was introduced in the 1975 code with the justification that heaters with "small internal conductors" might be protected by unspecified sizes of overcurrent devices.

The restrictions on overcurrent protection of water heaters in the present code are unnecessarily restrictive for the new types of instantaneous water heaters. No technical justification has been given to limit the loads to 48 amperes. Field experience and testing has indicated that the design and control of today's instantaneous water heaters allows for their safe installation as described in 422.11(F)(3).

For example, an instantaneous water heater with four elements drawing a maximum of 22 amperes each would require four 30-ampere branch circuits by the present wording of 680.9 in the NEC. A safer alternative would be to subdivide the loads using two elements each on a 60-ampere circuit as allowed by 422.11. Then, only two circuit breakers need to be turned off to disconnect the unit. Since the heater must be a listed appliance, the internal wiring would be sufficient for the 60-ampere circuits.

Panel Meeting Action: Reject

Panel Statement: Section 422.11 pertains to appliances in an occupancy. A swimming pool is not an occupancy.

An instantaneous water heater is listed to UL 499 and not listed for pool use. UL 1261 applies to water heaters for swimming pools.

See panel action and statement on Proposal 17-5.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-75 Log #580 NEC-P17 **Final Action: Reject**
(680.10)

Submitter: Michael Tooke, Temecula, CA

Recommendation: This article as currently written:

Underground wiring shall not be permitted under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool unless this wiring is necessary to supply the pool equipment permitted by this article. <u>Where space limitations prevent wiring from being routed a distance 1.5 m (5 ft)</u> or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as given in Table 680.10.

This article with the revision:

Underground wiring shall not be permitted under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool unless this wiring is necessary to supply the pool equipment permitted by this article. <u>Where space limitations prevent wiring that is necessary to supply the pool equipment from being routed a distance 1.5 m (5 ft)</u> or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as given in Table 680.10.

Substantiation: The first sentence in this article states that NO underground wiring is permitted within 1.5 m (5 ft) from the inside wall of the pool unless it is necessary to supply pool equipment. The next sentence needs clarification, as it is being interpreted that ANY underground wiring (even if it is not necessary to supply the pool equipment) is permitted within the 1.5 m (5 ft) area so long as it is installed in an approved raceway at the depths listed in the chart. By adding the phrase <u>that is necessary to supply the pool equipment</u> to this second sentence (where I indicated above), it clarifies the intent of the article.

Panel Meeting Action: Reject

Panel Statement: The intent of the Code is to permit, when space is limited, conduits from other systems to be buried within 5 ft of the pool in accordance with 680.10 and Table 680.10.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-76 Log #1634 NEC-P17 **Final Action: Accept**
(680.10)

Submitter: L. Keith Lofland, International Association of Electrical Inspectors

Recommendation: Revise text to read as follows:

680.10 Underground Wiring Location.

Underground wiring shall not be permitted under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool unless this wiring is necessary to supply pool equipment permitted by this article. Where space limitations prevent wiring from being routed a distance 1.5 m (5 ft) or more from the pool, such wiring shall be permitted where installed in <u>complete raceway systems of</u> rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as given in Table 680.10.

Substantiation: The main requirements of 680.10 requires underground wiring systems to be located a minimum of 1.5 m (5 ft) horizontally from the inside wall of a pool. Where space limitations prevent this, an allowance inside the restricted 1.5 m (5 ft) distance is permitted when employing specified raceway systems. Clarification is needed as to whether these specified raceway systems are required to be complete raceway systems (transformer pad to meterbase at building as an example) or does the underground wiring system simply have to be "sleeved" where the underground wiring system is located within the restricted 1.5 m (5 ft) area of the pool.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-77 Log #1907 NEC-P17 **Final Action: Accept**
(680.10)

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Recommendation: Revise text to read as follows:

680.10 Underground Wiring Location. Underground wiring shall not be permitted under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool unless this wiring is necessary to supply pool equipment permitted by this article. Where space limitations prevent wiring from being routed a distance 1.5 m (5 ft) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum ~~burial~~ <u>cover</u> depth shall be as given in Table 680.10.

Table 680.10 Minimum ~~Burial~~ <u>Cover</u> Depths

Wiring Method	Minimum ~~Burial~~ <u>Cover</u> mm	in.
Rigid metal conduit	150	6
Intermediate metal conduit	150	6
Nonmetallic raceways listed for direct burial without concrete encasement	450	18
Other approved raceways*	450	18

*Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) thick.

Substantiation: Changing the word "burial" to "cover" will provide consistency with 300.5 and will eliminate any confusion about whether the burial depth is measured to the bottom of the trench or to the fill above the raceway.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-78 Log #2956 NEC-P17 **Final Action: Reject**
(680.10)

Submitter: Philip Simmons, Simmons Electrical Services

Recommendation: Revise 680.10 to permit jacketed type MC that is listed for direct burial as follows:

680.10 Underground Wiring Location. Underground wiring shall not be permitted under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool unless this wiring is necessary to supply pool equipment permitted by this article.

Where space limitations prevent wiring from being routed a distance of 1.5 M (5 ft) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, <u>jacketed type MC cable that is listed for direct burial</u> , or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be given in Table 680.10.

Table 680.10 Minimum Burial Depths

Wiring Method	Minimum Burial mm	in..
Rigid metal conduit	150	6
Intermediate metal conduit	150	6
Nonmetallic raceways listed for direct burial without concrete encasement	450	18
Other approved raceways*	450	18
<u>Jacketed MC cable listed for direct burial</u>	<u>600</u>	<u>24</u>

*Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) thick.

Substantiation: Jacketed Type MC cable that is listed for direct burial is suitable for underground installations including those within 5 ft of a swimming pool. The burial depth that is proposed is taken from Table 300.5 as are the wiring methods and burial depths presently covered in Table 680.10. Jacketed Type MC cable that is listed for direct burial has both an outer jacket and a metallic armor that provides suitable mechanical protection for the cable in the proposed application.

A similar proposal was accepted by the Code Panel during the processing of the 2005 NEC but was later rejected. We think the installer should be given the opportunity to select a reliable and proven wiring method offered by Type MC cable that is suitable for the area. Most often, these conductors are not pulled out and replaced as offered by a raceway wiring method. These conductors generally stay in place for the life of the pool.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: With the highly corrosive nature of swimming pools, spas, and similar waters, the likelihood of the conductors becoming corroded is foreseeable.

Due to the construction method of MC cable, it is impossible to replace the conductors if damaged as foreseen. Therefore, the panel is against the use of MC cable in this application as it can create a hazardous condition to allow a wiring method to be employed that would encourage repairs on damaged conductors that would not meet the free-length requirement indicated under 300.14. Without a removable method, the conductors associated with MC cable will recreate a potentially hazardous condition.

The panel's actions are supported by 90.1(A,) which states that "the purpose of the NEC is to provide the practical safeguarding of persons and property from the hazards arising from the use of electricity." Section 90.1(B) further states, "compliance herewith and proper maintenance will result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use." As stated in 90.1(C), "This Code is not intended as a design specification...".

In reviewing the above three requirements in conjunction with considering the submitter's proposed changes to Article 680, the panel does not consider the NEC requirements being limited to new or remodeling conditions, but to cover maintenance concerns as well and the associated hazards that can arise from adoption of this proposal.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

BLEWITT, T.: Type MC cable is available with constructions designed to resist the chemical vapors likely in these installations. They are jacketed versions and are marked "Suitable for use in swimming pool motor circuits".

17-79 Log #900 NEC-P17 **Final Action: Reject**
(680.12)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

One or more ~~means~~ <u>switches or circuit breakers</u> to <u>simultaneously</u> disconnect all ungrounded conductors..." (remainder unchanged).

Substantiation: Edit. Type of disconnecting means should be specified. The definition of disconnecting means in Article 100 is broad enough to include plug/receptacle, terminals, links (668.13(B)), relays, etc. Most Code sections specific type. Different wording pertaining to the same thing may cause confusion. 600.6 specifies switch or circuit breaker.

Panel Meeting Action: Reject

Panel Statement: The disconnecting means includes switches, circuit breakers, and other means; see 680.7.

The panel disagrees with the submitter's substantiation. Section 668.13(B) does not apply to this section.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-80 Log #1635 NEC-P17 **Final Action: Accept**
(680.12)

Submitter: L. Keith Lofland, International Association of Electrical Inspectors

Recommendation: Add new text as follows:

680.12 Maintenance Disconnecting Means.

One or more means to disconnect all ungrounded conductors shall be provided for all utilization equipment other than lighting. Each means shall be readily accessible and within sight from its equipment <u>, and shall be located at least 1.5 m (5 ft) horizontally from the inside walls of a pool, spa, or hot tub.</u>

Substantiation: The required maintenance disconnecting means was required to be located at least 1.5 m (5 ft) horizontally from the inside wall of a pool in the 1999 edition of the National Electrical Code. During the reorganization of Article 680 for the 2002 NEC, this requirement was removed from 680.12. A proposal was submitted for the 2005 NEC to bring back the 1.5 m (5 ft) rule to 680.12 (See 2005 ROP 17-69 Log #1434 NEC-P17). This proposal was rejected with the panel statement stating that "It is already required by 680.22(C)."

680.12 "Maintenance Disconnecting Means" is located in Part I of Article 680. 680.22(C) "Switching Devices" is located in Part II for "Permanently Installed Pools." This makes 680.22(C) not applicable to such things as spas, hot tubs, fountains, etc. Even if 680.22(C) were applicable, not all maintenance disconnecting means fit into the category of a "Switching Device." This was made evident in the 2005 NEC with the addition of 240.24(A) for accessibility of overcurrent devices. These added the "2.0 m (6 ft 7 in.)" rule in Article 240 and not rely on 404.8(A) "Switches" for this requirement.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-81 Log #1366 NEC-P17 **Final Action: Accept**
(680.21)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete section (4) and make it an exception to (A)(1). Change the word "paragraph" to "section."

(A) Wiring Methods.

(1) Remain unchanged

<u>*Exception: In the interior of dwelling units, or in the interior of accessory buildings associated with a dwelling unit, any of the wiring methods recognized in Chapter 3 of this Code that comply with the provisions of this section shall be permitted. Where run in a cable assembly, the equipment grounding conductor shall be permitted to be uninsulated, but it shall be enclosed within the outer sheath of the cable assembly.*</u>

(2) Remain unchanged

(3) Remain unchanged

~~(4) One-Family Dwellings. In the interior of one-family dwellings, or in the interior of accessory buildings associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that comply with the provisions of this paragraph shall be permitted. Where run in a cable assembly, the equipment grounding conductor shall be permitted to be uninsulated, but it shall be enclosed within the outer sheath of the cable assembly.~~

<u>(4)</u> Cord-and-Plug Connections. Pool-associated motors shall be permitted to employ cord-and-plug connections. The flexible cord shall not exceed 900 mm (3 ft) in length. The flexible cord shall include an equipment grounding conductor sized in accordance with 250.122 and shall terminate in a grounding-type attachment plug.

Substantiation: Parenthetical 4 refers to compliance with a paragraph. Because of this, it makes the entire subsection a moot point! Parenthetical 4 is basically an exception to parenthetical 1. It should be written as such, not as a separate subsection. Also, the proper terminology is a section or a subsection, not a paragraph.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

YASENCHAK, R.: Most of the wiring methods mentioned in Chapter 3 are not allowed to be installed under Article 680.

17-82 Log #2122 NEC-P17 **Final Action: Reject**
(680.21(5))

Submitter: Bud Swathwood, Bud Swathwood Consulting

Recommendation: Add to 680.21(5) after the last sentence of paragraph (5):

The cord and plug may be factory installed or field installed and shall meet the requirements of 680.7(A), (B), and (C).

Substantiation: This proposal and the one for 680.7 will make it clear that the cord and plug may be either field or factory installed as long as the cord and plug meet the requirements of 680.7.

Panel Meeting Action: Reject

Panel Statement: The submitter's substantiation does not include the requirement for a cord-and-plug listed for the purpose.

Not all equipment is listed for cord-and-plug connection.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-83 Log #983 NEC-P17 **Final Action: Accept**
(680.21(A)(3))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Add "liquidtight flexible" ahead of "nonmetallic conduit".

Substantiation: Edit. The specific type of nonmetallic conduit should be specified.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-84 Log #1303 NEC-P17 **Final Action: Reject**
(680.22)

Submitter: Jim Davis, Electrical Education Services, LLC

Recommendation: Revise text as follows:

680.22 ~~Area Lighting, Receptacles, and Equipment~~ <u>Receptacles, Area Lighting, and Switching Devices</u> .

Substantiation: Delete the present title of 680.22 and replace as suggested above. The proposed title provides a more accurate description of text content and is also a more logical order of item listing, which aids code users when searching for specific rules in this section. This increases code usability.
Panel Meeting Action: Reject
Panel Statement: The present section title best describes the section text. The section is broader than limiting it to receptacles, area lighting, and switching devices.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-85 Log #3493 NEC-P17 **Final Action: Reject**
(680.22)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Alan Manche, Square D Co.
Recommendation: Revise NEC 680.22 by deleting the last sentence of 680.22(A)(5), insert 680.22(B) as provided below, and renumber existing (B) as (C). Revise NEC 680.22 with the additions (underlined) and deletions (strike through) as shown. The entire text of 680.22(A)(5) is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
(5) GFCI Protection. All 15- and 20-ampere, single-phase, 125-volt receptacles located within 6.0 m (20 ft) of the inside walls of a pool shall be protected by a ground-fault circuit interrupter. ~~Receptacles that supply pool pump motors and that are rated 15 or 20 amperes, 125 volts through 250 volts, single phase, shall be provided with GFCI protection.~~
(B) GFCI Protection. Outlets supplying pool pump motors from branch circuits with short-circuit and ground-fault protection rated 15 or 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.
Substantiation: This proposal reinstates the 1999 Code language requiring GFCI protection on single phase hard-wired pump motors. This is an important safety issue that should be reconsidered. Significant support exists as the panel has not provided an explanation as to why a cord and plug connected pump is more of a hazard than a hard-wired device as this is exactly what this requirement is stating. A similar proposal was made during the 2005 NEC cycle which the panel rejected, however, the Electrical Section supported a floor action to require single phase hard-wired pumps to be GFCI protected. The discussion on the floor supported the inclusion, but the wording was slightly flawed. This proposed wording change is identical to that proposed in the comment stage of the for the 2005 NEC by a supported of the original proposal.
The panel needs to provide an explanation for not requiring protection on a hard-wire system. The only difference between the hard-wired and the cord and plug pumps is the electrical connection, which is the receptacle interface. If the connection is the issue due to human interface or corrosion, it would appear the code panel would required a hard-wire connection of these pumps and restrict this installation from a receptacle connection. If the panel is truly concerned about electrical shock, which appears to be where industry support lies at this point, then why is a cord and plug connection treated differently than a hard-wired connection?
I urge the panel to address the electrical safety issue at hand with a solid electrical safety answer by requiring GFCI protection on single phase hard-wired pool pump motors on 15 and 20A branch circuits as proposed.
Panel Meeting Action: Reject
Panel Statement: The intent of the panel is to require GFCI protection on cord-and-plug-connected motors and not require GFCI protection on “hard-wired” motors.
The 1999 NEC did not require all motors to be GFCI protected. In “other than dwelling units”, motors whether cord-and-plug-connected or by direct connection were required to have GFCI protection. In the 2002 code-making cycle for the NEC, the requirement for direct connected “hard-wired” motors to be GFCI protected was removed for lack of substantiation to require it. In the 2005 code-making cycle for the NEC, proposals to require “hard-wired” motors to be GFCI protected were not only rejected by the panel but also at the general assembly on the floor.
The panel went back and reviewed the proposals and substantiations of the 1999 NEC on this subject. The panel has not been provided with sufficient substantiation to change the requirements at this time.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 8 Negative: 3
Explanation of Negative:
JHONSON, D.: I agree with the submitter’s point; the difference between a hard-wired pool pump motor and cord and plug connected pool pump motor is the receptacle connection.
The safety of the installation would be improved by requiring GFCI protection for both hard-wired and cord and plug connected pool pump motors. The common sense factor should be applied to the code. The majority of pool pump motors are installed outdoors at ground level. Any incident that may occur is potentially influenced during wet conditions.
ROCK, B.: GFCI protection of hard-wired pump motors in the 1999 NEC provides needed safety and these requirement should be reinstated in the 2008 NEC.
YASENCHAK, R.: The panel did not explain the removal of this requirement and has not provided substantiation for not reinstalling the limitation. I consider this a life safety hazard. These pump motors will be in a damp or wet location and should be considered a life safety hazard. This panel has accepted proposal 17-96 in which they stated “a life safety hazard could arise from a 30 volt outlet”, yet they are ignoring a 240V motor.

17-85a Log #CP1707 NEC-P17 **Final Action: Accept**
(680.22, 680.34, 680.43, 680.62 and 680.71)

Submitter: Code-Making Panel 17,
Recommendation: Change 680.22(A)(1) to read as follows:
“…shall be located at least 3.0m (10 ft) from the inside walls of the pool, or not less than 1.83 m (6 ft) from the inside walls of the pool if they meet the following…”
Change 680.22 (A)(2) to read as follows:
“Other receptacles shall be not less than 1.83 m.(6 ft.) from the inside walls of a pool.”
Change 680.22(A)(3) to read as follows:
“… a general purpose branch circuit shall be located not less than 1.83 m (6 ft) and not more than 6.0 m (20 ft) from the inside wall…”
Delete 680.22(A)(4)
Renumber 680.22(A)(5) and (6) to be (4) and (5)
Change 680.34 to read as follows:
“Receptacles shall not be located less than 1.83 m (6 ft.) from the inside walls’”
hange 680.43(A) to read as follows:
“…receptacle on a general purpose branch circuit shall be located not less than 1.83 m (6 ft.) and not exceeding 3.0 m (10 ft) from…”
Change 680.43(A)(1) to read as follows:
“Receptacles shall be located at least 1.83 m (6 ft) measured horizontally…”
Change 680.62(E) to read as follows:
“All receptacles within 1.83 m (6 ft) of a therapeutic tub shall be protected by a ground-fault circuit interrupter.”
Change 680.71 to read as follows:
“…all 125-volt, single-phase receptacles not exceeding 30 amperes and located within 1.83 m (6 ft) measured horizontally of the inside walls of a hydromassage tub be protected by a ground-fault circuit interrupter(s).”
Substantiation: The panel changed 5 ft to 6 ft and 10 ft to 6 ft for receptacle locations relative to distance to water to ensure consistency throughout Article 680. The 10 ft has been in the Code for many years, previous to the introduction of GFCI devices. The panel determined that 6 ft is sufficient. 6 ft correlates with standard power supply cord lengths.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-86 Log #1489 NEC-P17 **Final Action: Accept in Principle**
(680.22(A)(3))

Submitter: Jeffrey Slimmer, City of Maple Grove
Recommendation: Revise text to read as follows:
Dwelling Unit(s). Where a permanently installed pool is installed at a dwelling unit(s), no fewer than one 125-volt 15 amp or 20 amp receptacle on a general-purpose branch circuit shall be located not less than 1.5 m (5 ft) and not more than 6.0 m (20 ft) from the inside wall of pool.
Delete 680.22 (A)(4).
Substantiation: If the code allows the placement of a receptacle now within 10 ft for a swimming pool in a restricted space lot, why would this area be safer than a lot that has larger dimensions and could meet the minimum 10 ft requirement. By reducing the spacing to 5 ft, the code would not say that one area is better than the other.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-85a (Log #CP-1707).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-87 Log #1637 NEC-P17 **Final Action: Reject**
(680.22(A)(3) (New))

Submitter: L. Keith Lofland, International Association of Electrical Inspectors
Recommendation: Add new text as follows:
(3) Dwelling Unit(s) Where a permanently installed pool is installed at a dwelling unit(s), no fewer than one 125-volt 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located not less than 3.0 m (10 ft) from, and not more than 6.0 m (20 ft) from, the inside wall of the pool. This receptacle shall be located within sight of the pool and not more than 2.0 m (6 ft 6 in.) above the floor, platform, or grade level serving the pool.
Substantiation: This required receptacle is to be located within 3.0 m (10 ft) to 6.0 m (20 ft) from the pool to ensure that a convenience receptacle outlet is available and useable about the pool area. This also discourages the use of extension cords around pool areas. This required receptacle outlet is rendered useless in meeting this application if the homeowner or guest cannot see the required receptacle outlet. This added language would not only require the receptacle outlet within the 3.0 m (10 ft) to 6.0 m (20 ft) area of the pool, but

would require the receptacle outlet to be visible from the pool area. Existing language would allow the required receptacle outlet to be located on the opposite side of a fence from a pool as long as the receptacle outlet was within 3.0 m (10 ft) to 6.0 m (20 ft) of the pool and on the same grade level.
Panel Meeting Action: Reject
Panel Statement: It is not the intent of the Code to require the receptacle to be within sight of the pool. The panel rejects the substantiation. The submitter has has not provided adequate substantiation to establish a requirement "for within sight of the pool".
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-88 Log #1271 NEC-P17 **Final Action: Accept in Principle**
(680.22(A)(4))

Submitter: Mark Shapiro, Farmington Hills, MI
Recommendation: Revise the first sentence so as to permit a receptacle to be within up to 6 ft (a full 6 feet) of a pool with restrict space, rather than within 5 feet.
"Where a pool is within 3.0 m (10 ft) of a dwelling and the dimensions of the lot preclude meeting the required clearances, not more than one receptacle outlet shall be permitted if not less than ~~1.5 m (5 ft~~) <u>(1.83 m (6 ft)</u> measured horizontally from the inside wall of the pool.
Substantiation: This proposal differs from a companion proposal by requiring the receptacle to be 1.83 meters from the pool, rather than 1.8 meters. Where there is an issue of safety, extra digits are permitted in the metric conversion. UL standards also use 1.83 meters when referring to 6 foot cords.
The 2002 NEC's permission to allow parallel-blade receptacles within 5 feet of a pool reflects an attempt to balance the need for safety (safe clearances) versus the practical realities of lack of space in small areas.
Changing this dimension by 1 foot would still address the issue of small lots, but make the installation considerably safer.
With a receptacle 5 feet away from a pool, an appliance such as a radio, with a standard 6 foot long cord, could easily be in a position to fall into the water. If the receptacle is a full 6 feet away, it should at least pull the attachment plug out of the receptacle as it falls in.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-85a (Log #CP-1707).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-89 Log #1272 NEC-P17 **Final Action: Accept in Principle**
(680.22(A)(4))

Submitter: Mark Shapiro, Farmington Hills, MI
Recommendation: Revise the first sentence so as to permit a receptacle to be installed within up to 6 ft of a pool with restricted space, rather than within 5 feet.
"Where a pool is within 3.0 m (10 ft) of a dwelling and the dimensions of the lot preclude meeting the required clearances, not more than one receptacle outlet shall be permitted if not less than ~~1.5 m (5 ft)~~ <u>1.8 m (6 ft)</u> measured horizontally from the inside wall of the pool."
Substantiation: The 2002 NEC's permission to allow parallel-blade receptacles within 5 feet of a pool reflects an attempt to balance the practical realities of lack of space in small areas with the need for safety (safe clearances).
Changing this dimension by 1 foot would still recognize the problem of small lots, but make the installation considerably safer.
When people have cord and plug connected appliances, such as radios, near pools, too many of them are plugged in and placed near the pool. With a receptacles 5 feet away from a pool, an appliance with a standard 6 foot long cord would easily be in a position to fall into the water. If the receptacle is 6 feet away, it should at least pull the attachment plug out of the receptacle as it falls in.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action on Proposal 17-88.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-90 Log #1850 NEC-P17 **Final Action: Reject**
(680.22(A)(5))

Submitter: David Williams, Lansing, MI
Recommendation: Revise as follows:
(5) GFCI Protection. All 15- and 20-ampere, single-phase, 125-volt receptacles located within 6.0 m (20 ft) of the inside walls of a pool shall be protected by a ground-fault circuit interrupter. ~~Receptacles that supply pool pump motors and that are rated 15- or 20-amperes, 125 volts through 250 volts, single phase, shall be provided with GFCI protection~~ . All pool pump motors shall be protected by a ground-fault circuit interrupter.
Substantiation: The code requirement for GFCI protection of all pool pump motors was removed without any substantiation. GFCI protection is a requirement by the pool pump manufacturers that are listed in their instructions. Many contractors and homeowners do not read these very important safety instructions. Most electrical inspectors do not have the time to read the instructions to make sure that the installations are complying with the instructions, which are a part of the listing investigation. Please correct this error in the code and reinstate GFCI protection for all pool pump motors.
Panel Meeting Action: Reject
Panel Statement: The submitter proposed removing existing GFCI protection for pool pump motors connected to 250 V receptacles. The panel disagrees with the submitter's substantiation that pool pump manufacturers require GFCI protection as per their installation instructions.
In regards to the last sentence as proposed by the submitter, see panel action and statement on Proposal 17-85.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
YASENCHAK, R.: See my explanation of negative vote on Proposal 17-85.

17-91 Log #2196 NEC-P17 **Final Action: Reject**
(680.22(A)(5))

Submitter: James Paul, James R. Paul Jr. Electrical Contractor
Recommendation: Revise as follows:
Receptacles (<u>and Branch Circuits</u>) that supply pool pump motors...15 or 20 amps, 125-250 volts..., shall be provided with GFCI protection.
Substantiation: A problem exists that if someone chooses to "hardwire" a pool pump motor with liquidtight flex, etc., there is no requirement that circuit be GFI protected. A service switch would be the required disconnecting means. It may lead to a hazardous situation.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 17-85.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
YASENCHAK, R.: See my explanation of negative vote on Proposal 17-85.

17-92 Log #2542 NEC-P17 **Final Action: Reject**
(680.22(A)(5))

Submitter: Timothy D. Curry, Curry Electric, Inc.
Recommendation: Modify the second sentence as follows:
~~Receptacles~~ <u>Wiring</u> that supplies pool pump motors and is rated 15 and 20 amps, <u>120</u> to <u>240</u> volts, single phase, shall be provided with ground fault circuit interrupter protection for personnel.
Substantiation: This wording appeared in the 1999 NEC 680-6(D) after my proposal. It was even included in Fred Hartwell's draft rewrite of the 2002 code. Somehow, during the massive effort to reorganize the article, this requirement was dropped. I only recently became aware of the omission and am writing to correct it.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 17-85.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
YASENCHAK, R.: See my explanation of negative vote on Proposal 17-85.

17-93 Log #1367 NEC-P17 **Final Action: Reject**
(680.22(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete 680.22(C) and make it a new section.
~~680.22(C) Switching Devices. Switching devices shall be located at least 1.5 m (5 ft) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier. Alternatively, a switch that is listed as being acceptable for use within 1.5 m (5 ft) shall be permitted.~~
Substantiation: This proposal is being submitted in concert with a proposal to create a new section of Article 680, part II, keeping the same language as 680.26(C). The relocation of this requirement will be helpful in making the code a user-friendlier document. 680.22 should cover receptacles and luminaries, but switching devices should be located in a section of their own. The type of equipment addressed here is much more than just a typical general use snap switch, and because of the many, many items that meet the term "switching device", a new section should be created. The existing language is not only buried too deeply in the Code, but it also has a tendency of making the Code user think of luminaire switches, as opposed to other types of switches.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).
Deleting and making a new section would not improve usability of the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-94 Log #2641 NEC-P17 **Final Action: Reject**
(680.22(C))

Submitter: Michael Grubbs, City of Medford, Oregon
Recommendation: Add a new sentence at the end of the existing paragraph. "Circuit breakers shall not be used to control pool luminaires. GFI protection shall be provided ahead of all switching.
Substantiation: With the current code, a circuit breaker can be used to control a pool wet niche luminaire. I have witnessed several installations. This can and does lead to a very dangerous situation. Imagine an individual who is swimming and decides to turn on the pool light, he or she walks to the breaker panel, soaking wet, standing on concrete, and bare foot...anything can happen. Shock potential is very high with this person reaching into a pool control or breaker panel to activate the light. Even with GFI breaker installed to protect the wet niche the panel itself most likely is not GFI protected, therefore subjecting anybody to electric shock. I also note that the GFI protection should be installed ahead of the single pole switch, if a single pole switch is to be used. This makes sense to GFI protect all electrical aspects of the pool luminaire circuit. This suggestion is a simple remedy to a potentially dangerous condition. It puts positive language into the code requiring some other method of controlling the luminaire which would reduce personnel contact with non GFI protected equipment. If there is no record of an injury, I believe it is only a matter of time before someone is seriously hurt.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided adequate substantiation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
BLEWITT, T.: Only the insulated circuit breaker handle/face and grounded metal would be exposed to the user.

17-95 Log #1365 NEC-P17 **Final Action: Reject**
(680.22(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete 680.22(C) and make it a new section.
Switching Devices. Switching devices shall be located at least 1.5 m (5 ft) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier. Alternatively, a switch that is listed as being acceptable for use within 1.5 m (5 ft) shall be permitted.
Substantiation: This proposal is being submitted in concert with a proposal to delete subsection 680.22(C). The relocation of this requirement will be helpful in making the code a user-friendlier document. 680.22 should cover receptacles and luminaries, but switching devices should be located in a section of their own. The type of equipment addressed here is much more than just a typical general use snap switch, and because of the many, many items that meet the term "switching device," a new section should be created. The existing language is not only buried too deeply in the code, but it also has a tendency of making the Code user think of luminaire switches, as opposed to other types of switches.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).
Deleting and making a new section would not improve usability of the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-96 Log #389 NEC-P17 **Final Action: Accept in Principle**
(680.22(D))

Submitter: Bryan P. Holland, Holland Electric
Recommendation: Add new text as follows:
(D) Other Outlets. Other outlets containing circuits operating at 30 volts or more shall be not less than 3.0 m (10 ft) from the inside walls of the pool. Measurements shall be determined in accordance with 680.22(A)(6).
FPN: Other outlets may include, but are not limited to remote-control, signaling, fire alarm, and communications circuits.
Substantiation: A life safety hazard could arise from the use of other equipment used in the vicinity of a pool. The typical homeowner or pool user may not be aware of the potential hazards associated with communication and other "low-voltage" equipment and may wish to use this equipment near or at the pool if an outlet is also near or at the pool area. This restriction provides reasonable protection by increasing the distance from a pool at which these outlets may be installed.
Panel Meeting Action: Accept in Principle
Add new text as follows:
(D) Other Outlets. Other outlets shall be not less than 3.0 m (10 ft) from the inside walls of the pool. Measurements shall be determined in accordance with 680.22(A)(6).
FPN: Other outlets may include, but are not limited to, remote-control, signaling, fire alarm, and communications circuits.
Panel Statement: The panel agrees with the proposal that a safety hazard could arise. The panel is deleting the limitation to "30 V or more" as these outlets could also create a hazard.
The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-97 Log #2640 NEC-P17 **Final Action: Reject**
(680.22(D) (New))

Submitter: Michael Grubbs, City of Medford, Oregon
Recommendation: Add new text to read:
(D) Panelboards, Services, Pool Control Panels. Panelboards, services, pool control panels, and electrical equipment shall not be located closer than 3.0 meters (10 ft) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier.
Substantiation: I have chose to add a new paragraph, but left under section 680.22 because it is titled "Area Lighting, Receptacles and Equipment". Panelboards, services etc. fall under the heading of Equipment.
In the current code, there is no direction as to how close a pool can be installed to existing service equipment and panelboards, or new service equipment and panelboards. I believe that the danger to a person who is swimming in the pool is too great if they can touch the equipment while still in the water. This addition would put positive language into the code as to exactly how close the equipment can be to the pool. I chose 3 m, (10 ft) because you want the equipment out of reach from anybody still in the pool. 1.5 m (5 ft) would be too close. I believe this is a good addition to Article 680 of the NEC. If this proposal is accepted it may be relocated to another section of Article 680 if the CMP feels it is better served elsewhere.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Panelboards, pool control panels, and electrical equipment are already addressed in 680.22(C). The submitter is also referred to 680.8.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-98 Log #2421 NEC-P17 **Final Action: Reject**
(680.23)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.
Recommendation: Section 680.23 Underwater Luminaries (Lighting Fixtures).
Underwater Luminaries shall be NOT be installed in swimming pools.
Substantiation: The problem is that the Underwater Luminaries are "grounded" and there is electrical connections directly back to the high voltage primary side of the pole mounted or pad mounted or underground transformer. The details of this connection will be described later. This electrical connection from the underwater luminaries is a path for the continuously flowing stray current emanating from the utility companies multigrounded neutral electrical distribution systems that has the neutral connected to earth at least 4 times per mile. It is this current that enters the swimming pool to complete the electrical circuit. Bear in mind that the current may be flowing in the opposite direction. The direction is arbitrary.
In addition to the above multigrounded neutral electrical distribution system earthing, there is a second electrical circuit. The second circuit is the bastardized electrical connection between the high voltage primary neutral and the secondary neutral allowing primary high voltage electricity to flow directly into the residence, commercial or industrial facility using the secondary neutral which is bonded to the green equipment grounding conductor. Now this green color equipment grounding conductor is connected to the underwater luminaries metal frame allowing stray continuous flowing dangerous and hazardous current to complete the circuit.
What the above bastardize electrical connection does is allow the direct electrical connection of any lightning strike to nearby distribution system to flow directly into your own home and destroy the sensitive electrical equipment, which is not an act of God or Mother Nature, but directly attributable to the utility since 1932.
With the approval of Code Making Panel # 5's acceptance of the dangerous and hazardous multigrounded neutral distribution system, stray current has been measured flowing within swimming pools, hot tubs, showers, etc.
EPRI: "Created by the nation's electric utilities in 1973, EPRI is one of America's oldest and largest research consortia, with some 700 members and an annual budget of about $ 500 million. Linked to a global network of technical specialists, EPRI scientists and engineers develop innovative solutions to the world's toughest energy problems while expanding opportunities for a dynamic industry."
The Electric Power Research Institute (EPRI) an organization of utilities companies states that 40 to 60 percent of the return neutral current from the high voltage electrical circuit returns over or through the earth. We have measured as high as eighty-eight (88) percent of the neutral current returning over the earth and thus through dairies, back yards of homes through hot tubs, swimming pools, etc.
Ohm's Law states that **Voltage = Current X Resistance**

It is impossible to eliminate voltage gradients, except in your imagination as long as current is flowing continuously through the concrete and re-bar, which is happening in the real world.

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the equipotential bonding will have some resistance. The concrete is semi-conductive being wet and especially since the concrete had a metallic mesh within it. Any current flowing over and through the equipotential bonding will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

It must be noted that the human body has approximately the same internal resistance as a cow. The electrical principle is the same for equipotential planes and equipotential bonding. The following will show conclusively that there is high voltage electric current flowing in the earth. In one court case, there were 18.5 amperes on the high voltage phase conductor and only 3.5 amperes on the multigrounded neutral electrical distribution system. Simple math shows that 15 amperes of return current in that case was flowing uncontrolled over the earth.

In another case, an engineering firm measured 5 amperes returning to the substation flowing over the earth shocking persons. This is a current hot tub stray current case.

What happens is the swimming pool with its water soaked concrete is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. With the underwater luminaries connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the high voltage primary neutral thus completing the connection to the primary electrical circuit back to the substation completing the circuit.

Thus, in order to eliminate this dangerous and hazardous electrical connection the underwater luminaries must be completely removed.

There must be no electrical connection from the water in the pool back to the high voltage primary electrical system. The metallic frame of the pump motor need to be connected to the equipment grounding conductor and system in order to provide a low impedance path back to the service panel in order to trip the protective device, circuit breaker or fuse.

As the electrical load increases more and more stray current will enter the earth resulting in more and more shocking incidents. It is opined that as the electrical load increases to a critical level that may last for only an hour or a day, in any one multigrounded neutral electrical distribution system, someone will be electrocuted or drown because the persons muscles froze and they sank to the bottom of the pool and drowned. It may have already occurred.

No doubt, someone will make the comment that equipotential planes must do some good, must have a little advantage or may afford some help. That person needs to face the facts – **THERE IS NO BENEFIT IN ANY WAY, SHAPE OR FORM FROM EQUIPOTENTIAL PLANES, ONLY HARM.** The concept was based on erroneous ideas and conclusions and mis-understanding of electrical principles.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).

See panel action and statement on Proposal 17-99.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

CRIVELL, P.: 1. The proposal addresses a valid concern. There is a real potential for the underwater light fixture to act as part of the return path for unbalanced utility current.

2. Underwater luminaries should be required to be manufactured or installed in such a way as to eliminate the potential for underwater light fixtures from acting as part of the return path for unbalanced utility current (e.g., double insulation or isolation through an isolation transformer).

17-99 Log #2422 NEC-P17 **Final Action: Reject**
(680.23)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Delete Section 680.23 Underwater Luminaries (Lighting Fixtures).

Substantiation: The problem is that the Underwater Luminaries are "grounded" and there is electrical connections directly back to the high voltage primary side of the pole mounted or pad mounted or underground transformer. The details of this connection will be described later. This electrical connection from the underwater luminaries is a path for the continuously flowing stray current emanating from the utility companies multigrounded neutral electrical distribution systems that has the neutral connected to earth at least 4 times per mile. It is this current that enters the swimming pool to complete the electrical circuit. Bear in mind that the current may be flowing in the opposite direction. The direction is arbitrary.

In addition to the above multigrounded neutral electrical distribution system earthing, there is a second electrical circuit. The second circuit is the bastardized electrical connection between the high voltage primary neutral and the secondary neutral allowing primary high voltage electricity to flow directly into the residence, commercial or industrial facility using the secondary neutral which is bonded to the green equipment grounding conductor. Now this green color equipment grounding conductor is connected to the underwater luminaries metal frame allowing stray continuous flowing dangerous and hazardous current to complete the circuit.

What the above bastardize electrical connection does is allow the direct electrical connection of any lightning strike to nearby distribution system to flow directly into your own home and destroy the sensitive electrical equipment, which is not an act of God or Mother Nature, but directly attributable to the utility since 1932.

With the approval of Code Making Panel # 5's acceptance of the dangerous and hazardous multigrounded neutral distribution system, stray current has been measured flowing within swimming pools, hot tubs, showers, etc.

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The Electric Power Research Institute (EPRI) an organization of utilities companies states that 40 to 60 percent of the return neutral current from the high voltage electrical circuit returns over or through the earth. We have measured as high as eighty-eight (88) percent of the neutral current returning over the earth and thus through dairies, back yards of homes through hot tubs, swimming pools, etc.

Ohm's Law states that **Voltage = Current X Resistance**

It is impossible to eliminate voltage gradients, except in your imagination as long as current is flowing continuously through the concrete and re-bar, which is happening in the real world.

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the equipotential bonding will have some resistance. The concrete is semi-conductive being wet and especially since the concrete had a metallic mesh within it. Any current flowing over and through the equipotential bonding will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

It must be noted that the human body has approximately the same internal resistance as a cow. The electrical principle is the same for equipotential planes and equipotential bonding. The following will show conclusively that there is high voltage electric current flowing in the earth. In one court case, there were 18.5 amperes on the high voltage phase conductor and only 3.5 amperes on the multigrounded neutral electrical distribution system. Simple math shows that 15 amperes of return current in that case was flowing uncontrolled over the earth.

In another case, an engineering firm measured 5 amperes returning to the substation flowing over the earth shocking persons. This is a current hot tub stray current case.

What happens is the swimming pool with its water soaked concrete is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. With the underwater luminaries connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the high voltage primary neutral thus completing the connection to the primary electrical circuit back to the substation completing the circuit.

Thus, in order to eliminate this dangerous and hazardous electrical connection the underwater luminaries must be completely removed.

There must be no electrical connection from the water in the pool back to the high voltage primary electrical system. The metallic frame of the pump motor need to be connected to the equipment grounding conductor and system in order to provide a low impedance path back to the service panel in order to trip the protective device, circuit breaker or fuse.

As the electrical load increases more and more stray current will enter the earth resulting in more and more shocking incidents. It is opined that as the electrical load increases to a critical level that may last for only an hour or a day, in any one multigrounded neutral electrical distribution system, someone will be electrocuted or drown because the persons muscles froze and they sank to the bottom of the pool and drowned. It may have already occurred.

No doubt, someone will make the comment that equipotential planes must do some good, must have a little advantage or may afford some help. That person needs to face the facts – **THERE IS NO BENEFIT IN ANY WAY, SHAPE OR FORM FROM EQUIPOTENTIAL PLANES, ONLY HARM.** The concept was based on erroneous ideas and conclusions and mis-understanding of electrical principles.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree with the submitter's substantiation.

Removing underwater luminaires will not prevent stray currents. The Code provides for the establishment of an equipotential bonding grid to limit voltage gradients within the pool area.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

CRIVELL, P.: 1. The proposal addresses a valid concern. There is a real potential for the underwater light fixture to act as part of the return path for unbalanced utility current.

2. Underwater luminaries should be required to be manufactured or installed in such a way as to eliminate the potential for underwater light fixtures from acting as part of the return path for unbalanced utility current (e.g., double insulation or isolation through an isolation transformer).

17-100 Log #1228 NEC-P17 **Final Action: Reject**
(680.23(A)(3))

Submitter: Michael Dempsey, Municipal Code Inspections
Recommendation: Add text to read as follows:

<u>GFI protection of a underwater pool light shall not be fed from the load side of a GFI receptacle, and the GFCI shall only protect the underwater pool lighting fixtures.</u>

Substantiation: Added level of protection, will prevent GFI receptacles that are used for the general purpose receptacle and protecting the pool light, this will prevent something getting plugged into the receptacle that damages the GFI receptacle and its ability to trip if needed.
Panel Meeting Action: Reject
Panel Statement: This has been an accepted method for GFCI protection for underwater luminaires and there is no substantiation for changing existing methods. Further, there are manufacturers that have listed pool control panels with this configuration.

This is addressed by the listing requirements of GFCIs.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-101 Log #2725 NEC-P17 **Final Action: Accept**
(680.23(A)(6))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: [Changes proposed only for 680.23(A)(6). No change to other text of 680.23]

680.23 Underwater Luminaires (Lighting Fixtures). This section covers all luminaires (lighting fixtures) installed below the normal water level of the pool.

(A) General.

(6) Bottom-Mounted Luminaires (Fixtures). A luminaire (lighting fixture) facing upward shall <u>comply with either (a) or (b)</u> ; ~~have the lens adequately guarded to prevent contact by any person.~~

<u>(a) have the lens adequately guarded to prevent contact by any person.</u>

<u>(b) Be listed for use without a guard.</u>

Substantiation: 680.23(A)(6) does not provide for use of an upward-facing luminaire that has a lens with no guard and where the lens is, however, confirmed during evaluation for listing to withstand the loading and impact required of a lens guard. Luminaires with high-strength plastic lenses can be found suitable for this use. Luminaires with small diameter, particularly thick, glass lenses can be found suitable as well. Such alternative designs for upward-facing luminaires can be developed, listed, and used if 680.23(A)(6) is revised, such as proposed, to permit such alternate luminaire designs.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-102 Log #2726 NEC-P17 **Final Action: Reject**
(680.23(B))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: [Changes proposed below for 680.23(B)(1), (2), (3), (4), and (5)]

680.23 Underwater Luminaires (Lighting Fixtures). This section covers all luminaires (lighting fixtures) installed below the normal water level of the pool.

(B) Wet-Niche Luminaires (Fixtures).

(1) Forming Shells. Forming shells shall be installed for the mounting of all wet-niche underwater luminaires (fixtures) and shall be equipped with provisions for conduit entries. Metal parts of the luminaire (fixture) and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal. All forming shells used with nonmetallic conduit systems, other than those that are part of a listed ~~low voltage~~ lighting system not requiring grounding, shall include provisions for terminating an 8 AWG copper conductor.

(2) Wiring Extending Directly to the Forming Shell. Conduit shall be installed from the forming shell to a junction box or other enclosure conforming to the requirements in 680.24. Conduit shall be rigid metal, intermediate metal, liquidtight flexible nonmetallic, or rigid nonmetallic.

(a) Metal Conduit. Metal conduit shall be approved and shall be of brass or other approved corrosion-resistant metal.

(b) Nonmetallic Conduit. Where a nonmetallic conduit is used, an 8 AWG insulated solid or stranded copper bonding jumper shall be installed in this conduit unless a listed ~~low voltage~~ lighting system not requiring grounding is used. The bonding jumper shall be terminated in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure. The termination of the 8 AWG bonding jumper in the forming shell shall be covered with, or encapsulated in, a listed potting compound to protect the connection from the possible deteriorating effect of pool water.

(3) Equipment Grounding Provisions for <u>Wet-Niche Luminaires (Lighting Fixtures)</u> ~~Cords~~ , Wet-niche luminaires (lighting fixtures) <u>shall comply with either (a) or (b)</u> : ~~that are supplied by a flexible cord or cable shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of the cord or cable. This grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure. The grounding conductor shall not be smaller than the supply conductors and not smaller than 16 AWG.~~

<u>(a) Have all exposed non-current carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of the cord or cable. This grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure. The grounding conductor shall not be smaller than the supply conductors and not smaller than 16 AWG.</u>

<u>(b) Be a listed lighting system not requiring grounding.</u>

(4) Luminaire (Fixture) Grounding Terminations. The end of the flexible-cord jacket and the flexible-cord conductor terminations within a luminaire (fixture) shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the luminaire (fixture) through the cord or its conductors. ~~In addition~~ <u>If present,</u> the grounding connection within a luminaire (fixture) shall be similarly treated to protect such connection from the deteriorating effect of the pool water in the event of water entry into the luminaire (fixture).

(5) Luminaire (Fixture) Bonding. <u>Unless listed as not requiring bonding, the</u> ~~The~~ luminaire (fixture) shall be bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to remove the luminaire (fixture) from the forming shell. ~~Bonding shall not be required for luminaires (fixtures) that are listed for the application and have no non-current carrying metal parts.~~

Substantiation: Problem 1 - Luminaires Unnecessarily Limited to Low Voltage. 680.23(B)(1) provides for forming shells used with nonmetallic conduit systems do not have provisions for terminating an 8 AWG copper conductor if the forming shell is part of a listed low-voltage lighting system not requiring grounding. 680.23(B)(2)(b) also provides for not installing an 8 AWG bonding jumper in nonmetallic conduit extending directly to the forming shell if the forming shell is part of a listed low-voltage lighting system not requiring grounding.

These requirements unnecessarily prevent development and use of 120 V wet-niche luminaires that do not have an equipment grounding conductor, even if they do not have non-current-carrying metal parts requiring grounding. The unnecessary low voltage limitation prevents luminaire manufacturers, pool builders, owners, and users from gaining the benefits of 120 V luminaires that do not require or have provision for grounding.

Substantiation for Changes for Problem 1

Forming shells and 120 V wet-niche luminaire without a grounding conductor can be designed so "that, where the luminaire (fixture) is properly installed without a ground-fault circuit-interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping)" 1 . Test techniques for determining compliance with this NEC requirement are well developed and specified in the Standard for Underwater Lighting Fixtures and Junction Boxes, UL 676. during the evaluation for the required listing of wet-niche luminaires and forming shells, it can be determined if both an ungrounded 120 volt wet-niche luminaire and ungrounded mating forming shell(s) limit the risks of electric shock just as required for (a) low-voltage designs without a grounding conductor and (b) 120 V designs with a grounding conductor.

Forming shells and 120 V wet-niche luminaire designs without a grounding conductor and that limit the risks of electric shock can both be practical and comply with all safety requirements, including the lift for escape current conducting into the swimming pool water under damaged lens or gasket conditions, and other applicable fault conditions required in UL 676.

If replacement of the wet-niche luminaire is needed, the listed forming shell is marked where visible following installation to identify the luminaire(s) with which it is to be used, as required in UL 676. No wet-niche luminaires requiring grounded are permitted to be identified in the marking on a forming shell for use only with wet-niche luminaires not requiring grounding.

Problem 2 - Confusion Regarding Need for Equipment Grounding Conductor in Flexible Cord - 680.23(B)(3) requires all wet-niche luminaires supplied by a flexible cord to be grounded with an equipment grounding conductor within the cord. The text of 680.24(B)(4) implies there will always be an equipment grounding conductor in the flexible cord that terminates at a grounding connection within the wet-niche luminaire. The flexible cord of a listed low-voltage wet-niche luminaire not requiring grounding need not include an equipment grounding conductor. The flexible cord of a wet-niche luminaire is always 12 ft or more in length and is often longer, sometimes as much as 100 ft or more for installations needing greater length. Using flexible cord with an equipment grounding conductor when not required results in additional product bulk and weight and significant additional expense for both the lighting assembly manufacturers and users.

Substantiation for Changes for Problem 2 - 680.23(B)(1) and 680.23(B)(2)(b) already provide for a listed low-voltage lighting system not requiring grounding. The text of 680.23(B)(3) and 680.23(B)(4) requires or implies the presence of an equipment grounding conductor in the flexible cord for all wet-niche luminaires, including listed low-voltage lighting system not requiring grounding. To remove likely confusion about the need for an equipment grounding conductor in the flexible cord of listed low-voltage lighting system not requiring grounding, 680.23(B)(3) and 680.23(B)(4) need to be revised. The proposed text for 680.23(B)(3) and 680.23(B)(4) will avoid the confusion.

The term "low-voltage" has been purposely left out of the proposed phrase "Unless a listed lighting system not requiring grounding" for proposed 680.23(B)(3)(b). The substantiation for not including the term "low-voltage" is to provide for ungrounded 120 V luminaires, as described for problem 1 above.

Problem 3 - "No Non-Current-Carrying Metal Parts" Too Inclusive - 680.23(B)(5) requires a luminaire not requiring bonding to the forming shell to have "non-current-carrying metal parts." This results in the use of nonmetallic screws or other nonmetallic part securement means that often do not provide the needed or desired securement strength. It also precludes the use of other design-benefiting metal parts in plastic luminaires.

Substantiation for Changes for Problem 3 - As discussed in the comments for Problem 1 above, wet-niche luminaires without a grounding conductor can be designed so there is no shock hazard with any likely combination of fault conditions. Luminaires with ungrounded metal parts can be designed, and determined through testing for listing, to limit the risks of electric shock when these ungrounded metal parts are not bonding to the forming shell.

I present two of many examples of metal parts not requiring grounding and that should not be required to be bonded to the forming shell. First, manufacturers of plastic luminaires want to use metal screws to tightly secure and seal a front plastic bezel (face ring) over the lens and lens gasket. The screws secure to metal threaded inserts in or metal nuts behind an external plastic flange of the luminaire's plastic body. These metal fasteners do not penetrate into or come near the electrical enclosure. They are not capable of being inadvertently energized through the failure of electrical insulation, electrical spacings, or both. Another example would be a metal spring clip designed to hold a bi-pin lamp in its lampholder (such as a MR-16 type lamp). Even if not grounded or bonded to the forming shell, the plastic luminaire design may be such that, as confirmed through testing, it limits the escape current conducting into the swimming pool water under damaged lens or gasket conditions and other applicable fault conditions required in UL 676.

Where it is determined that the risks of electric shock are addressed by the luminaire design, designs with non-current-carrying metal parts not bonded to the forming shell can be permitted and should not be prevented by Section 680.23(B)(5).

Footnote

1 Quoted text is from 680.23(A)(1), Underwater Luminaires (Lighting Fixtures); General; Luminaire (Fixture) Design, Normal Operation.

Panel Meeting Action: Reject

Panel Statement: The proposal would reduce the mechanical integrity of the equipment grounding conductor. In addition, the proposal would permit 120 v luminaires.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

BLEWITT, T.: Panel should Accept in Principle in Part

UL 676, the Standard for Underwater Luminaires, specifies construction and performance requirements for line-voltage double-insulated luminaires. Therefore the 680.23(B)(2)(b) low voltage restriction for luminaires not requiring grounding is no longer necessary.

The revision to 680.23(B)(5) is therefore appropriate although it should be amended as follows:

(5) Luminaire (Fixture) Bonding. Unless listed with an approved system of double insulation, the luminaire (fixture) shall be bonded….

All other proposed revisions are editorial. Therefore, the Panel Statement regarding the mechanical integrity of the equipment grounding conductor may have been unintentionally included. The 16 AWG equipment grounding conductor already appears in 680.23(B)(3) and is not proposed to be changed.

Comment on Affirmative:

HIRSCH, B.: See comment for Proposal 17-64.

17-103 Log #2786 NEC-P17 **Final Action: Accept in Principle**
(680.23(B)(6))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

680.23 Underwater Luminaires (Lighting Fixtures) . This section covers all luminaires (lighting fixtures) installed below the normal water level of the pool.

(B) Wet-Niche Luminaires (Fixtures).

(1) through (5) [No change]

~~**(6) Servicing.** All luminaires shall be removable from the water for relamping or normal maintenance. Luminaires shall be installed in such a manner that personnel can reach the luminaire for relamping, maintenance, or inspection while on the deck or equivalently dry location.~~

(6) Servicing. All wet-niche luminaires shall be removable from the water for inspection, relamping, or other maintenance. The forming shell location and length of cord in the forming shell shall permit personnel to place the removed luminaire on the deck or other dry location for such maintenance. The luminaire maintenance location shall be accessible without entering or going in the pool water.

Substantiation: Problem/Substantiation - Servicing a Wet-Niche Luminaire – Section 680.23(B)(6) [new for 2005 NEC] requires it be possible to "reach the luminaire for relamping, maintenance, or inspection while on the deck or equivalently dry location."

This appears to require (or could easily be interpreted to require) that the wet-niche luminaire be located near enough to the deck (or equivalently dry location) that a service person can lie on the dry deck and then reach into the pool water and remove the luminaire from the forming shell.

Situation Requiring Clarified Text :

If 680.23(B)(6) is not intended to require the luminaire to be close enough to the deck to be reached from the deck, the present wording leaves it easy for readers to reach this conclusion and the wording should be revised to better avoid this confusion. Proposed 680.23(B)(6) more clearly describes the needed installation characteristics. It also draws the reader's attention to the need for the cord in the forming shell to have the needed length. It also proposes that the maintenance location be accessible without the service personnel having to enter or get over pool water, which helps the service person remain dry for the inspection, relamping, or other maintenance of the (electric) luminaire.

Situation Requiring Changed Requirement :

If 680.23(B)(6) is intended to require the luminaire to be close enough to the deck to be reached from the deck, this requirement should be changed to proposed 680.23(B)(6) for the following reasons.

Greater Depth Wanted or Needed - Historically and to date, designers for residential and commercial pools often locate the wet-niche luminaire at a depth greater than can be reached by a person lying on the deck. Pool designers and owners continue to want or need the greater depth. Wet-niche luminaires are mounted at the base of some walls to achieve a lighting effect across the bottom of the pool. Luminaires are also mounted a depths greater than can be reached for better viewing of pool occupants. One example is diving pools with 10 m diving platforms. These pools can often be as deep as 6 m. Illumination at the greater depths, typically at least 3 m luminaire depth, is required in order to view divers for possible injury and rescue. Greater luminaire depth for better viewing of pool occupants applies for many other pools too.

Difficulty of Removing/Reinstalling Luminaire from Deck - It is very difficult for service personnel lying on the deck to complete required tasks (a) through (c) below (with their immersed arms and hands).

(a) Remove the screw securing the wet-niche luminaire in and to the forming shell and then remove the luminaire and its coiled cord from the forming shell.

(b) Lift and place the luminaire on the deck.

(c) After completing relamping, maintenance, or inspection on the deck, recoil the cord and insert both the coiled cord and wet-niche luminaire back into the forming shell and align and tighten the securement screw with a tool.

The wet-niche luminaire will likely be installed with "the top of the luminaire (lens)" a minimum of "450 mm (18 in.) below the normal water level of the pool" to comply with 680.23(A)(5). The increased difficulty of completing the above tasks while lying on the deck can lead to improper reinstallation of the luminaire or damage to the luminaire or forming shell.

Entering Pool for Retrieving Luminaire is Reasonable and Common - It is reasonable to expect a person servicing a wet-niche luminaire to enter the pool to remove the de-energized luminaire from its forming shell and place it on the deck for maintenance. Sometimes, where needed, a service person with goggles will hold their breath while fully immersed to uninstall (and later reinstall) wet-niche luminaires that are not so deep as to prevent this approach. If needed, professional pool service personnel make use of underwater breathing equipment for servicing a wet-niche luminaire at a greater depth.

Service personnel often enter the pool (rather than work from the deck) to save significant time and effort, even if the luminaires can be reached from the deck. For example, service personnel will very likely use facemask, fins, weight belts, and underwater breathing equipment for pools with many luminaires (such as 35 luminaires in a 50 m racing pool).

Interpretation Not Clearly the Intent of Original Submitters - This requirement was initially proposed for the 2005 NEC (proposal 17-98 Log#3273 NEC-P17). A comment (Proposal 17-139 Log #1881 NEC-P17) with replacement text for proposed 680.23(B)(6) was subsequently received in the Receipt of Comments phase of 2005 NEC development. The replacement text was accepted and appears in the 2005 NEC. Nothing in the original proposal or the original and subsequent substantiation comments indicate an intent to require the luminaire to be close enough to the deck for it to be reached from the deck.

Panel Meeting Action: Accept in Principle

Revise text to read as follows:

680.23 Underwater Luminaires (Lighting Fixtures). This section covers all luminaires (lighting fixtures) installed below the normal water level of the pool.

(B) Wet-Niche Luminaires (Fixtures).

(1) through (5) [No change]

~~(6) Servicing. All luminaires shall be removable from the water for relamping or normal maintenance. Luminaires shall be installed in such a manner that personnel can reach the luminaire for relamping, maintenance, or inspection while on the deck or equivalently dry location.~~

(6) Servicing. All wet-niche luminaires shall be removable from the water for inspection, relamping, or other maintenance. The forming shell location and

length of cord in the forming shell shall permit personnel to place the removed luminaire on the deck or other dry location for such maintenance. The luminaire maintenance location shall be accessible without entering or going in the pool water.
Panel Statement: The panel does not accept the last sentence of the substantiation as it was, in fact, addressed in Proposal 17-98 of the 2005 ROP.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-104 Log #1026 NEC-P17 **Final Action: Reject**
(680.23(F))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Branch circuit wiring on the supply side of enclosures and junction boxes, connected to conduits run to wet-niche and no-niche luminaries (fixtures), and the field wiring compartments of dry-niche luminaries (fixtures) shall be installed using rigid galvanized steel conduit, intermediate metal conduit, rigid silicon bronze conduit, stainless steel conduit, liquidtight flexible metal conduit, rigid nonmetallic conduit, rigid nonmetallic conduit, or Type MI cable . Where installed on buildings or structures electrical metallic tubing shall be permitted. For one-family dwellings, the provisions of 680.21(A) shall be permitted .
Exception: Where ~~connecting to~~ liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit is used for connecting to transformers for underwater pool lights ~~liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted The~~ the length shall not exceed ...(remainder unchanged).
Substantiation: Liquidtight flexible metal conduit and Type MI cable appear to be as suitable as liquidtight flexible nonmetallic conduit. The present rquirement for rigid metal conduit includes aluminum, which may not be suitable in corrosive conditions. The exception permitting liquidtight flexible nonmetallic conduit for transformers (enclosures) is already permitted in (1). Type MI cable apepars to be a suitable wiring method, resistant to corrosion and physical damage and providing a reliable grounding means. The proposal part for one family dwellings correlates with 680.21(A)(4) and removes a conflict.
Panel Meeting Action: Reject
Panel Statement: The use of MI cable is not suitable for pool use; see 332.12.
LFMC has not been substantiated for use in pool locations as it is subject to physical damage. LFMC is also not suitable for pool locations due to the corrosive environment.
The substantiation is incorrect. Aluminum conduit would not meet the requirements of the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-105 Log #2342 NEC-P17 **Final Action: Reject**
(680.23(F)(1))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Add new text:
AC cable containing an insulated equipment grounding conductor sized in accordance with Table 250.122 but not less than #12 AWG.
Substantiation: AC cable with an equipment grounding conductor provides an equal or better ground path than MC cable and should be permitted.
Panel Meeting Action: Reject
Panel Statement: All AC cables do not contain an insulated grounding conductor for general-use branch circuits.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-106 Log #2957 NEC-P17 **Final Action: Reject**
(680.23(F)(1))

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 680.23(F)(1) as follows:
(F) Branch-Circuit Wiring.
(1) Wiring Methods. Branch-circuit wiring on the supply side of enclosure and junction boxes connected to conduits run to wet-niche and no-niche luminaires (fixtures), and the field wiring compartments of dry-niche luminaires (fixtures), shall be installed using rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, ~~or~~ rigid nonmetallic conduit or listed type MC cable having an impervious outer nonmetallic jacket . Where installed on buildings, electrical metallic tubing shall be permitted, and where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted.
Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit , ~~*or*~~ *liquidtight flexible nonmetallic conduit or listed Type MC cable having an impervious outer nonmetallic jacket shall be permitted. The length shall not exceed 1.8 m (6 ft) for any one length or exceed 3.0 m (10 ft) in total length used. Liquidtight flexible nonmetallic conduit, Type B (LFNC-B), shall be permitted in lengths longer than 1.8 m (6 ft).*
Substantiation: Listed Type MC cable that has an impervious out nonmetallic jacket is listed for direct earth burial as well as concrete encasement. The cable contains an insulated equipment grounding conductor and should be an excellent wiring method for the application in this section.
A similar proposal was accepted by the Code Panel during the processing of the 2005 NEC but was later rejected. We think the installer should be given the opportunity to select a reliable and proven wiring method offered by Type MC cable that is suitable for the area. Most often, these conductors are not pulled out and replaced as offered by a raceway wiring method. These conductors generally stay in place for the life of the pool.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 17-78.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-107 Log #2787 NEC-P17 **Final Action: Reject**
(680.23(F)(2))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: [Changes proposed only for 680.23(F) (2). No change to other text of 680.23]
680.23 Underwater Luminaires (Lighting Fixtures) . This section covers all luminaires (lighting fixtures) installed below the normal water level of the pool.
~~**(F)(2) Equipment Grounding.** Through-wall lighting assemblies, wet-niche, dry-niche, or no-niche luminaires (lighting fixtures) shall be connected to an insulated copper conductor equipment grounding conductor installed with the circuit conductors. The equipment grounding conductor shall be installed without joint or splice except as permitted in (F)(2)(a) and (F)(2)(b). The equipment grounding conductor shall be sized in accordance with Table 250.122 but shall not be smaller than 12 AWG~~
~~*Exception: An equipment grounding conductor between the wiring chamber of the secondary winding of a transformer and a junction box shall be sized in accordance with the overcurrent device in this circuit.*~~
(a) ~~If more than one underwater luminaire (lighting fixture) is supplied by the same branch circuit, the equipment grounding conductor, installed between the junction boxes, transformer enclosures, or other enclosures in the supply circuit to wet-niche luminaires 9fixtures), or between the field wiring compartments of dry-niche luminaires (fixtures) shall be permitted to be terminated on grounding terminals.~~
~~(b) If the underwater luminaire (lighting fixture) is supplied from a transformer, ground-fault circuit interrupter, clock-operated switch, or a manual snap switch that is located between the panelboard and a junction box connected to the conduit that extends directly to the underwater luminaire (lighting fixture) the equipment grounding conductor shall be permitted to terminate on grounding terminals on the transformer, ground-fault circuit interrupter, clock-operated switch enclosure, or an outlet box used to enclose a snap switch.~~
(F)(2) Equipment Grounding.
(a) Underwater Luminaires (lighting fixtures). Underwater luminaires (lighting fixtures) shall comply with (1) or (2):
(1) The luminaire shall be connected to an insulated copper equipment grounding conductor installed with the circuit conductors. The equipment grounding conductor shall be installed without joint or splice except as permitted in (F)(2)(b) and (F)(2)(c). The equipment grounding conductor shall be sized in accordance with Table 250.122 but shall not be smaller than 12 AWG
(2) The luminaire shall be listed as not requiring grounding.
Exception: An equipment grounding conductor between the wiring chamber of the secondary winding of a transformer and a junction box shall be sized in accordance with the overcurrent device in this circuit.
(b) Multiple Underwater Luminaires . If more than one underwater luminaire (lighting fixture) is supplied by the same branch circuit, the equipment grounding conductor, installed between the junction boxes, transformer enclosures, or other enclosures in the supply circuit to wet-niche luminaires (fixtures), or between the field wiring compartments of dry-niche luminaires (fixtures) shall be permitted to be terminated on grounding terminals.
(c) Enclosure Between Junction Box and Panelboard. If the underwater luminaire (lighting fixture) is supplied from a transformer, ground-fault circuit interrupter, clock-operated switch, or a manual snap switch that is located between the panelboard and a junction box connected to the conduit that extends directly to the underwater luminaire (lighting fixture); the equipment grounding conductor shall be permitted to terminate on grounding terminals on the transformer, ground-fault circuit interrupter, clock-operated switch enclosure, or an outlet box used to enclose a snap switch.
Substantiation: Problem 1 – Confusion Regarding Need to Connect Underwater Luminaire to Branch Circuit Equipment Grounding Conductor – Section 680.23(F)(2) requires an underwater luminaire to "be connected to an insulated copper equipment grounding conductor installed with the circuit conductors." Multiple requirements of Article 680 provide for the use of a low-voltage underwater luminaire not requiring grounding. If such a luminaire is not designed with provisions to connect to an equipment grounding conductor, installers and inspection authorities may question the capability of the luminaire to be installed in accordance with this 680.23(F)(2).

Alternatively, unnecessarily requiring a luminaire to have provision for connection to an equipment grounding conductor results in additional expense for both the lighting assembly manufacturers and users.

Substantiation for Changes for Problem 1 - It is unnecessary to require an underwater luminaire to be connected to a branch circuit equipment grounding conductor if the luminaire does not have non-current-carrying metal parts requiring grounding.

The terms "low-voltage" have been purposely left out of the proposed phrase "Unless listed as not requiring grounding" for list item (2) of proposed 680.23(F)(2)(a). 120 V luminaires without a grounding conductor can be designed so "that, where the luminaire (fixture) is properly installed without a ground-fault circuit-interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping)"1. Test techniques for determining compliance with this NEC requirement are well developed and specified in the Standard for Underwater Lighting Fixtures and Junction Boxes, UL 676. During the evaluation for the required listing [see 680.23(A)(8)] of the luminaire, it can be determined if both an ungrounded 120 volt luminaire limits the risks of electric shock and fire just as required for (a) low-voltage designs without a grounding conductor and (b) 120 V designs with a grounding conductor.

120 V luminaire designs without a grounding conductor and that limit the risks of electric shock and fire can both be practical and comply with all safety requirements, including the limit for escape current conducting into the swimming pool water under damaged lens or gasket conditions and other applicable fault conditions required in UL 676.

To provide for luminaires listed as not requiring grounding in proposed 680.23(F)(2), the submitter has

·Revised the first sentence of present 680.23(F)(2) and relocated the requirements of the first paragraph of present 680.23(F)(2) to become list item (1) of proposed 680.23(F)(2)(a).

·Added the new provision for luminaires listed as not requiring grounding as list item (2) of proposed 680.23(F)(2)(a).

·Relocated the present exception to stay associated with the same requirement that is now located in proposed 680.23(F)(2)(a).

·Renumbered paragraphs (a) and (b) in present 680.23(F)(2) to new numbering of proposed 680.23(F)(2)(b) and 680.23(F)(2)(c), respectively

·Added proposed titles to each of proposed 680.23(F)(2)(a), (b) and (c), to make it easier for readers to determine applicability of the requirement.

Except for providing for listed luminaires not requiring grounding, the submitter is not intending to otherwise change the requirements.

Footnote

1) Quoted text is from 680.23(A)(1), Underwater Luminaires (Lighting Fixtures); General; Luminaire (Fixture) Design, Normal Operation.

Problem/Substantiation 2 – Simplify Wording – To simplify wording for improved ease of reading, the submitter also proposes replacing the terms "Through-wall lighting assemblies, wet-niche, dry-niche, or no-niche luminaires (lighting fixtures)" in the first sentence of 680.23(F)(2) with "underwater luminaires (lighting fixtures)". Except for underwater luminaires not requiring grounding as discussed above, all types of underwater luminaires need to be connected to the branch circuit equipment grounding conductor. There does not appear to be the need to state all types of underwater luminaires in the requirement when they can be referred to collectively as underwater luminaires. This change appears in first sentence of proposed 680.23(F)(a).

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 17-102.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

BLEWITT, T.: Proposal should be Accepted in Principle

All revisions are editorial except for proposed new 680.23(F)(2)(a)(2) referencing a listed luminaire not requiring grounding.

UL 676, the Standard for Underwater Luminaires, specifies construction and performance requirements for line-voltage double-insulated luminaires. For such luminaires, the requirement for grounding is not necessary.

New 680.23(F)(2)(a)(2) should therefore read:

(2) The luminaire shall be listed with an approved system of double insulation.

Comment on Affirmative:

HIRSCH, B.: See comment for Proposal 17-64.

17-108 Log #2788 NEC-P17 **Final Action: Accept**
(680.24)

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

680.24 Junction Boxes and Electrical Enclosures for Transformers or Ground-Fault Circuit Interrupters.

(A) Junction Boxes. A junction box connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche luminaire (fixture) shall meet the requirements of this section.

(1) Construction. [No change]

(2) Installation. Where the luminaire (fixture) operates over 15 volts, the junction box location shall comply with (A)(2)(a) and (A)(2)(b). Where the luminaire (fixture) operates at ~~less than~~ 15 volts <u>or less</u> , the junction box location shall be permitted to comply with (A)(2)(c).

[Remainder of item (2) not changed]

[No change to 680.24(B), (C), (D), and (E)]

(F) Grounding. The <u>equipment grounding conductor terminals of a</u> junction box, transformer enclosure, or other enclosure in the supply circuit to a wet-niche or no-niche luminaire (lighting fixture) and the field-wiring chamber of a dry-niche luminaire (lighting fixture) shall be grounded to the equipment grounding terminal of the panelboard. This terminal shall be directly connected to the panelboard enclosure.

Substantiation: Problem/Substantiation 1 – Exactly 15 Volts not Addressed – The first two sentences of Section 680.24(A)(2) address installations where the luminaire operates both over or less than 15 volts but does not address installations where the luminaire operates at 15 volts. Proposed change for 680.24(A)(2) results in the 15 volt situation having to comply with the requirements presently assigned to the less than 15 volt situation. This is the association that is used elsewhere in Article 680, such as 680.23(A)(3) and (8), 680.33(A), and 680.51(A).

Problem/Substantiation 2 –Enclosure Can't be Grounded if Plastic

Section 680.24(F) refers to grounding a junction box, transformer enclosure, or other enclosure to the equipment grounding terminal of the panelboard. Swimming pool junction boxes, enclosures of transformers, and other enclosures can be entirely of plastic. Such enclosures may have only internal equipment grounding conductor terminals for the supply and load circuits and for grounding any internal non-current-carrying metal parts requiring grounding.

The submitter proposes revising 680.24(F) to require the grounding of the equipment grounding terminals of the swimming pool junction box (or other enclosure) rather than grounding the enclosure. All non-current-carrying metal parts requiring grounding will be bonded to the supply circuit equipment grounding conductor terminal as will all other equipment grounding conductor terminals in the enclosure.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-109 Log #1625 NEC-P17 **Final Action: Accept in Principle**
(680.24(A)(2))

Submitter: Tom Henry, Code Electrical Classes, Inc.

Recommendation: Add new text as follows:

Where the luminaire (fixture) operates at <u>15 volts or less</u> , the junction box location shall be permitted to comply with (A)(2)(C).

Substantiation: The way this section reads now it does not cover 15 volts, it's either over 15 volts or less than 15 volts. Confusing wording.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 17-108.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-110 Log #907 NEC-P17 **Final Action: Reject**
(680.24(A)(2)(a))

Submitter: Sam Arcadu, Princeton, NJ

Recommendation: New text with deletions removed.

(a) Vertical Spacing. The junction box shall be located not less than 200 mm (8 in.), measured from the inside of the bottom of the box, above the maximum pool water level.

Substantiation: This section needs clarification for field use. The NEC provides a definition of Maximum Water Level so it appears obvious that 200 mm (8 in.) will always be the greater elevation. If it is the intent of this section to assure that water will not seep into these junction boxes than a height of 8 in. above the maximum water level would always meet the intent.

Panel Meeting Action: Reject

Panel Statement: This proposal reduces the level of safety provided by the current Code.

The panel does not agree with the submitter's substantiation as this will not always be the greater elevation.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

BLEWITT, T.: Removal of the text specifying minimum 4 inch spacing above the ground level would inadvertently allow an installation of a box at ground level when the ground adjacent to the pool was 8 inches above the pool water level.

17-111 Log #364 NEC-P17 **Final Action: Accept**
(680.24(F))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read:
(F) Grounding. The junction box, transformer enclosure, or other enclosure in the supply circuit to a wet-niche or no-niche luminare (lighting fixture) and the field-wiring chamber of a dry-niche luminare (lighting fixture) shall be ~~grounded~~ connected to the equipment grounding terminal of the panelboard. This terminal shall be directly connected to the panelboard enclosure.
Substantiation: This is an editorial revision. The correct word to use here is connected, not grounded. The connection to the equipment grounding terminal is a bonding function that accomplishes the grounding required by this section.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-112 Log #1024 NEC-P17 **Final Action: Accept in Part**
(680.24(F))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise latter part of the first sentence...shall be ~~grounded~~ connected to the equipment grounding terminal (if available) of the panelboard or the metal enclosure of the branch circuit overcurrent protective device . Delete the last sentence.
Substantiation: Edit. All circuits may not be supplied by a panelboard; they may originate from a fused switch or a single circuit breaker. The last sentence is covered by other standards.
Panel Meeting Action: Accept in Part
Panel Statement: See panel action on Proposal 17-111.
The panel does not accept "equipment grounding terminal (if available) of the panelboard or the metal enclosure of the branch circuit overcurrent protective device . Delete the last sentence." as the submitter has not provided adequate substantiation.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-113 Log #901 NEC-P17 **Final Action: Accept in Part**
(680.25(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence to read as follows:
Feeders shall be installed in rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit.
Add exception: Aluminum conduit shall not be permitted in the pool area where subject to corrosion.
Substantiation: Liquidtight flexible metal conduit appears to be as suitable as liquidtight flexible nonmetallic conduit. Per 350.10(1). Chemical vapors may corrode aluminum.
Panel Meeting Action: Accept in Part
Revise 680.25(A) as follows:
(A) Wiring Methods. Feeders shall be installed in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Electrical metallic tubing shall be permitted where installed on or within a building, and electrical nonmetallic tubing shall be permitted where installed within a building.
Change existing exception to be Exception No. 1.
Add Exception No. 2 as follows:
Exception No. 2. Aluminum conduit shall not be permitted in the pool area where subject to corrosion.
Panel Statement: The panel rejects the submitter's proposed text to 680.25(A). LFMC has not been substantiated for use in pool locations as it is subject to physical damage. LFMC is also not suitable for pool locations due to the corrosive environment.
The panel accepts the new exception.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-114 Log #2958 NEC-P17 **Final Action: Reject**
(680.25(A))

Submitter: Philip Simmons, Simmons Electrical Services
Recommendation: Revise existing 680.25(A) as follows:
(A) Wiring Methods. Feeders installed outdoors shall be suitable for a wet or damp location. Feeders in a wet location shall be installed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, liquidtight flexible nonmetallic conduit, ~~or~~ rigid nonmetallic conduit , or Type MC cable with an impervious out jacket . Feeders installed in a dry or damp location shall be installed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, liquidtight flexible nonmetallic conduit, rigid nonmetallic conduit, or Type MC cable. ~~Electrical metallic tubing shall be permitted where installed on or within a building, and~~ Electrical nonmetallic tubing shall be permitted where installed within a building.
Substantiation: Type MC cable provides excellent protection from physical damage in compliance with the UL Product Safety Standard. Specific tests the cable must pass that are related to protection against physical damage include:
Impact Test
Crushing Test - All Cable
Crushing Test - Cable Marked for Direct Burial
Type MC cable must also pass a Fault Current Test and an Overload Current Test.
Ordinary Type MC cable is suitable for a dry and damp location. Type MC cable is also produced with an impervious PVC outer jacket and is suitable for installation in wet locations, for direct earth burial and for installation in poured concrete.
Obviously, wire installed in conduit or tubing is not required to pass these tests. Type MC cable is a superior wiring method and is superbly suited for installation as a feeder for panelboards used for applications covered by this section.
In addition, Type MC cable contains an insulated equipment grounding conductor that is in compliance with 250.122. This ensures a reliable and low impedance ground fault current return path. As a result, Type MC cable is an excellent wiring method for feeders to panelboards for swimming pool equipment.
Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: In accordance with 330.12(4), some MC cables are not suitable to be installed due to chlorine vapors.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
BLEWITT, T.: Type MC cable is available with constructions designed to resist the chemical vapors likely in these installations. There are jacketed versions and are marked "Suitable for use in swimming pool motor circuits."

17-114a Log #CP1708 NEC-P17 **Final Action: Accept**
(680.26)

TCC Action: The Technical Correlating Committee directs that the panel reconsider the proposal and rewrite the text to comply with the NEC Style Manual to correct items such as the mandatory text in Fine Print Notes No. 1 and No. 2, incomplete sentences, and correcting other NEC Style issues. This action will be considered by the panel as a public comment.
Submitter: Code-Making Panel 17,
Recommendation: Revise 680.26 to read as follows:
680.26 Equipotential Bonding.
(A) Performance. The equipotential bonding required by this section shall be installed to reduce voltage gradients in the pool area.
(B) Bonded Parts. The parts specified in 680.26(B)(1) through (B)(7) shall be bonded together using solid copper conductors, insulated covered, or bare, not smaller than 8 AWG or with rigid metal conduit of brass or other identified corrosion-resistant metal. Connections to bonded parts shall be made in accordance with 250.8. An 8 AWG or larger solid copper bonding conductor provided to reduce voltage gradients in the pool area shall not be required to be extended or attached to remote panelboards, service equipment, or electrodes.
(1) Conductive Pool Shells. Bonding to conductive pool shells shall be provided as specified in 680.26(B)(1)(a) or 680.26(B)(1)(b).
FPN No.1: Poured concrete, pneumatically applied or sprayed concrete, and concrete block with painted or plastered coatings are all considered conductive materials due to water permeability and porosity.
FPN No. 2: Vinyl liners and fiberglass composite shells are considered to be nonconductive materials.
a. Structural Reinforcing Steel. The structural reinforcing steel (rebar) of a concrete pool where the reinforcing rods are bonded together by steel tie wires or the equivalent. For structural reinforcing steel encapsulated in a nonconductive compound see 680.26(B)(1)(b).
b. Copper Conductor Grid.
1. Materials and Connections. The grid shall be constructed of minimum 8 AWG bare solid copper conductors. Conductors shall be bonded to each other at all points of crossing.
2. Grid Structure. The grid shall conform to the contour of the pool and the pool deck. It shall be arranged in a 300 mm (12 in.) by 300 mm (12 in.) network of conductors in a uniformly spaced perpendicular grid pattern with tolerance of 100 mm (4 in.).
3. Securing. The below-grade grid shall be secured within or under the pool. It shall follow the contours of the pool shell. When not part of the pool shell, it shall be secured no more than 150 mm (6 in.) from the outer contour of the pool shell.
(2) Perimeter Surfaces. Extends for 1 m (3 ft) horizontally beyond the inside walls of the pool. Includes unpaved surfaces as well as poured concrete and other types of paving. Bonding for perimeter surfaces shall be provided as specified in 680.26(B)(2)(a) or 680.26(B)(2)(b), and attached to the pool reinforcing steel or copper conductor grid at a minimum of four (4) points uniformly spaced around the perimeter of the pool. For non-conductive pool shells, bonding at four points shall not be required.

a. Structural Reinforcing Steel. Structural reinforcing steel shall be bonded in accordance with 680.26(B)(1)(a).

b. Alternate Means. Where structural reinforcing steel is not available copper conductors shall be utilized where the following conditions are met:

1. Materials and Connections. Bonding shall be by means of at least one minimum 8 AWG bare solid copper conductor. The conductors shall follow the contour of the perimeter surface. Approved splices shall be permitted. If only a single conductor is provided, it shall be 450 to 600 mm (18 to 24 inches) from the inside wall of the pool.

2. Securing. Perimeter surface equipotential bonding conductors shall be secured within or under the perimeter surface. An equipotential bonding conductor under the perimeter surface shall be considered secured when installed 100 to 150 mm (4 to 6 inches) below the subgrade.

(3) Metallic Components. All metallic parts of the pool structure, including reinforcing metal not addressed in 680.26(1)(a). Where reinforcing steel is encapsulated with a nonconductive compound it shall not be required to be bonded.

(4) Underwater Lighting. All metal forming shells and mounting brackets of no-niche luminaires (fixtures).

Exception: Listed low-voltage lighting systems with nonmetallic forming shells not requiring bonding.

(5) Metal Fittings. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts that are not over 100 mm (4 in.) in any dimension and do not penetrate into the pool structure more than 25 mm (1 in.) shall not require bonding.

(6) Electrical Equipment. Metal parts of electrical equipment associated with the pool water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors.

Exception: Metal parts of listed equipment incorporating an approved system of double insulation.

a. Double-Insulated Water Pump Motors. Where a double-insulated water-pump motor is installed under the provisions of this rule, a solid 8 AWG copper conductor that is of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the motor vicinity. Where there is no connection between the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit.

b. Pool Water Heaters. Pool water heaters shall be bonded. Those heaters having specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded and only those parts designated to be grounded shall be grounded.

(7) Metal Wiring Methods and Equipment. Metal-sheathed cables and raceways, metal piping, and all fixed metal parts that are within the following distances of the pool, except those separated from the pool by a permanent barrier, shall be bonded.

a. Within 1.5 m (5 ft) horizontally of the inside walls of the pool.

b. Within 3.7 m (12 ft) measured vertically above the maximum water level of the pool, or as measured vertically above any observation stands, towers, or platforms, or any diving structures.

Substantiation: The panel revised text to add clarity of intent.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-115 Log #2706 NEC-P17 **Final Action: Accept in Principle**
(680.26)

Submitter: Gary L. Siggins, Underwriters Laboratories Inc.

Recommendation: Revise as follows:

680.26 Equipotential Bonding.

(A) Performance. The equipotential bonding required by this section shall be installed to reduce ~~eliminate~~ voltage gradients in the pool area ~~as prescribed~~ . An 8 AWG or larger solid copper bonding conductor provided to reduce voltage gradients in the pool area shall not be required to be extended or attached to any remote panelboard, to service equipment, or to any electrode.

~~FPN: The 8 AWG or larger solid copper bonding conductor shall not be required to be extended or attached to any remote panelboard, service equipment, or any electrode.~~

(B) Bonded Parts. The parts specified in 680.26(B)(1) through (B)(~~5~~)(7) shall be bonded together ~~,~~ using solid copper conductors, insulated covered, or bare, not smaller than 8 AWG or with rigid metal conduit of brass or other identified corrosion-resistant metal. Connections to bonded parts shall be made in accordance with 250.8 .

(1) Conductive Pool Shells. Bonding to conductive pool shells shall be provided as specified in 680.26(B)(1)(a) and 680.26(B)(1)(b).

FPN: Poured concrete, pneumatically applied or sprayed concrete, and concrete block with painted or plastered coatings are all considered conductive materials due to water permeability and porosity.

FPN: Vinyl liners and fiberglass composite shells are considered to be nonconductive materials.

a. Structural Reinforcing Steel. The structural reinforcing steel (rebar) of a concrete pool where the reinforcing rods are bonded together by steel tie wires or the equivalent. Structural reinforcing steel encapsulated in a nonconductive compound shall not be relied upon for bonding .

b. Copper Conductor Grid.

1. Materials and Connections. The grid shall be constructed of minimum 8 AWG bare solid copper conductors. Conductors shall be bonded to each other at all points of crossing.

2. Grid Structure. The grid shall conform to the contour of the pool and the pool deck. It shall be arranged in a 300 mm (12 in.) by 300 mm (12 in.) network of conductors in a uniformly spaced perpendicular grid pattern with tolerance of 100 mm (4 in.).

3. Securing. The below-grade grid shall be secured within or under the pool. It shall follow the contours of the pool shell. When not part of the pool shell, it shall be secured no more than 150 mm (6 in.) from the outer contour of the pool shell.

(2) Perimeter Surfaces. Extends for 1 m (3 ft) horizontally beyond the inside walls of the pool. Includes unpaved surfaces as well as poured concrete and other types of paving. Bonding to walking surfaces shall be provided as specified in 680.26(B)(2)(a) or 680.26(B)(2)(b).

a. Structural Reinforcing Steel. In accordance with 680.26(B)(1)(a).

b. Copper Conductors.

1. Materials and Connections. Bonding shall be by means of at least one minimum 8 AWG bare solid copper conductor. The conductors shall follow the contour of the perimeter surface. Splices shall be permitted. If only a single conductor is provided, it shall be in the center of the perimeter surface.

2. Securing. A perimeter surface equipotential bonding conductor shall be secured within or under the perimeter surface. An equipotential bonding conductor under the perimeter surface shall be secured within 150 mm (6 inches) of the bottom of the paved surface.

(3)(~~1~~) Metallic Structural Components. All metallic parts of the pool structure, including reinforcing metal not addressed in 680.26(1)(a). Where reinforcing steel is encapsulated with a nonconductive compound it shall not be required to be bonded , ~~the reinforcing metal of the pool, shell, coping stones, and deck, shall be bonded. The usual steel tie wires shall be considered suitable for bonding the reinforcing steel together, and welding or special clamping shall not be required. These tie wires shall be made tight. If reenforcing steel is effectively insulated by an encapsulating nonconductive compound at the time of manufacture and installation, it shall not be required to be bonded. Where reinforcing steel of the pool shell or the reinforcing steel of coping stones and deck is encapsulated with a nonconductive compound or another conductive material is not available, provisions shall be made for an alternative means to eliminate voltage gradients that would otherwise be provided by unencapsulated, bonded reinforcing steel.~~

(4) ~~(2)~~ Underwater Lighting. All meal forming shells and mounting brackets of no-niche luminaires (fixtures) ~~shall be bonded unless a listed low voltage lighting system with nonmetallic forming shells not requiring bonding used.~~

Exception: Listed low-voltage lighting systems with nonmetallic forming shells not requiring bonding.

(5)(~~3~~) Metal Fittings. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts that are not over 100 mm (4 in.) in any dimension and do not penetrate into the pool structure more than 25 mm (1 in.) shall not require bonding.

(6)(~~4~~) Electrical Equipment. Metal parts of electrical equipment associated with the pool water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors ~~, shall be bonded. Accessible metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded by a direct connection to the equipotential bonding grid. The mans for grounding internal nonaccessible, noncurrent carrying metal parts shall be an equipment grounding conductor run with the power supply conductors in the case of motors supplied with a flexible cord, or a grounding terminal in the case of motors intended for permanent connection.~~

Exception: Metal parts of listed equipment incorporating an approved system of double insulation.

a. Double-Insulated Water Pump Motors . Where a double-insulated water-pump motor is installed under the provisions of this rule, a solid 8 AWG copper conductor that is of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the motor vicinity. Where there is no connection between the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit.

b. Pool Water Heaters. For pool water heaters rated at more than 50 amperes and having specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded and only those parts designated to be grounded shall be grounded.

(7) (~~5~~) Metal Wiring Methods and Equipment. Metal-sheathed cables and raceways, metal piping, and all fixed metal parts that are within the following distances of the pool, except those separated from the pool by a permanent barrier, shall be bonded.

(1) Within 1.5 m (5 ft) horizontally of the inside walls of the pool.

(2) Within 3.7 m (12 ft) measured vertically above the maximum water level of the pool, or as measured vertically above any observation stands, towers, or platforms, or any diving structures.

~~(C) Equipotential Bonding Grid. The parts specified in 680.26(B) shall be connected to an equipotential bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than 8 AWG or rigid metal conduit of~~

~~brass or other identified corrosion-resistant metal conduit. Connection shall be made by exothermic welding or by listed pressure connectors or clamps that are labeled as being suitable for the purpose and are of stainless steel, brass, coper, or coper alloy. The equipotential common bonding grid shall extend under paved walking surfaces for 1 m (3 ft) horizontally beyond the inside walls of the pool and shall be permitted to be any of the following:~~

~~(1) Structural Reinforcing Steel. The structural reinforcing steel of a concrete pool where the reinforcing rods are bonded together by the usual steel tie wires or the equivalent.~~

~~(2) Bolted or Welded Metal Pools. The wall of a bolted or welded metal pool.~~

~~(3) Alternate Means. This system shall be permitted to be constructed as specified in (a) through (c):~~

~~a. Materials and Connections. The grid shall be constructed of minimum 8 AWG bare solid copper conductors. Conductors shall be bonded to each other at all points of crossing. Connections shall be made as required by 680.26(D).~~

~~b. Grid Structure. The equipotential bonding grid shall cover the contour of the pool and the pool deck extending 1 m (3 ft) horizontally from the inside walls of the pool. the equipotential bonding grid shall be arranged in a 300 mm (12 in.) by 300 mm (12 in.) network of conductors in a uniformly spaced perpendicular grid pattern with tolerance of 100 mm (4 in.)~~

~~c. Securing. The below grade grid shall be secured within or under the pool and deck media.~~

~~(D) Connections. Where structural reenforcing steel or the walls of bolted or welded metal pool structures are used as an equipotential bonding grid for nonelectrical parts, the connections shall be made in accordance with 250..~~

~~(E) Pool Water Heaters. For pool water heaters rated at more than 50 amperes and having specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded and only those parts designated to be grounded shall be grounded.~~

Substantiation: Existing text is difficult to interpret, it intermingles requirements for what shall be bonded, how to bond to the various parts and how to connect the parts together. Existing text can also be interpreted to require the Alternative Means Grid of 680.26(C) for vinyl liner and glass fiber composite shell pools. As these shells are nonconductive, the Alternative means Grid will not improve their safety. Also, the bonding of pool perimeter surfaces is not clearly defined. Specifically:

680.26(A) FPN: FPNs cannot contain mandatory statements. It was edited and moved to 680.26(A). The text was revised slightly as equipotential bonding cannot eliminate all voltage gradients, it can only substantially reduce them.

680.26(B) - Section revised to more clearly detail what shall be bonded, and how to bond to each part. Separate subsections were created for conductive pool shells and the perimeter surfaces around the pool. FPNs added to clarify what types of pool shells need to be bonded.

Discussed during the 2005 cycle but not clearly addressed were pools that were unpaved within the 3 ft area around the edge of the pool. As the shock hazard potential exists with unpaved earth as well as concrete or various types of pavers, this section was expanded to clearly address bonding to all types of perimeter constructions. Proposed 680.26(B)(2)(b) text is a new bonding option. Due to the limited width of the perimeter surface, a single 8 AWG solid copper conductor should be sufficient to collect any ground currents circulating through the pool perimeter.

680.26(B)(2) - Subsection regarding underwater lighting moved so all electrical equipment requirements are now in one place.

680.26(B)(4) - Much of the existing text concerning the bonding of double insulated electrical equipment is not necessary and is proposed to be deleted. The construction requirements for double-insulated pumps do not allow inaccessible grounded metal to be in contact with the water. also, accessible metal parts could not be grounded and would be required to be insulated from internal grounded metal.

680.26(C) - This section moved to indicate this construction is used to bond to conductive pool shells only.

680.26(D) Connections - General connection requirements were moved to 680.26(B).

680.26(E) - This was moved to put all requirements for electrical equipment in one place.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-115a Log #CP1706 NEC-P17 **Final Action: Accept**

(680.26(A))

TCC Action: It was the action of the Technical Correlating Committee that this action be reconsidered and correlated with the action taken on Proposal 17-114a. This action will be considered by the panel as a public comment.

Submitter: Code-Making Panel 17,

Recommendation: Change 680.26(A) to read as follows:

(A) Performance The equipotential bonding required by this section shall be installed to reduce voltage gradients in the pool area as prescribed.

Substantiation: It was never the intent of the equipotential bonding grid to eliminate all voltage gradients.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-116 Log #2423 NEC-P17 **Final Action: Reject**

(680.26(A))

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Remove Section 680.26 (A).

Substantiation: This error entered the NEC during the proposed amendments stage for the 1984 Code. NFPA Document NEC-TCR-83-A on page 342, Proposal 20-31 (680-22, FPN – (New)), Log #1932. It was “Accepted in Principle” and with a vote of 8 for acceptance and one negative.

During the comment stage, (See NEC-TCD, page 413, Comments 20-21 & 20-22), it is opined that the two comments received did not address the issue.

The definition of “equipotential Bonding” as given in Section 680 (A) **Performance** is a complete misunderstanding and misconception as there is **no such item as an equipotential bonding that prevents a difference in voltage gradients from developing within the pool area. It is impossible to eliminate voltage gradients, except in your imagination as long as current is flowing continuously through the concrete and re-bar, which is happening in the real world.**

Ohm’s Law states that **Voltage = Current X Resistance**

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the equipotential bonding will have some resistance. The concrete is semi-conductive being wet and especially since the concrete had a metallic mesh within it. Any current flowing over and through the equipotential bonding will produce a voltage per Ohm’s Law. This has been proven by testing as will be described below.

With the approval of Code Making Panel # 5’s acceptance of the dangerous and hazardous multigrounded neutral distribution system, stray current has been measured flowing within swimming pools, hot tubs, showers, etc.

EPRI: “Created by the nation’s electric utilities in 1973, EPRI is one of America’s oldest and largest research consortia, with some 700 members and an annual budget of about $ 500 million. Linked to a global network of technical specialists, EPRI scientists and engineers develop innovative solutions to the world’s toughest energy problems while expanding opportunities for a dynamic industry.”

The Electric Power Research Institute (EPRI) an organization of utilities companies states that 40 to 60 percent of the return neutral current from the high voltage electrical circuit returns over or through the earth. We have measured as high as eighty-eight (88) percent of the neutral current returning over the earth and thus through dairies, back yards of homes through hot tubs, swimming pools, etc.

It must be noted that the human body has approximately the same internal resistance as a cow. The electrical principle is the same for equipotential planes and equipotential bonding.

Mr. Lawrence C Neubauer has conducted investigations and has measured stray current in over 600 – 800 dairies. To prove there is a voltage in an equipotential plane or in the case of Article 680, equipotential bonding, Mr. Neubauer took a large plastic container, which is an insulator. He placed a coil of bare copper under the bucket in intimate contact with the concrete. Next, he placed a coil of copper in the bottom of the plastic bucket. A milliammeter was connected between the coil in the bottom of the bucket and the coil of copper “connected” to the concrete holding area where the equipotential plane had been installed.

The plastic bucket was filled with water. As the cows entered they attempted to drink out of the plastic bucket, however, it was evident they received an electrical shock as they jerked their heads out of the water.

The electrical circuit was from the equipotential bonding, which supposedly prevents a difference in voltage from developing, up the legs of the cow, through the body to the tongue, into the water, through the copper in to bottom of the plastic bucket, to the milliammeter and finally to the copper which is in intimate contact with the concrete equipotential plane. Readings of over a milliamp were recorded on VHS.

Now instead of the cow substitute a human.

The American Society of Agricultural Engineers (ASAE) EP473-2001, Equipotential Planes in Animal Containment Areas is incorrect as it is producing a false sense of security when actually the equipotential plane is harming the animals and humans are also animals in the same classification.

How did the misunderstood equipotential planes get into the NEC? In the early 1980s it is opined that some agriculture professors read IEEE Standard 80 and being familiar with cow shit and not electrical engineering, misunderstood IEEE Standard 80. Four Ag professors wrote three papers on equipotential planes and dairies.

In 1985 the misinformed Ad Hoc Subcommittee on Electrical Grounding of Agriculture Buildings submitted the above inaccurate, ill-conceived proposal # 19-16, Log # 1363, 1985 ROP for the 1987 NEC, which since it came from a supposable informed subcommittee, was adopted by Panel 19 Unanimously Affirmative. Now it is hoped that none of the original members of the above groups are still on Panel 19, because it is against human nature to disown a concept supported previously.

It is opined that Gustafson, et al and the NEC Making Panels did not take into consideration the purpose of the IEEE Standard 80, "Guide for Safety in AC Substation Grounding".

IEEE Standard 80 states:

"1.2 Purpose. The intent of this guide is to provide guidance and information pertinent to safe grounding practices in ac substation design.

"The specific proposes of this guide are to

a) Establish, as a basis for design, the safe limits of potential differences that can exist in a substation under fault conditions between points that can be contacted by the human body.

b) Review substation grounding practices with special reference to safety, and develop criteria for a safe design.

c) Provide a procedure for the design of practical grounding systems, based on these criteria.

d) Develop analytical methods as an aid in the understanding and solution of typical gradient problems."

It is very clear that Clause 1.2 a) states that IEEE Standard 80 is under **fault conditions.** Stray current or if one insists, stray voltage, exists under normal steady state, continuous operating conditions, not fault conditions.

Professor Robert J. Gustafson writes, "Gradient control is used by the electrical industry to minimize the risk of hazardous step (foot-to-foot) and touch (hand-to-foot) potentials **under fault conditions** (emphases by author) at substations and around electrical equipment. In addition to protecting people, animals, and equipment **under fault or lightning conditions** , proper equipotential systems in livestock facilities can solve stray voltage/current problems." The concept of "equipotential planes" made up by the same Ag professors is totally false. Fault currents in electrical substations are several magnitudes larger than any fault current that will be found on dairy farms. In substations we expect hundreds of thousands of amperes where on a dairy farm in the middle of nowhere maybe have 5,000 amperes for seconds until the protective device such as the circuit breaker or fuse operates. They are two very different conditions, fault current and steady state normal flowing stray current, and are not related.

Now compare that small amount of FAULT current for a few seconds to the continuous flow of steady state stray neutral current flowing continuously from the dangerous and hazardous multigrounded neutral electrical distribution system which is flowing across the equipotential plane continuously causing the dairy cow harm. Electric Power Research Institute states that 40 to 60 percent of the neutral return current will flow over the earth.

It is evident that this is an enormous, immense, huge, gigantic, colossal, mammoth, tremendous, stupendous, gargantuan, mis-application of an electrical principle that has caused untold harm to dairy cows and to humans.

Now remember, the cow and the human are both from the same classification, Mammals, and they both have approximately the same internal resistance. The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers.

What happens is the equipotential plane is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. This equipotential plane is connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the primary neutral thus completing the connection to the primary electrical circuit back to the transformer.

What should be done is to connect all conductive metallic surfaces that can become energized to the grounding system through bonding conductors. No more, no less just as would be done in a home or industry.

No doubt, someone will make the comment that equipotential planes must do some good, must have a little advantage or may afford some help. That person needs to face the facts – **THERE IS NO BENEFIT IN ANY WAY, SHAPE OR FORM FROM EQUIPOTENTIAL PLANES, ONLY HARM.** The concept was based on erroneous ideas and conclusions and mis-understanding of electrical principles.

If equipotential planes were such a great idea, why not require the basements and garage floors to have equipotential planes in case someone walked on the floor in their bare feet? Now watch some panel think that this is a great idea. A fool is born every code cycle.

The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree with the submitter's substantiation.

The Code provides for the establishment of an equipotential bonding grid to limit voltage gradients within the pool area. It is not the intent of the equipotential bonding grid to limit voltage gradients to 0 V but to reduce them.

See panel action on Proposal 17-115a (Log #CP-1706).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-117 Log #2424 NEC-P17 **Final Action: Reject**
(680.26(B), (B)(1), (B)(2), (B)(3), & (B)(5))

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Remove Sections 680.26 (B) and (B) (1) and (B) (2) and (B) (3) and (B) (5)

Retain Section (B) (4)

Renumber

Substantiation: With the advent of the GFCI requirement there is no longer the fear of dropping a 120-volt powered electric device into a pool such as a radio or heating iron. Thus, there is no need to connect all metal within the pool area together and connect the bond back to the service entrance panel in order to trip an electric fault that yesterday would and could occur in a pool.

Today we do not allow receptacles within the pool area as we did previously. The excessive bonding of metallic parts that could not possibly become energized is obsolete and non-functioning. A carry over from other times.

Only metallic boxes that contain energized conductors need to be "grounded" today.

Today we have discovered a great secret that there is a constant flow of uncontrolled dangerous and hazardous stray current emanating from NOT the house wiring installed under the safe NEC, but from the utility.

This error entered the NEC during the proposed amendments stage for the 1984 Code. NFPA Document NEC-TCR-83-A on page 342, Proposal 20-31 (680-22, FPN – (New)), Log #1932. It was "Accepted in Principle" and with a vote of 8 for acceptance and one negative.

During the comment stage, (See NEC-TCD, page 413, Comments 20-21 & 20-22), it is opined that the two comments received did not address the issue.

The definition of "equipotential Bonding" as given in Section 680 (A) **Performance** is a complete misunderstanding and misconception as there is **no such item as an equipotential bonding that prevents a difference in voltage gradients from developing within the pool area. It is impossible to eliminate voltage gradients, except in your imagination as long as current is flowing continuously through the concrete and re-bar, which is happening in the real world.**

Ohm's Law states that **Voltage = Current X Resistance**

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the equipotential bonding will have some resistance. The concrete is semi-conductive being wet and especially since the concrete had a metallic mesh within it. Any current flowing over and through the equipotential bonding will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

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The plastic bucket was filled with water. As the cows entered they attempted to drink out of the plastic bucket, however, it was evident they received an electrical shock as they jerked their heads out of the water.

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"The specific proposes of this guide are to

a) Establish, as a basis for design, the safe limits of potential differences that can exist in a substation under fault conditions between points that can be contacted by the human body.

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Professor Robert J. Gustafson writes, "Gradient control is used by the electrical industry to minimize the risk of hazardous step (foot-to-foot) and touch (hand-to-foot) potentials **under fault conditions** (emphases by author) at substations and around electrical equipment. In addition to protecting people, animals, and equipment **under fault or lightning conditions** , proper equipotential systems in livestock facilities can solve stray voltage/current problems." The concept of "equipotential planes" made up by the same Ag professors is totally false.

Fault currents in electrical substations are several magnitudes larger than any fault current that will be found on dairy farms. In substations we expect hundreds of thousands of amperes where on a dairy farm in the middle of nowhere maybe have 5,000 amperes for seconds until the protective device such as the circuit breaker or fuse operates. They are two very different conditions, fault current and steady state normal flowing stray current, and are not related.

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The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers.

Panel Meeting Action: Reject

Panel Statement: The panel does not agree with the submitter's substantiation.

The Code provides for the establishment of an equipotential bonding grid to limit voltage gradients within the pool area. It is not the intent of the equipotential bonding grid to limit voltage gradients to 0 V but to reduce them.

See panel action on Proposal 17-115a (Log #CP-1706).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-118 Log #3137 NEC-P17 **Final Action: Accept in Part**
(680.26(B)(1))

Submitter: Eric Stromberg, Stromberg Engineering, Inc.

Recommendation: Revise text:

All metallic parts of the pool structure, including the reinforcing metal of the pool shell, coping stones, and deck, shall be bonded. The usual steel tie wires shall be considered suitable for bonding the reinforcing steel together, and welding or special clamping shall not be required. These tie wires shall be made tight. If reinforcing steel is effectively insulated by an encapsulating nonconductive compound at the time of manufacture and installation, <u>enough of the nonconductive compound shall be scraped off in order to completely bond every piece together to form a faraday cage.</u> ~~it shall not be required to be bonded. Where reinforcing steel of the pool shell or the reinforcing steel of coping stones and deck is encapsulated with a nonconductive compound or another conductive material is not available, provisions shall be made for an alternative means to eliminate voltage gradients that would otherwise be provided by unencapsulated, bonded reinforcing steel.~~ <u>Where fiberglass reinforced concrete is used, without reinforcing bar, a metal mesh must be installed in the concrete and bonded to the parts specified in 680.26(B)(1) through (B)(5) accordingly.</u>

Substantiation: People all over the country are not able to use their pools due to receiving shocks. In most cases, it is found that the grounding system has voltage on it, from the utility. The pools with standard rebar in them are less prone to shocking swimmers because they provide a faraday cage that protects the swimmers. Epoxy coated rebar, that is not bonded together, does not provide this protection. Fiberglass reinforced concrete offers no protection at all, and shouldn't be used for swimming pools.

Panel Meeting Action: Accept in Part

Panel Statement: Removing the protective coating will jeopardize the structural integrity of the pool.

The panel addressed the last sentence of the submitter's recommendation. See action on Proposal 17-114a (Log #CP-1708).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-119 Log #2789 NEC-P17 **Final Action: Reject**
(680.26(B)(2))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.

Recommendation: [Changes proposed only for 680.23(B)(2). No change to other text of 680.26]

680.26 Equipotential Bonding

(B) Bonded Parts.

(2) Underwater Luminaires. All ~~metal~~ forming shells and mounting brackets of no-niche luminaires (fixtures) shall be bonded unless a listed ~~low-voltage~~ lighting system with nonmetallic forming shells not requiring bonding is used.

Substantiation: Problem/Substantiation 1 – Reinforce that nonmetallic forming shells shall be bonded – Some nonmetallic forming shells are required to be bonded to the pool bonding grid. The phrase "unless a listed low-voltage lighting system with nonmetallic forming shells not requiring bonding is used" does not literally permit one leaving a nonmetallic forming shell requiring bonding not bonded to the pool bonding grid. Even so, I propose that removing the term "metal" in 680.26(B)(2) would help dissuade the reader from incorrectly thinking that metal forming shells need to be bonded and (by 680.26(B)(2) not mentioning nonmetallic forming shells) that nonmetallic forming shells do not need to be bonded.

Problem 2 - Luminaires Unnecessarily Limited to Low Voltage. Section 680.26(B)(2) provides for forming shells and mounting brackets to not be bonded to the pool bonding grid if they are part of a listed low-voltage lighting system with nonmetallic forming shells not requiring bonding.

This requirement unnecessarily prevents development and use of 120 volt lighting systems with nonmetallic forming shells or mounting brackets that do not have provision for connecting to the pool bonding grid, even if the luminaires and forming shells or mounting brackets do not have non-current-carrying metal parts requiring grounding or bonding or that can bypass the equipotential bonding grid. The unnecessary low voltage limitation prevents luminaire manufacturers, pool builders, owners, and users from gaining the benefits of 120 V luminaires and nonmetallic forming shells or mounting brackets that do not require or have provision for bonding to the pool bonding grid.

Substantiation for Changes for Problem 2

All comments below referring to wet-niche luminaires and forming shells are intended to also apply to no-niche luminaires and their mounting brackets. For brevity, only the wet-niche luminaire and forming shell products are used for the comments.

120 V wet-niche luminaires and nonmetallic forming shells, both without grounding and without bonding to the pool bonding grid, can be designed so "that, where the luminaire (fixture) is properly installed without a ground-fault circuit-interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping)"1. Test techniques for determining compliance with this NEC requirement are well developed and specified in the Standard for Underwater Lighting Fixtures and Junction Boxes, UL 676. During the evaluation for the required listing [see 680.23(A)(8)] of wet-niche luminaires and forming shells, it can be determined if an ungrounded/unbonded 120 volt wet-niche luminaire and ungrounded/unbonded mating nonmetallic forming shell(s) limit the risks of electric shock just as required for (a) low-voltage designs without grounding/bonding and (b) 120 V designs with grounding/bonding.

Forming shells and 120 V wet-niche luminaire designs without grounding and without bonding to the pool bonding grid and that limit the risks of electric shock can both be practical and comply with all safety requirements, including the limit for escape current conducting into the swimming pool water under damaged lens or gasket conditions and other applicable fault conditions required in UL 676.

Further, the nonmetallic forming shell can be required to not have any metal that forms a conductive connection between the pool water and the concrete or backfill in contact with the back side of forming shell. This would eliminate the possibility of electric current from sources outside the pool using a metal path through any metal of the forming shell to enter the pool. The equipotential bonding grid would not be compromised by use of such a nonmetallic forming shell.

If replacement of the wet-niche luminaire is needed, the listed forming shell is marked visible following installation to identify the luminaire(s) with which it is to be used, as required in UL 676. No wet-niche luminaires requiring grounded or bonding to the pool bonding grid are permitted to be identified in the marking on a nonmetallic forming shell not requiring bonding to the pool bonding grid.

Footnote

1) Quoted text is from 680.23(A)(1), Underwater Luminaires (Lighting Fixtures); General; Luminaire (Fixture) Design, Normal Operation.

Panel Meeting Action: Reject

Panel Statement: The proposal would reduce the mechanical integrity of the equipment grounding conductor. In addition, the proposal would permit 120 v luminaires.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

BLEWITT, T.: The proposal should have been Accepted in Principle

The deletion of the word "metal" is editorial. The requirement in that section applies to all forming shells, metallic and non-metallic.

UL 676, the Standard for Underwater Luminaires, specifies construction and performance requirements for line-voltage double-insulated luminaires. Therefore the low voltage restriction for luminaires not requiring grounding is no longer necessary.

The proposed change in 680.26(B)(2) should therefore read:

(2) **Underwater Lighting.** All ~~metal~~ forming shells and mounting brackets of no-niche luminaires (fixtures) shall be bonded unless a listed ~~low-voltage~~ lighting system with a nonmetallic forming shell ~~s~~ and an approved system of double-insulation ~~not requiring bonding~~ is used.

Comment on Affirmative:

HIRSCH, B.: See comment for Proposal 17-64.

17-120 Log #1304 NEC-P17 **Final Action: Accept in Principle**
(680.26(C))

Submitter: Jim Davis, Electrical Education Services, LLC

Recommendation: Revise text as follows:

680.26(C) "...The equipotential ~~common~~ bonding grid shall extend under paved walking surfaces for 1 m (3 ft) horizontally beyond the inside walls of the pool and shall be permitted to be any of the following:.

Substantiation: Delete the word "common" as it was part of the reference to "common bonding grid" in the earlier code editions which was replaced in the 2005 NEC by the "equipotential bonding grid." This is merely "editorial housekeeping."

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-121 Log #1368 NEC-P17 **Final Action: Accept in Principle**
(680.26(C))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Change dimensional equivalent of the third sentence as follows:

The equipotential common bonding grid shall extend under paved walking surfaces for ~~1 m~~ 900 mm (3 ft) horizontally beyond the inside walls of the pool and shall be permitted to be any of the following:

Substantiation: This brings this section into alignment with the dimensional equivalents that are used elsewhere in the *Code* .

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-122 Log #1894 NEC-P17 **Final Action: Reject**
(680.26(C) (New))

Submitter: Frank C. Lambert, Georgia Tech/NEETRAC / Rep. National Electric Energy Testing, Research, & Applications Center

Recommendation: Insert a new Section 680.26(C) as follows:

680.26(C) Pool Water. An intentional bond of a minimum conductive surface area of 5806 mm 2 (9 in 2) shall be installed in contact with the pool water. This bond shall be permitted to consist of parts that are required to be bonded in 680.26(B).

Renumber the present sections sequentially from (C) to (D), (D) to (E), and (E) to (F).

Substantiation: Bonding of metal parts in and around a swimming pool to an equipotential bonding grid is extensively covered in 680.26. The intent of this bonding is to equalize the voltages between the pool water and the deck including any attached metal structures or parts. 680.26 has been effective in mitigating stray voltage problems, especially in the case of fiberglass swimming pools or pools with insulated liners.

680.26 describes various metal parts and equipment that require bonding with an equipotential bonding grid. In describing these metal parts, it is assumed that one or more of the parts are in contact with the pool water. This may not always be the case. Some pools do not have any bonded metal parts in contact with the water. In such a case, intentional bonding of the water is necessary to equalize the water-to-deck voltages. Presently, 680.26 does not have a provision for intentional bonding of the pool water.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided adequate substantiation. There are issues such as conductivity of water, changes with water temperature, current flow, size of conductors, etc. that need to be addressed.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 9 Negative: 2

Explanation of Negative:

HIRSCH, B.: The testing done by the National Electric Energy Testing, Research and Applications Center (NEETRAC) clearly substantiates that the potential for shock hazard is increased in pools where the pool water is not bonded via metal parts in the pool. Results of this testing were reported to Panel 17 at the proposal meeting in January of 2006. Based on this testing, EEI supports the adoption of this proposal and as such is voting negative to the panel's action. At the proposal meeting, Panel 17 indicated they had additional questions that needed to be answered before supporting this proposal. The panel statement, however, did little to document those concerns. Just as the submitter needs to provide compelling substantiation for a code change, the code panel has the responsibility to provide a justifiable technical basis to reject well supported proposals.

JHONSON, D.: I agree with the Submitter's substantiation, and, in addition, the substantiation of the NEETRAC testing results reported to Code-Making Panel 17 at the ROP meeting in January of 2006. I have provided additional relevant pool test results from a project supervised by the university of Newcastle, Australia and sponsored by Energy Australia. This reports a potential shock hazard when conditions exist effectively bridging the isolation of the pool water provided by an insulated pool shell.

This issue should be revisited.

Note: Supporting Material is available for review at NFPA headquarters.

17-123 Log #3422 NEC-P17 **Final Action: Accept in Principle**
(680.26(C))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Revise as follows:

(C) Equipotential Bonding Grid. The parts specified in 680.26(B) shall be connected to an equipotential bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than 8 AWG. ~~or~~ Rigid metal conduit of brass or other identified corrosion-resistant metal conduit shall be permitted to be included as part of the bonding path within an equipotential bonding grid. Connection shall be made by exothermic welding or by listed pressure connectors or clamps that are labeled as being suitable for the purpose and are of stainless steel, brass, copper, or copper alloy. The equipotential bonding grid shall extend under paved walking surfaces for 1 m (3 ft) horizontally beyond the inside walls of the pool and shall be permitted to be any of the following:

(1) Structural Reinforcing Steel. The structural reinforcing steel of a concrete pool or deck where the conductive (unencapsulated) reinforcing ~~rods~~ elements are bonded together by the usual steel tie wires or the equivalent

(2) Bolted or Welded Metal Pools. The wall of a bolted or welded metal pool

(3) Bare Copper Conductor. A solid, bare copper conductor run around the entire perimeter of the pool and just below or within any paved surfaces adjacent to the pool walls

~~(3)~~ (4) Alternate Means. An alternate means to eliminate voltage gradients that would otherwise be provided by unencapsulated, bonded reinforcing steel This system shall be required adjacent to any portions of pool construction that employ reinforcing steel encapsulated with a nonconductive compound. The grid shall comply with a. through c.:

a. Materials and Connections. The grid shall be constructed of minimum 8 AWG bare solid copper conductors. Conductors shall be bonded to each other at all points of crossing. Connections shall be made as required by 680.26(D).

b. Grid Structure. The equipotential bonding grid shall cover all contours of the pool and the pool deck that use encapsulated reinforcing elements within 1 m (3 ft) horizontally from the inside walls of the pool. The equipotential bonding grid shall be arranged in a 300 mm (12 in.) by 300 mm (12 in.) network of conductors in a uniformly spaced perpendicular grid pattern with tolerance of 100 mm (4 in.).

c. Securing. The below-grade grid shall be secured within or under the pool and deck media.

Substantiation: This proposal is submitted as a constructive alternative to the TIA released to solve the immediate problem of providing substation quality ground grids around vinyl pools. The changes from the 2005 NEC version of this subsection are as follows, taken sequentially:

1. Brass rigid metal conduit is never going be a bonding grid in and of itself, but it might form one element of a required bonding path. The current usage is unrealistic and should be revisited. The current literal text suggests that conduit could be backwrapped around or bolted to conductive elements. In actuality conductive elements might be connected to such conduit in strategic locations. This proposal correctly describes the conduit function in this context.

2. In (C)(1) the deck steel is included per the TIA. In addition, the terminology has been adjusted so reinforcing rods are not the only bonding option. The proposal does this by substituting "elements" for "rods" and only qualifying unencapsulated steel, which was overlooked in the TIA. A number of authorities disallowed the customary steel mesh under the deck because it did not employ "rods" in its construction. This problem also remains with the TIA in effect..

3. In (C)(3) this proposal restores the allowance for a 8 AWG solid copper conductor to be a permissible key constituent of a bonding grid. This was a consistent feature of Article 680 from the 1965 NEC to the 2002 NEC, where it was covered in 680.26(C)(3) after the article rewrite. However, it has been modified to better accommodate its equipotential bonding function by being bare, and running around the perimeter of the pool. This moves in the direction of the substantiated concerns that provoked the current text in 680.26(C) without creating an astronomical expense. This would probably be the usual approach for vinyl pools. The TIA includes a requirement to bond metallic structural elements of such pools which this proposal does not. The reason is that such conductive elements are already required to be bonded by 680.26(B)(1) and there is no need to duplicate the requirement.

4. The alternate means becomes mandatory in the vicinity of encapsulated, nonconductive reinforcing steel. This is simply and clearly laid out in the proposed second paragraph of 680.26(C)(4). The remainder of the proposal duplicates the current requirements. The wording is clear and does not require the use of an exception to make the relevant points.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-124 Log #3477 NEC-P17 **Final Action: Accept in Principle**
(680.26(C))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise text to read:

680.26(C) Equipotential Bonding Grid....or copper alloy. The equipotential common bonding grid shall extend under paved or concrete walking surfaces for 1 m horizontally beyond etc.

Substantiation: This article needs rewording because it is not clear if the rule only applies to paved (blacktop or macadam) surfaces.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-125 Log #3604 NEC-P17 **Final Action: Accept in Principle**
(680.26(C))

Submitter: Robert E. Wisenburg, Coates Heater Co., Inc.
Recommendation: Add to 680.26(C) Bonding grids for in or under decks may be constructed of #8 solid copper wire layed in 12" X 12" squares and tied with copper tie wires.
Substantiation: The code allows a copper grid, but does not address copper tie wires, only welded grids. Ties are used for rebar. The same method will work with a copper wire grid.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-126 Log #545 NEC-P17 **Final Action: Accept in Principle**
(680.26(C) & 680.26(C)(1))

Submitter: Code-Making Panel 17,
Recommendation: Revise 680.26 (C) & 680.26 (C)(1) as follows:

(C) Equipotential Bonding Grid. The parts specified in 680.26(B) shall be connected to an equipotential bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than 8 AWG or rigid metal conduit of brass or other identified corrosion-resistant metal conduit. Connection shall be made by exothermic welding or by listed pressure connectors or clamps that are labeled as being suitable for the purpose and are of stainless steel, brass, copper, or copper alloy. The equipotential bonding grid shall conform to the contours of the pool and shall extend within or under paved walking surfaces for 1 m (3 ft) horizontally beyond the inside walls of the pool and shall be permitted to be any of the following:

Exception: The equipotential bonding grid shall not be required to be installed under the bottom of or vertically along the walls of vinyl lined polymer wall,
fiberglass composite, or other pools constructed of non-conductive materials. Any metal parts of the pool, including metal structural supports, shall be bonded in accordance with 680.26(B). For the purposes of this section, poured concrete, pneumatically-applied (sprayed) concrete, and concrete block, with painted or plastered coatings, shall be considered conductive material.

(1) Structural Reinforcing Steel. The structural reinforcing steel of a concrete pool or deck where the reinforcing rods are bonded together by the usual steel tie wires or the equivalent. Where deck reinforcing steel is not an integral part of the pool, the deck reinforcing steel shall be bonded to other parts of the bonding grid using a minimum 8 AWG solid copper conductor. Connection shall be per 680.26(D).

Substantiation: Submitters Reason:

In accordance with Section 5-2(f) of the NFPA Regulations Governing Committee Projects, the Task Group on behalf of CMP-17, is requesting a Tentative Interim Amendment to address two unintended consequences of the revisions to 680.26 published in the 2005 National Electrical Code. The first unintended consequence that occurred in 680.26 is that certain requirements for providing an equipotential bonding grid around
swimming pools are being interpreted in ways not anticipated or intended by the CMP.
This has resulted in an adverse impact on certain swimming pool designs and new, unnecessary construction features being mandated at considerable expense. Specifically, Article 680.26 (C) and 680.26 (C) (1), is being interpreted to require the builder to construct an equipotential bonding grid under or along the side of a nonconductive, vinyl lined polymer walled or fiberglass composite pool. This extensive
bonding grid is not necessary for pools that are constructed with non conductive vinyl
liners or fiberglass composite shells. The proposed revision permits the conductive structural elements that are installed within or under the concrete pool deck or other type of paved deck surface to serve as the equipotential bonding grid.

The second unintended consequence that occurred in the 2005 revision to 680.26 is the interpretation that the 1 meter (3 ft.) horizontal extension of the bonding grid is required to be installed as a continuous, unbroken extension of the structural reinforcing steel or metal wall of a pool. CMP-17 only intended that the bonding grid extend up to three feet horizontally within or under a concrete pool deck or other paved walking surface and not that this portion of the equipotential bonding grid be an unbroken extension of the pool wall rebar or metal pool wall. It was also not intended that the deck reinforcing steel be required to be a continuous structure of the pool shell. It could be a separate structure bonded to the swimming pool in accordance with present requirements in the Code. Continuous extensions of reinforcing steel into the deck will result in damage to the structure of the pool and deck due to differences in movement between the two structures. We appreciate the Standards Council's consideration of our request for this Tentative Interim Amendment.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-127 Log #2425 NEC-P17 **Final Action: Reject**
(680.26(C) and (D))

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.
Recommendation: Remove Sections 680.26 (C) and (D)
Retain Section (E)
Renumber
Substantiation: With the advent of the GFCI requirement there is no longer the fear of dropping a 120-volt powered electric device into a pool such as a radio or heating iron. Thus, there is no need to connect all metal within the pool area together and connect the bond back to the service entrance panel in order to trip an electric fault that yesterday would and could occur in a pool.

Today we do not allow receptacles within the pool area as we did previously. The excessive bonding of metallic parts that could not possibly become energized is obsolete and non-functioning. A carry over from other times.

Only metallic boxes that contain energized conductors need to be "grounded" today.

Today we have discovered a great secret that there is a constant flow of uncontrolled dangerous and hazardous stray current emanating from NOT the house wiring installed under the safe NEC, but from the utility.

This error entered the NEC during the proposed amendments stage for the 1984 Code. NFPA Document NEC-TCR-83-A on page 342, Proposal 20-31 (680-22, FPN – (New)), Log #1932. It was "Accepted in Principle" and with a vote of 8 for acceptance and one negative.

During the comment stage, (See NEC-TCD, page 413, Comments 20-21 & 20-22), it is opined that the two comments received did not address the issue.

The definition of "equipotential Bonding" as given in Section 680 (A) **Performance** is a complete misunderstanding and misconception as there is **no such item as an equipotential bonding that prevents a difference in voltage gradients from developing within the pool area. It is impossible to eliminate voltage gradients, except in your imagination as long as current is flowing continuously through the concrete and re-bar, which is happening in the real world.**

Ohm's Law states that **Voltage = Current X Resistance**

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the equipotential bonding will have some resistance. The concrete is semi-conductive being wet and especially since the concrete had a metallic mesh within it. Any current flowing over and through the equipotential bonding will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

With the approval of Code Making Panel # 5's acceptance of the dangerous and hazardous multigrounded neutral distribution system, stray current has been measured flowing within swimming pools, hot tubs, showers, etc.

EPRI: "Created by the nation's electric utilities in 1973, EPRI is one of America's oldest and largest research consortia, with some 700 members and an annual budget of about $ 500 million. Linked to a global network of technical specialists, EPRI scientists and engineers develop innovative solutions to the world's toughest energy problems while expanding opportunities for a dynamic industry."

The Electric Power Research Institute (EPRI) an organization of utilities companies states that 40 to 60 percent of the return neutral current from the high voltage electrical circuit returns over or through the earth. We have measured as high as eighty-eight (88) percent of the neutral current returning over the earth and thus through dairies, back yards of homes through hot tubs, swimming pools, etc.

It must be noted that the human body has approximately the same internal resistance as a cow. The electrical principle is the same for equipotential planes and equipotential bonding.

Mr. Lawrence C Neubauer has conducted investigations and has measured stray current in over 600 – 800 dairies. To prove there is a voltage in an equipotential plane or in the case of Article 680, equipotential bonding, Mr. Neubauer took a large plastic container, which is an insulator. He placed a coil of bare copper under the bucket in intimate contact with the concrete. Next, he placed a coil of copper in the bottom of the plastic bucket. A milliammeter was connected between the coil in the bottom of the bucket and the coil of copper "connected" to the concrete holding area where the equipotential plane had been installed.

The plastic bucket was filled with water. As the cows entered they attempted to drink out of the plastic bucket, however, it was evident they received an electrical shock as they jerked their heads out of the water.

The electrical circuit was from the equipotential bonding, which supposedly prevents a difference in voltage from developing, up the legs of the cow, through the body to the tongue, into the water, through the copper in to bottom of the plastic bucket, to the milliammeter and finally to the copper which is in intimate contact with the concrete equipotential plane. Readings of over a milliamp were recorded on VHS.

Now instead of the cow substitute a human.

The American Society of Agricultural Engineers (ASAE) EP473-2001, Equipotential Planes in Animal Containment Areas is incorrect as it is producing a false sense of security when actually the equipotential plane is harming the animals.

How did the misunderstood equipotential planes get into the NEC? In the early 1980s it is opined that some agriculture professors read IEEE Standard 80 and being familiar with cow shit and not electrical engineering, misunderstood IEEE Standard 80. Four Ag professors wrote three papers on equipotential planes and dairies.

In 1985 the misinformed Ad Hoc Subcommittee on Electrical Grounding of Agriculture Buildings submitted the above inaccurate, ill-conceived proposal # 19-16, Log # 1363, 1985 ROP for the 1987 NEC, which since it came from a supposable informed subcommittee, was adopted by Panel 19 Unanimously Affirmative. Now it is hoped that none of the original members of the above groups are still on Panel 19, because it is against human nature to disown a concept supported previously.

It is opined that Gustafson, et al and the NEC Making Panels did not take into consideration the purpose of the IEEE Standard 80, "Guide for Safety in AC Substation Grounding".

IEEE Standard 80 states:

"**1.2 Purpose.** The intent of this guide is to provide guidance and information pertinent to safe grounding practices in ac substation design.

"The specific proposes of this guide are to

a) Establish, as a basis for design, the safe limits of potential differences that can exist in a substation under fault conditions between points that can be contacted by the human body.

b) Review substation grounding practices with special reference to safety, and develop criteria for a safe design.

c) Provide a procedure for the design of practical grounding systems, based on these criteria.

d) Develop analytical methods as an aid in the understanding and solution of typical gradient problems."

It is very clear that Clause 1.2 a) states that IEEE Standard 80 is under **fault conditions.** Stray current or if one insists, stray voltage, exists under normal steady state, continuous operating conditions, not fault conditions.

Professor Robert J. Gustafson writes, "Gradient control is used by the electrical industry to minimize the risk of hazardous step (foot-to-foot) and touch (hand-to-foot) potentials **under fault conditions** (emphases by author) at substations and around electrical equipment. In addition to protecting people, animals, and equipment **under fault or lightning conditions** , proper equipotential systems in livestock facilities can solve stray voltage/current problems." The concept of "equipotential planes" made up by the same Ag professors is totally false.

Fault currents in electrical substations are several magnitudes larger than any fault current that will be found on dairy farms. In substations we expect hundreds of thousands of amperes where on a dairy farm in the middle of nowhere maybe have 5,000 amperes for seconds until the protective device such as the circuit breaker or fuse operates. They are two very different conditions, fault current and steady state normal flowing stray current, and are not related.

Now compare that small amount of FAULT current for a few seconds to the continuous flow of steady state stray neutral current flowing continuously from the dangerous and hazardous multigrounded neutral electrical distribution system which is flowing across the equipotential plane continuously causing the dairy cow harm. Electric Power Research Institute states that 40 to 60 percent of the neutral return current will flow over the earth.

It is evident that this is an enormous, immense, huge, gigantic, colossal, mammoth, tremendous, stupendous, gargantuan, mis-application of an electrical principle that has caused untold harm to dairy cows and to humans.

Now remember, the cow and the human are both from the same classification, Mammals, and they both have approximately the same internal resistance. The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers.

What happens is the equipotential plane is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. This equipotential plane is connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the primary neutral thus completing the connection to the primary electrical circuit back to the transformer.

What should be done is to connect all conductive metallic surfaces that can become energized to the grounding system through bonding conductors. No more, no less just as would be done in a home or industry.

No doubt, someone will make the comment that equipotential planes must do some good, must have a little advantage or may afford some help. That person needs to face the facts – **THERE IS NO BENEFIT IN ANY WAY, SHAPE OR FORM FROM EQUIPOTENTIAL PLANES, ONLY HARM.** The concept was based on erroneous ideas and conclusions and mis-understanding of electrical principles.

If equipotential planes were such a great idea, why not require the basements and garage floors to have equipotential planes in case someone walked on the floor in their bare feet? Now watch some panel think that this is a great idea. A fool is born every code cycle.

The dairy farmers in Wisconsin long ago deleted from the state adopted NEC the sections on equipotential planes as they realized the danger and hazards equipotential planes presented to dairy farmers.

Panel Meeting Action: Reject
Panel Statement: The panel does not agree with the submitter's substantiation.

The Code provides for the establishment of an equipotential bonding grid to limit voltage gradients within the pool area. It is not the intent of the equipotential bonding grid to limit voltage gradients to 0 V but to reduce them.

See panel action on Proposal 17-115a (Log #CP-1706).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-128 Log #380 NEC-P17 **Final Action: Reject**

(680.26(C)(3))

Submitter: David Otzman, Detroit Edison

Recommendation: I propose that you return to the simpler wording in the 2002 NEC and change 680-26(C)(3) to read:

"A solid copper conductor, insulated, covered, or bare, not smaller than 8 AWG, encircling the pool, 450 mm (18 in.) horizontally from the inside walls of the pool."

Substantiation: I agree that the bonding grid does not need to be as extensive as now specified in 680.26(C)(3). The grid can be as simple as an 8 AWG solid copper conductor encircling the pool. However, some type of grid must be provided whether or not the pool walls are conductive.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel rejects the use of an insulated or covered conductor for the bonding grid.

See panel action on Proposal 17-114a (Log #CP-1708).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-129 Log #3581 NEC-P17 **Final Action: Reject**

(680.26(C)(3))

Submitter: David A. Kerr, Jr., Tri-State Inspection Agency, Inc.

Recommendation: Delete this section.

Substantiation: The equipotential bonding grid alternate means is a vast change in swimming pools. It will cost people $500 or $1000 to comply. Only lawyers will ever figure out what it means. There was previous little by way of technical substantiation.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided adequate substantiation.

Economic cost is not a technical justification.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-130 Log #593 NEC-P17 **Final Action: Accept in Principle**

(680.26(C)(3)d.)

Submitter: Don Nicoll, Latham International

Recommendation: Add the following paragraph:

d. Pool Decks. When not constructed using unencapsulated steel rebar, wire mesh, or other reinforcing metal capable of creating an equipotential bonding grid; pool decks shall have an equipotential bonding grid directly below the deck material, constructed of minimum 8 AWG bare solid copper conductors extending 1 m (3 ft) horizontally from the inside walls of the pool. The equipotential bonding grid shall be arranged in a 300 mm (12 in.) by 300 mm (12 in.) network of conductors in a uniformly spaced perpendicular grid pattern with a tolerance of 100 mm (4 in.). The points of crossing shall be secured by copper tie wires that have been made tight, or in accordance with 250.8. When a pool is required to have an equipotential bonding grid, the deck's bonding grid shall be bonded to the pool's bonding grid with minimum 8 AWG bare solid copper conductors in three places minimum uniformly spaced around the pool.

Substantiation: Clarification.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 17-114a (Log #CP-1708).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-131 Log #2427 NEC-P17 **Final Action: Reject**

(680.27(A))

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Recommendation: Section 680.23 (A) Underwater Audio Equipment.

New (3) and renumber present (3) to (4).

(3) Isolation Method. There shall be no electrical connection permitted that will allow stray current to flow back to the equipment grounding system from the water immersed speaker.

Substantiation: The problem is that the Underwater Luminaries are "grounded" and there is electrical connections directly back to the high voltage primary side of the pole mounted or pad mounted or underground transformer. The details of this connection will be described later. This electrical connection from the underwater luminaries is a path for the continuously flowing stray current emanating from the utility companies multigrounded neutral electrical distribution systems that has the neutral connected to earth at least 4 times per mile. It is this current that enters the swimming pool to complete the electrical circuit. Bear in mind that the current may be flowing in the opposite direction. The direction is arbitrary.

In addition to the above multigrounded neutral electrical distribution system earthing, there is a second electrical circuit. The second circuit is the bastardized electrical connection between the high voltage primary neutral and the secondary neutral allowing primary high voltage electricity to flow directly into the residence, commercial or industrial facility using the secondary neutral which is bonded to the green equipment grounding conductor. Now this green color equipment grounding conductor is connected to the underwater luminaries metal frame allowing stray continuous flowing dangerous and hazardous current to complete the circuit.

What the above bastardize electrical connection does is allow the direct electrical connection of any lightning strike to nearby distribution system to flow directly into your own home and destroy the sensitive electrical equipment, which is not an act of God or Mother Nature, but directly attributable to the utility since 1932.

With the approval of Code Making Panel # 5's acceptance of the dangerous and hazardous multigrounded neutral distribution system, stray current has been measured flowing within swimming pools, hot tubs, showers, etc.

The Electric Power Research Institute (EPRI) an organization of utilities companies states that 40 to 60 percent of the return neutral current from the high voltage electrical circuit returns over or through the earth. We have measured as high as eighty-eight (88) percent of the neutral current returning over the earth and thus through dairies, back yards of homes through hot tubs, swimming pools, etc.

Ohm's Law states that **Voltage = Current X Resistance**

It is impossible to eliminate voltage gradients, except in your imagination as long as current is flowing continuously through the concrete and re-bar, which is happening in the real world.

Unless the buried in concrete metal mesh is at or near absolute zero temperature, the equipotential bonding will have some resistance. The concrete is semi-conductive being wet and especially since the concrete had a metallic mesh within it. Any current flowing over and through the equipotential bonding will produce a voltage per Ohm's Law. This has been proven by testing as will be described below.

It must be noted that the human body has approximately the same internal resistance as a cow. The electrical principle is the same for equipotential planes and equipotential bonding. The following will show conclusively that there is high voltage electric current flowing in the earth. In one court case, there were 18.5 amperes on the high voltage phase conductor and only 3.5 amperes on the multigrounded neutral electrical distribution system. Simple math shows that 15 amperes of return current in that case was flowing uncontrolled over the earth.

In another case, an engineering firm measured 5 amperes returning to the substation flowing over the earth shocking persons.

What happens is the swimming pool with its water soaked concrete is such a good, efficient low impedance contact with the earth that the equipotential plane acts as a "sink" for the majority of the stray neutral current flowing through earth in the vicinity. It becomes a magnet for collecting the stray current. With the underwater luminaries connected to the equipment grounding conductor which is connected to the neutral service entrance conductor which, is connected to the utility power company's transformer which has the secondary neutral connected to the high voltage primary neutral thus completing the connection to the primary electrical circuit back to the substation completing the circuit.

Thus, in order to eliminate this dangerous and hazardous electrical connection the underwater luminaries must be completely removed.

There must be no electrical connection from the water in the pool back to the high voltage primary electrical system. The metallic frame of the pump motor need to be connected to the equipment grounding conductor and system in order to provide a low impedance path back to the service panel in order to trip the protective device, circuit breaker or fuse.

As the electrical load increases more and more stray current will enter the earth resulting in more and more shocking incidents. It is opined that as the electrical load increases to a critical level that may last for only an hour or a day, in any one multigrounded neutral electrical distribution system, someone will be electrocuted or drown because the persons muscles froze and they sank to the bottom of the pool and drowned. It may have already occurred.

Panel Meeting Action: Reject

Panel Statement: The submitter referenced an incorrect section.

The panel does not agree with the submitter's substantiation.

Removing underwater luminaires or underwater audio equipment will not prevent stray currents. The Code provides for the establishment of an equipotential bonding grid to limit voltage gradients within the pool area.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

CRIVELL, P.: 1. The proposal addresses a valid concern. There is a real potential for the underwater light fixture to act as part of the return path for unbalanced utility current.

2. Underwater luminaries should be required to be manufactured or installed in such a way as to eliminate the potential for underwater light fixtures from acting as part of the return path for unbalanced utility current (e.g., double insulation or isolation through an isolation transformer).

17-132 Log #888 NEC-P17 **Final Action: Accept**
(680.27(A)(2))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise 680.27(A)(2) to read as follows:
"Rigid metal conduit ~~or intermediate metal conduit~~ of brass or other identified corrosion-resistant metal...".
Substantiation: This issue was corrected in 680.26(C) in the 2005 NEC. Intermediate metal conduit is a steel product by definition. Unlike RMC, IMC is not available in other metals. Since IMC will not be brass or the equivalent, it should not be mentioned as a possible wiring method.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-133 Log #3258 NEC-P17 **Final Action: Accept in Principle**
(680.27(A)(2))

Submitter: Donald Dekker, N. Muskegon, MI
Recommendation: Revise text to read as follows:
~~Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion resistant metal, liquidtight flexible nonmetallic conduit (LFNC-B), or rigid nonmetallic conduit)~~ (Conduit shall be rigid metal, intermediate metal, liquidtight flexible nonmetallic or rigid nonmetallic. The metal conduit shall be approved and shall be of brass or other approved corrosion-resistant metal. The conduit) shall extent from the forming shell...
Substantiation: The wording in this section implies that we can use Rigid Metal Conduit (RMC) or Intermediate Metal Conduit (IMC) to run from an underwater forming shell to the listed junction box. RMC and IMC, as we would normally purchase them, are not corrosion-resistant metals. I recommend revising the wording in this section to match the wording in 680.23(B)(2) & 680.23(B)(2)(a).
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-132.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-134 Log #2019 NEC-P17 **Final Action: Reject**
(680.27(C)(3))

Submitter: Russell Childs, Heatizen System
Recommendation: 680.27(C)(3) Radiant Heating Cables Not Permitted. Radiant heating cables embedded in or below the deck shall not be permitted.
680.27(C)(3) Radiant Heating Cables Not Permitted. Radiant heating cables embedded in or below the deck shall not be permitted, unless cables operating at less than 30V and powered by an isolation transformer. The transformer shall have a grounded metal barrier between the primary and secondary windings.
Substantiation: This change would enable decks and concrete around swimming pools and spas to be safely heated. Low voltage heating systems produce high current from the secondary of a step down a transformer. Low voltage transformers with an isolated ungrounded secondary winding that has a grounded metal barrier between the primary and secondary are permitted for lighting for swimming pools and spas in the NEC 2005 680.23 under a transformer. With the secondary of the transformer being isolated from ground there is no need for a GFCI. The addition of a GFCI in the secondary of the transformer in a listed product would not provide any additional protection because the isolated secondary does not have a connection to ground and so would not operate a GFCI if a fault to ground was placed on the circuit. (Also, with a fault to ground there is no circuit so no current flow to other grounded equipment in the area.
Panel Meeting Action: Reject
Panel Statement: Faults in the heater cable could still enable faults that would cause a safety shock hazard and deterioration of the equipotential bonding grid.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
BLEWITT, T.: The use of a transformer with a grounded copper shield would not protect persons on the deck or in the pool from fault currents flowing from one side of the transformer secondary to the other. These could result from faults in the heater conductors. In addition, faults in the heater cables might result in significant current flowing continuously through parts of the equipotential bonding grid. This would substantially accelerate the corrosion of these current paths.

17-135 Log #3640 NEC-P17 **Final Action: Accept in Principle in Part**
(680.32)

Submitter: Aaron B. Chase, Leviton Mfg. Co. Inc.
Recommendation: Revise text to read:
680.32 Ground Fault Circuit Interrupters Required. All electrical equipment, including power-supply cords, used with storable pools shall be protected by ground-fault circuit interrupters.
~~All 125 volt receptacles located within 6.0 m (20 ft) of the inside walls of a storable pool shall be protected by a ground fault circuit interrupter. In determining these dimensions, the distance to be measured shall be the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.~~
Delete entire second paragraph of 680.32. Add new text as second line of first paragraph:
The ground-fault-circuit interrupter shall be an integral part of the attachment plug or located in the power supply cord within 300 mm (12 in.) of the attachment plug.
Substantiation: The above proposal was adopted by CMP-17 during the last Code cycle, but was placed on hold by the TCC. The reason for the TCC hold was that the Panel proposal (Log #CC1700) to address TIA 02.2 introduced new material not presented during the ROP phase.
The intent of this proposal is to submit the panel's proposal during the ROP in order to have the panel's position properly incorporated in the next edition of NFPA 70.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle in Part
Change 680.31 to read as follows:
680.31 Pumps
A cord-connected pool filter pump shall incorporate an approved system of double insulation or its equivalent and shall be provided with means for grounding only the internal and nonaccessible non–current-carrying metal parts of the appliance.
The means for grounding shall be an equipment grounding conductor run with the power-supply conductors in the flexible cord that is properly terminated in a grounding-type attachment plug having a fixed grounding contact member.
Cord-connected pool filter pumps shall be provided with a ground-fault circuit interrupter that is an integral part of the attachment plug or located in the power supply cord within 300 mm (12 in.) of the attachment plug.
Panel Statement: The panel accepts the submitter's recommendation to add two new paragraphs. However, these were combined and relocated to 680.31 for clarity.
The panel chose to retain "All 125-volt receptacles … barrier" in 680.32.

Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
HIRSCH, B.: The EEI/EL&P believe the current code wording amply covers the GFCI requirements. The change does not offer any additional protection for the public and in the case of pool pumps will require duplicate GFCI protection. In addition, requirements for pool pump cords should be covered in the appliance standards and not in the NEC. The submitter did not provide substantiation for the change, but simply that the proposal was placed on hold by the TCC during the 2005 comment cycle due to being new material.

17-136 Log #2790 NEC-P17 **Final Action: Reject**
(680.33)

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
680.33 Luminaires (Lighting Fixtures). An underwater luminaire (lighting fixture), if installed, shall be installed in or on the wall of the storable pool. It shall comply with 680.33(A) and either 680.33(~~A~~ B) or 680.33(~~B~~ C).
(A) Non-Current-Carrying Metal Parts . Non-current-carrying metal parts shall comply with (1) or (2):
(1) The parts shall be grounded by means of an equipment grounding conductor in the supply cord, terminating on the grounding contact of a grounding-type attachment plug. The size of the equipment grounding conductor shall comply with 250.122(E)
(2) The parts shall be separated from current-carrying parts by an approved system of double insulation or its equivalent.
The metal parts specified in items (3) and (4) shall be separated from current-carrying parts and grounded metal of the lighting assembly by an approved system of double insulation or its equivalent.
(3) Metal parts with an electrically conductive path to the pool water
(4) Metal parts within 1.5 m (5 ft) horizontally of the inside walls of the pool and that are capable of being touched
(~~A~~ B) 15 Volts or Less. A luminaire (lighting fixture) shall be part of a cord-and-plug-connected lighting assembly. This assembly shall be listed as an assembly for the purpose and have the following construction features:
~~(1) No exposed metal parts~~
(~~2~~ 1) A luminaire (fixture) lamp that operates at 15 volts or less
(~~3~~ 2) An impact-resistant polymeric lens, luminaire (fixture) body, and transformer enclosure
(~~4~~ 3) A transformer meeting the requirements of 680.23(A)(2) with a primary rating not over 150 volts
(B C) Over 15 Volts But Not Over 150 Volts . A lighting assembly without a transformer and with the luminaire (fixture) lamp(s) operating at not over 150 volts shall be permitted to be cord-and-plug connected where the assembly is listed as an assembly for the purpose. The installation shall comply with 680.23(A)(5), and the assembly shall have the following construction features:

~~(1) No exposed metal parts~~
(~~2~~ 1) An impact-resistant polymeric lens and luminaire (fixture) body
(~~3~~ 2) A ground-fault circuit interrupter with open neutral protection as an integral part of the assembly
(~~4~~ 3) The luminaire (fixture) lamp permanently connected to the ground-fault circuit interrupter with open-neutral protection
(~~5~~ 4) Compliance with the requirements of 680.23(A)

Substantiation: Problem 1 – "No Exposed Metal Parts" Too Inclusive - Section 680.33(A)(1) and 680.33(B)(1) require the lighting assembly's luminaire at the pool wall and the assembly's remote transformer or remote ground-fault circuit-interrupter to have no exposed metal parts and, therefore, excludes metal screws, fasteners, and mounting brackets. Polymeric screws or other nonmetallic part securement means often does not provide the needed or desired securement strength. Section 680.33(A)(1) and (B)(1) prevents the use of metal brackets and fasteners for securing the luminaire to the pool wall and for supporting the transformer or GFCI near the utilized receptacle, even when such metal parts are unlikely to become energized and are the best or only choice for achieving needed or desired mounting strength for the luminaire and transformer or GFCI.

Substantiation for Changes Addressing Problem 1 - Risk of electric shock involving exposed metal parts on the lamp enclosure or other electrical enclosure within 5 ft of the pool wall can be made unlikely by requiring the exposed metal parts to be separated from current-carrying parts and grounded metal of the lighting assembly by an approved system of double insulation or its equivalent. Where the transformer or GFCI enclosure is located more than 5 ft from the inside wall of the pool, the risk of electric shock involving exposed metal on its enclosure can be addressed by either one of the following two methods commonly used for electric equipment located away from the pool, such as the transformer or GFCI assembly or other enclosures.
(1) The exposed metal is required to be grounded and separated from current-carrying parts by "normal" electrical insulation (not double insulation). Item (1) in proposed 680.33(A) provides for this.
(2) The exposed metal, if not grounded, is required to be separated from current-carrying parts by an approved system of double insulation or its equivalent that complies with the Standard for Double Insulation Systems for Use in Electrical Equipment, UL1097. See 4.5 of the Fifth Edition of UL 1097 for this requirement provision. Item (2) in proposed 680.33(A) provides for this.
Items (3) and (4) of proposed 680.33(A) also require double insulation for metal parts that have an electrically conductive path to the pool water and for metal parts that are within 5 ft of the pool and capable of being touched. This provides the additional reduced risk of shock for a pool occupant, as warranted.

Problem 2 – The Term "Exposed" Not Specific Enough - Consider the definition of the term Exposed (as applied to live parts) in Part I of Article 100.
Exposed (as applied to live parts). Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts that are not suitably guarded, isolated, or insulated.
Someone assessing a luminaire for compliance with the "No exposed metal parts" requirement of 680.33(A)(1) or 680.33(B)(1), whether or not they are familiar with the Article 100 definition for exposed, may not notice or might conclude that an immersed metal part of the luminaire that cannot be seen or touched after luminaire installation is not exposed . If electrical insulation between this "not exposed" immersed metal part and the electrical parts within the luminaire fails, the immersed metal part might conduct electric current into the pool, exposing pool occupants to a risk of electric shock.
Also consider an unseen and inaccessible grounded metal part that is not considered "exposed" and that is in contact with the pool water. This grounded metal part might conduct electric current in the pool during a ground fault within the lighting assembly or within another grounded electrical product connected to an equipment grounding conductor of the premises wiring system. There are also metal parts not immersed in the pool water (they are on the non-water side of the pool wall) and that can be touched only by inserting a finger into an opening in or gap between nonmetallic surfaces of the luminaire. These metal parts might be concluded to be not exposed . Examples include (a) a metal screw head that is recessed in the bottom of a hole in a nonmetallic surface and (b) a metal part inside an air vent opening in a nonmetallic surface. If electrical insulation fails between these types of "not exposed" metal parts and electrical parts, a person inserting their finger and touching the metal part can experience an electric shock. Also, if the metal part is grounded, a person touching it through the opening or gap is exposed to a risk of electric shock if there is an uninterrupted (higher impedance) ground fault within the lighting assembly or within another grounded electrical product connected to an equipment grounding conductor of the premises wiring system.

Substantiation for Changes Addressing Problem 2 – Section 680.33 needs to address the risks of shock described in the Problem comments. Proposed new 680.33(A) requires metal parts with an electrically conductive path to the pool water or capable of being touched within 5 ft of the pool to be separated from current-carrying parts and grounded metal of the lighting assembly by an approved system of double insulation or equivalent. The proposed text removes the potentially more subjective determination of whether or not a metal part is exposed and replaces it with the less subjective determination of whether or not a metal part is capable of being touched or is in contact with the pool water. The "electrically conductive path" phrase in the proposed text also addresses designs where an internal metal part is not, itself, in direct contact with the pool water but needs double insulation because it is in contact with a second metal part that is in direct contact with the pool water.

Problem 3 - Equipment Grounding Conductor Excessively Large or Not Needed -
The submitter requests and intends that this proposal for the new text for proposed 680.33 associated with the equipment grounding conductor and grounding of non-current-carrying metal parts likely to become energized be considered with the submitter's separate proposals for 680.7(B) also related to these issues for lighting assemblies for storable pools.
Section 680.7(B) requires the flexible cords that are part of a lighting assembly for storable pools to be provided with an equipment grounding conductor sized in accordance with Section 250.122 but not smaller than 12 AWG. No other requirement in Article 680 Part I General or Part III Storable Pools modifies this requirement for lighting assemblies for a storable pool. The Standard for Underwater Luminaires and Junction Boxes, UL 676, requires the flexible cord extending away from the luminaire at the pool wall to be minimum 25 ft. Some underwater luminaires for storable pools do not have non-current-carrying metal parts requiring grounding. For luminaires that do have non-current-carrying metal parts requiring grounding, an equipment grounding conductor smaller than 12 AWG can often address the involved safety issues as needed. Using flexible cord with an equipment grounding conductor when one is not required or with a larger equipment grounding conductor than needed results in additional product bulk and weight and significant additional expense for both the lighting assembly manufacturers and users.

Substantiation for Changes Addressing Problem 3 - Well developed test techniques for determining, during the listing investigation, "that, where the luminaire (fixture) is properly installed without a ground-fault circuit-interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping)."1 These test techniques are effective for evaluating storable pool lighting assemblies with no equipment grounding conductor or less than 12 AWG equipment grounding conductor just as they are affective for swimming pool luminaires with grounded non-current carrying metal parts for permanent swimming pools. Storable pool luminaires without grounding or with less than a 12 AWG equipment grounding conductor can both be practical and comply with all safety requirements, including the limit for escape current conducting into the swimming pool water under damaged lens or gasket conditions and other applicable fault conditions required in the UL Standard for Underwater Luminaires and Junction Boxes, UL 676. To provide for such designs of storable pool lighting assemblies, proposed 680.33(A) requires non-current-carrying metal parts to be grounded if they are not separated from current-carrying parts by an approved system of double insulation or its equivalent. Also, the proposed text requires the size of the equipment grounding conductor to comply with 250.122(E), which provides for, among other things, the equipment grounding conductor in flexible cord to "not be smaller than the circuit conductors" for flexible cords with circuit conductors up to 10 AWG. It is unlikely that a lighting assembly will ever require an equipment circuit conductors greater than 10 AWG, however, 250.122(E) addresses this situation as well, if one day needed.
Footnote
1) Quoted text is from 680.23(A)(1), Underwater Luminaires (Lighting Fixtures); General; Luminaire (Fixture) Design, Normal Operation. Though 680.23(A)(1) is not applicable to luminaires for storable pools, this text for underwater luminaires for permanent swimming pools illustrates the accepted approach of relying on the design of the swimming pool luminaire to address the risks of electric shock.

Panel Meeting Action: Reject
Panel Statement: The proposal would reduce the mechanical integrity of the equipment grounding conductor. In addition, the proposal would permit 120 v luminaires with exposed metal parts.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 10 Negative: 1
Explanation of Negative:
BLEWITT, T.: Proposal should have been Accepted in Principle
The proposed changes reflect newer designs of storable pool luminaires. UL 676, the Standard for Underwater Luminaires addresses the construction and performance of equipment grounding conductors in cords smaller than 12 AWG. It also addresses double insulated luminaire constructions.

17-137 Log #1618 NEC-P17 **Final Action: Accept**
(680.33(B)(3))

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Make the following change in 680.33(B)(3):
Change "neutral" to "neutral conductor."
The revised text would appear as follows:
(3) A ground-fault circuit interrupter with open neutral conductor protection as an integral part of the assembly
Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-138 Log #1648 NEC-P17 **Final Action: Reject**

(680.41)

Submitter: Jim Davis, Electrical Education Services, LLC

Recommendation: Revise text to read as follows:

680.41 Emergency Switch for Spas and Hot Tubs. A clearly labeled emergency shutoff or control switch for the purpose of stopping the motor(s) that provide power to the recirculation system and jet system shall be installed at a point ~~readily~~ <u>immediately</u> accessible to the users and not less than 1.5 m (5 ft) away, adjacent to, and within sight of the spa or hot tub. This requirement shall not apply to single-family dwellings.

Substantiation: Delete the word "readily" and use the word "immediately" as suggested above to invoke a new definition "immediately accessible" to better describe the purpose of this switch or shutoff. See the companion proposal for Article 100 of the addition of "immediately Accessible". The use of this new definition, especially in this section, ensures that the level of emergency is more clearly understood, and that the switch location and labeling will provide for the safety of the spa and hot tub users.

Panel Meeting Action: Reject

Panel Statement: The term "readily accessible" is defined and "immediately" is not. The panel refers the submitter to the NEC Style Manual, 3.2.5.5.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-139 Log #560 NEC-P17 **Final Action: Reject**

(680.42)

Submitter: Brian Magilley, Current Electric

Recommendation: Delete the following text:

~~680.42(A)(1) Flexible Conduit. Liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted in lengths of not more than 1.8 m (6 ft).~~

Substantiation: I do not see what purpose this 6 foot limitation serves. I feel that removing this section will allow for easier connection of the spa to the required disconnect. If I set the required disconnect 5 feet from the edge of a residential spa then I cannot run LFNMC the entire length from the disconnect to the spa without using two different conduit types. Having the option of running an unlimited length of LFNMC from the spa disconnect 5 feet away to the spa control panel, would make the installation much quicker than having to run say PVC (RNMC) from the disconnect up to the spa, and then make a transition over the LFNMC to the spa control panel.

Panel Meeting Action: Reject

Panel Statement: Other wiring methods are permitted precluding the use of LFMC.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

BLEWITT, T.: UL Guide Information for LFMC specifies the length limitation when the metal jacket is part of the equipment grounding path:

"Where terminated in fittings investigated for grounding and where installed with not more than 6 ft (total length) in any ground return path, liquid-tight flexible metal conduit in the 3/8 and 1/2 (12 and 16) trade sizes is suitable for grounding where used on circuits rated 20 A or less, and the 3/4, 1 and 1-1/4 (21, 27 and 35) trade sizes are suitable for grounding where used on circuits rated 60 A or less." Also see 250.118(5).

17-140 Log #3608 NEC-P17 **Final Action: Reject**

(680.42)

Submitter: Jim M. Schmer, Boise, ID

Recommendation: 680.42 Outdoor Conductor Clearance. (D)Overhead conductors shall have a minimum clearance of 3.0 m (10 ft.) above the water level for Self-Contained Spa(s) or Hot Tub(s).

Substantiation: There is no reason for the overhead conductors to be over 3.0 m (10 ft.) above the waater level, because when it comes to cleaning the Spa/ Hot Tub, you normally can reach clear across them.

Panel Meeting Action: Reject

Panel Statement: Long handle skimmers are used on spas or hot tubs. The methods of cleaning the spa or hot tub is not the only reason for this requirement.

This poses a safety hazard.

The panel does not want to decrease the level of safety already established.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-141 Log #511 NEC-P17 **Final Action: Reject**

(680.42(A)(1))

Submitter: Mike Wilson, Mike Wilson Electrical Service / Rep. Wake County Electrical Contractors Association

Recommendation: Revise text to read:

Flexible Conduit. Liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted ~~in lengths of not more than 1.8 m (6 ft)~~ .

Substantiation: Flex that is 6 ft is not long enough to run from a control panel under the tub to a disconnect (5 ft) away. The tub is manufactured in an entry on the left side. Control panel is (4 ft) from the side of the (text unreadable by NFPA staff). A disconnect could not be (text unreadable by NFPA staff) using (6 ft) of flex.

Panel Meeting Action: Reject

Panel Statement: Other wiring methods are permitted precluding the use of LFMC.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

Comment on Affirmative:

BLEWITT, T.: UL Guide Information for LFMC specifies the length limitation when the metal jacket is part of the equipment grounding path:

" Where terminated in fittings investigated for grounding and where installed with not more than 6 ft (total length) in any ground return path, liquid-tight flexible metal conduit in the 3/8 and 1/2 (12 and 16) trade sizes is suitable for grounding where used on circuits rated 20 A or less, and the 3/4, 1 and 1-1/4 (21, 27 and 35) trade sizes are suitable for grounding where used on circuits rated 60 A or less." Also see 250.118(5).

17-142 Log #3609 NEC-P17 **Final Action: Reject**

(680.42(B))

Submitter: Jim M. Schmer, Boise, ID

Recommendation: (2) Metal parts of electrical equipment associated with spa/hot tub water circulating systems, including pump motors shall be bonded with minimum #8 AWG Solid copper conductor or #6 AWG stranded insulated copper conductor green in color.

Substantiation: The Canadian Standards for Hot Tub(s)/Spa(s) are allowed to be bonded under the skirting with a stranded conductor. Since the NEC is an International Code, then the requirements for outside the USA should all be same.

Panel Meeting Action: Reject

Panel Statement: See panel action on Proposal 17-150.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-143 Log #1638 NEC-P17 **Final Action: Accept**

(680.42(C))

Submitter: L. Keith Lofland, International Association of Electrical Inspectors

Recommendation: Revise text to read as follows:

(C) Interior Wiring to Outdoor Installations. In the interior of a one-family dwelling or in the interior of another building or structure associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that contain a copper equipment grounding conductor that is insulated or enclosed within the outer sheath of the wiring method and not smaller than 12 AWG shall be permitted to be used for the connection to motor, heating, and control loads that are part of a self-contained spa or hot tub or a packaged spa or hot tub equipment assembly. Wiring to an underwater <u>luminaire</u> ~~(light fixture)~~ ~~light~~ shall comply with 680.23 or 680.33.

Substantiation: This change will comply with NEC Style Manual and continue the trend started in the 2002 NEC to change the term "light fixture" to "luminaire." 680.23 and 680.33, which are referenced in the last sentence of the proposed change both address luminaires (light fixtures).
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-144 Log #2702 NEC-P17 **Final Action: Accept**
(680.43(D))

Submitter: Gary L. Siggins, Underwriters Laboratories Inc.
Recommendation: Add a new exception to 680.43(D) as follows:
(D) Bonding. The following parts shall be bonded together:
(1) All metal fittings within or attached to the spa or hot tub structure
(2) Metal parts of electrical equipment associated with the spa or hot tub water circulating system, including pump motors
(3) Metal conduit and metal piping that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier
(4) All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub area by a permanent barrier
Exception No. 1 : Small conductive surfaces not likely to become energized, such as air and water jets and drain fittings, where not connected to metallic piping, towel bars, mirror frames, and similar non electrical equipment, shall not be required to be bonded.
Exception No. 2: Metal parts of electrical equipment associated with the water circulating system, including pump motors that are part of a listed self-contained spa or hot tub.
Substantiation: Grounding and bonding in listed self-contained spas can be evaluated and controlled as part of the listing. More options are available than are appropriate for field assembled spas. Existing text restricts these options.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-145 Log #2901 NEC-P17 **Final Action: Reject**
(680.43(D)(2))

Submitter: Jim M. Schmer, Boise, ID
Recommendation: Revise as follows:
680.43(D) Bonding. The following parts shall be bonded together:
(2) Metal parts of electrical equipment associated with the spa or hot tub water circulating system, including pump motors shall be bonded with a minimum #8 AWG solid copper conductor or a #6 AWG stranded insulated copper conductor green in color.
Substantiation: Electrical inspectors are running into a lot of spas and hot tubs coming in from Canada. The Canadian standard allows that the motor and electrical equipment that is under the skirt of the spas or hot tubs are allowed to be a #6 AWG stranded insulated copper conductor green in color.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 17-150.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-146 Log #1247 NEC-P17 **Final Action: Accept in Part**
(680.43(D)(3))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "conduit" to "raceways", or alternatively delete.
Substantiation: Raceways such as EMT should be included. This section is essentially covered by (D)(4).
Panel Meeting Action: Accept in Part
Panel Statement: See panel action on Proposal 17-147.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-147 Log #2979 NEC-P17 **Final Action: Accept in Principle**
(680.43(D)(3))

Submitter: Jim Townsend, Millennium Enterprises
Recommendation: Revise text as follows:
Metal Conduit (New word " raceway ") and metal piping that are within 1.5m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier.
Substantiation: Raceway is defined, "conduit" is not.
Raceway is consistent with code language.
Remove the word conduit and insert raceway.
Panel Meeting Action: Accept in Principle
Change 680.43(D)(3) to read as follows:
(3) Metal raceway and metal piping that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier.
Panel Statement: The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-148 Log #889 NEC-P17 **Final Action: Accept**
(680.43(E))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise 680.43(E)(3) as follows:
"The provisions of a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG ~~solid~~ ."
Substantiation: According to the current language, an 8 AWG stranded conductor could be used because it is as big (or bigger) than an 8 AWG solid conductor. The application is essentially the same as 680.26(C) and 680.62(C)(4) and should have similar wording that ensures the use of a solid copper conductor.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-149 Log #1369 NEC-P17 **Final Action: Accept in Principle**
(680.43(E))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Relocate the word "solid"
680.43(E) Methods of Bonding. All metal parts associated with the spa or hot tub shall be bonded by any of the following methods:
(1) The interconnection of threaded metal piping and fittings
(2) Metal-to-metal mounting on a common frame or base
(3) The provisions of a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG ~~solid~~ .
Substantiation: As written, the *Code* would permit a stranded bonding jumper, if larger than the circular mil of 8 AWG solid. If this is the intent, it should be spelled out to reflect the intent, as it is in 680.27(A)(2) and 680.26(C).

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-148.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-150 Log #2899 NEC-P17 **Final Action: Reject**
(680.43(E))

Submitter: Jim M. Schmer, Boise, ID
Recommendation: Revise as follows:
(E) Methods of Bonding.
(3) The provisions of copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG solid #6 AWG stranded insulated green in color.
Substantiation: Electrical inspectors are running into a lot of spas and hot tubs coming in from Canada. The Canadian standard allows that the motor and electrical equipment that is under the skirt of the spas or hot tubs are allowed to be a #6 AWG stranded insulated copper conductor green in color.
Panel Meeting Action: Reject
Panel Statement: A stranded wire exposed to chlorine will have an accelerated corrosion factor.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-151 Log #1510 NEC-P17 **Final Action: Reject**
(680.43(F)(1) and (2))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise:
(1) All exposed noncurrent-carrying metal electric equipment located...(remainder unchanged).
(2) All exposed noncurrent-carrying metal electric equipment associated with...(remainder unchanged).
Substantiation: Edit. Grounding should be limited to exposed and noncurrent-carrying metal. Equipment is a broad term including conductors, fuses, circuit breakers, etc. per Article 100.
Panel Meeting Action: Reject
Panel Statement: Grounding is already defined in 250.4(A)(2).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-152 Log #2699 NEC-P17 **Final Action: Accept**
(680.50)

Submitter: Gary L. Siggins, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
680.50 General. The provisions of Part I and Part V of this article shall apply to all permanently installed fountains as defined in 680.2. Fountains that have water in common to a pool shall additionally comply with the requirements in

Part II of this article. Part V does not cover self-contained, portable fountains ~~not larger than 1.5 m (5 ft) in any dimension~~ . Portable fountains shall comply with Parts II and III of Article 422.
Substantiation: The text specifying a 5 ft dimension limit is arbitrary. There are portable fountains larger than 5 ft. Indicating "Part V does not cover self-contained portable fountains" achieves the same result.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-153 Log #3144 NEC-P17 **Final Action: Reject**
(680.51(A))

Submitter: Dale Rooney, Municipality of Anchorage
Recommendation: After the words... "Luminaires (~~lighting fixtures~~)," add '"heat trace,".
Substantiation: In cold climates heat trace may be installed to keep the fountain operational and due to the close proximity of the public should have more that an equipment level of protection.
Panel Meeting Action: Reject
Panel Statement: The proposal needs to identify the specific applications and products being used. The submitter should use standard terms; see 426 and/or 427.
The submitter has not provided adequate substantiation.
The submitter is encouraged to review and resubmit for the ROC with specific proposed text.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-154 Log #2791 NEC-P17 **Final Action: Accept**
(680.51(C))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.
Recommendation: [Changes proposed only for 680.51(C). No change to other text of 680.51]
680.51 Luminaires (Lighting Fixtures), Submersible Pumps, and Other Submersible Equipment.
(C) Luminaire (Lighting Fixture) Lenses. Luminaires (lighting fixtures) shall be installed with the top of the luminaire (fixture) lens below the normal water level of the fountain unless listed for above-water locations. A luminaire (lighting fixture) facing upward shall <u>comply with either (1) or (2):</u> ~~have the lens adequately guarded to prevent contact by any person.~~
<u>(1) Have the lens adequately guarded to prevent contact by any person.</u>
<u>(2) Be listed for use without a guard.</u>

Substantiation: Section 680.51(C) does not provide for use of an upward-facing luminaire that has a lens with no guard and where the lens is, however, confirmed during evaluation for listing to withstand loading and impact required of a lens guard. Luminaires with high-strength plastic lenses can be found suitable for this use. Luminaires with small diameter, particularly thick, glass lenses can be found suitable as well. The Standard for Underwater Luminaires and Junction Box, UL 676, requires submersible luminaires with an integral lens guard to withstand a 250 lb loading test and a 100 ft-lbf impact (a 50 lb, 9-inch diameter cylinder dropped 2 feet). Luminaires with high-strength plastic lenses or small diameter, thick glass lenses and no guard can be as strong as required for luminaires with a guard. Such alternative designs for upward-facing luminaires can be developed, listed, and used if 680.51(C) is revised, such as proposed, to permit such alternate luminaire designs.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-155 Log #969 NEC-P17 **Final Action: Accept in Principle**
(680.51(E))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise second sentence:
The maximum length of <u>any one</u> exposed cord... (remainder unchanged).
Substantiation: Edit. Present wording limits aggregate length of cords to 10 feet.
Panel Meeting Action: Accept in Principle
Revise 2nd sentence of 680.51(E) to read as follows:
The maximum length of <u>each</u> exposed cord... (remainder unchanged).
Panel Statement: The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-156 Log #2287 NEC-P17 **Final Action: Reject**
(680.52(B), 680.53, AND 680.57(E))

Submitter: John Leder, Georgia Fountain Co. Inc.
Recommendation: Please find below our suggested changes to improve the safety and security of electrical equipment installations in fountains. Of course, some of the associated articles elsewhere would require adjustments too. We have also included details as we routinely use them for illustration.
● (680.52(B)(1)A)
The threaded conduit entries should be expanded to include the words (tapered threads). It only makes sense to make sure that the connection of a junction box to a conduit be made water tight. The standard we apply in our company is "NPT" as this refers to the national standard for fluid and gas lines (<u>N</u> ational <u>P</u> ipe <u>T</u> apered). All standard electrical fittings produced use the "NPS"-standard (or <u>N</u> ational <u>P</u> ipe <u>S</u> traight or straight threads).
● (680.52(B)(2()b)
Relating the above add the requirement for thread sealant (such as Teflon paste) to increase the standard for water tight seal between junction box and metallic conduit.
● New Article suggestion (680.52(C)
Relating to the above, many water intrusion problems often occur not from within the fountain but from outside the fountain in the form of groundwater in broken underground conduit runs, mostly from broken electrical PVC adapters and couplings which are not very strong. We usually specify a requirement.:
1) When using PVC conduit underground, the use of SCH80 PVC pressure fitting adaptors is required.
2) When using PVC conduit underground, the use of PVC primer and glue is required.
This requirement has cut back on failure rates significantly. However, we do occasionally have inspectors who will not reason on this because it is not anchored in the code.
● (680.52(B)(2)(b)
We strongly recommend abolishing the words and related implications of "non-metallic conduit". It is our experience over the years that non-metallic conduit (such as PVC) is susceptible to breakage during cold weather and UV damage, not necessarily when the fountain is in operation but more so during winter months when the fountains are usually shut down and empty. Frequently, fountains are also used in the winter months for Christmas tree locations and snow plow deposits.
● New Article suggestion (680.52(B)(1()c)
All pool floor and wall conduit concrete penetrations shall be made of SCH40 red brass, machined with tapered (NPT) threads and shall feature an integral square brass water stop plate with SST or brass bonding screw. The reference to the square brass plate will insure that the brass conduit cannot be turned and separated from the serving conduit below the concrete.
● (680-52(B)(2)(a)
The term "approved potting compound" leaves many options open, of which many inspectors still believe paraffin wax to be one of them. It has been our experience that should a breach in the junction box seal occur and if undo temperatures exist in the conductor junction, the wax will return to a liquid state and separate from the conductors and allow any water in the box to come in contact with the junction. This leads to eventual corrosion of the juncture and increases the electrical shock hazard. There are today several compounds available that provide a much greater protection such as 3M Scotchcast #2112 which is a two component re-enterable soft compound. We suggest making provisions to the effect to guide the industry toward up-to-date material technology. Duct sealant to seal the conduit before potting is still required.
● (680-52(B)(2()b)
References to copper should be expanded to include a requirement that "all copper surfaces be painted or wrapped BEFORE concrete pours". The danger is not deterioration from currents between dissimilar metals in the system, but from the attack on the copper from the concrete itself being in direct contact with the copper.
● New Article suggestion (680.52B)(2c)
Where a brass conduit penetration through the concrete is connected to an EMT steel conduit system (such as in office buildings) a dielectric union shall be installed between the two materials. This will provide protection from galvanic action between the two materials.
● New Article suggestion (680.52(B)(1)(d)
Cord connected equipment and luminaries shall be installed to a junction box using a UL listed corrosion proof metal watertight strain relief. The cord seal/strain relief shall be equipped with neoprene seal. We are seeing the use of various plastic seals which again in winter time can be extremely brittle and susceptible to breakage when the fountain is in the winter period but also the influence of UV rays and chemical treatment combinations.
● (680.52(B)(1)(b)
Change the last word of that article from "material" to "metal". Plastic junction boxes are often understood to mean boxes such as "Carlon" PVC boxes. Though qualifying as a corrosion resistant material it is often used for under water purposes. Again the influence of temperatures, ice and chemical treatment has a very negative influence on the stability of the material.
● Article (680.53)
Add additional reference to Article 680.26 and remove reference to Article 250.122.
● Article 680.57(E)
Add additional reference to Articles 680.26 (for bonding) and 680.53.
● New Article suggestion (680.51)(A)(1)
All three phase submersible pumps shall be connected to a 3-Phase GFCI with 30mA max. fault trip range. In order to provide the industry with guidance on the use of three phase submersible pumps, we suggest this new article as the current 3-Phase equipment available world wide, is equipped with 10mA, 30mA, and 300mA fault trip ranges. Most European countries use 10mA and 30mA ranges for person protection.

Substantiation: We are in the fountain business world Note: wide hand have been at it for over 20 years. We have seen every installation imaginable. Having reviewed the 2005 NEC carefully, we still find, in our opinion, some code deficiencies that we would like to bring to your attention for consideration in the 2008 issue.

Many of the issues reflect the requirement to attention in the areas of the material selection with respect to temperature extremes (summer-winter ice) ice expansion and chemical resistance (UV rays and water treatment chemicals).

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).

The submitter has not provided adequate substantiation.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-157 Log #934 NEC-P17 **Final Action: Reject**
(680.52(B)(2)(b))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise second sentence:

~~Where the~~ A junction box ~~is~~ not exceeding 1650 cm 3 (100 in. 3) in size shall be permitted to be supported only by the conduit (s) . The conduit (s) shall be made of copper, brass, stainless steel, or other corrosion-resistant metal and threaded wrenchtight into a threaded box entry .

Substantiation: Edit. 314.23(E) indicates enclosures (boxes) may be supported by two conduits under certain conditions. This section suggests, but does not specifically permit support by one conduit, therefore, does not modify the requirements of 314.23(E). The proposal provides specific modification of that section.

Panel Meeting Action: Reject

Panel Statement: The submitter did not correctly quote the current Code text.

In accordance with 314.14(A), the box is not permitted to be supported by only one conduit. This imposes a safety risk.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-158 Log #2792 NEC-P17 **Final Action: Reject**
(680.54)

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

680.54 Grounding. The following equipment shall be grounded:

(1) All electrical equipment located within the fountain or within 1.5 m (5 ft) of the inside wall of the fountain , unless listed as not requiring grounding.

(2) All electrical equipment associated with the recirculating system of the fountain

(3) Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the fountain.

Substantiation: Problem - Some underwater luminaires for fountains do not have non-current-carrying metal parts requiring grounding. Requiring such luminaires to have provision for being grounded to permit an installation complying with 680.54 results in additional expense for both the luminaire manufacturers and users. This same situation occurs or is likely to occur for other types of electrical equipment located with the fountain or within 1.5 m (5 ft) of the inside wall of the fountain.

Substantiation – Standards for safety for electrical equipment used in or within 5 ft of the inside wall of a fountain provide for equipment designs that do not have non-current-carrying metal parts requiring grounding. One example is the Standard for Underwater Luminaires and Junction Boxes, UL676, which covers submersible luminaires intended for use in fountains. Section 680.54 should not require grounding for electric products that have been determined as part of their listing to not require grounding to address the risks of electric shock and fire.

Panel Meeting Action: Reject

Panel Statement: The proposal does not clearly identify specific types of product or equipment.

The fact that the product may be listed does not specify the equivalent methods for grounding.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

BLEWITT, T.: Panel should have Accepted in Principle. The Submitter did not make it clear that double insulation was intended.

UL 676, the Standard for Underwater Luminaires, specifies construction and performance requirements for line-voltage double-insulated luminaires.

Proposed revised 680.54(1) should be amended as follows:

(1) All electrical equipment located within the fountain or within 1.5 m (5 ft) of the inside wall of the fountain , unless listed with an approved system of double insulation .

Comment on Affirmative:

HIRSCH, B.: See comment for Proposal 17-64.

17-158a Log #CP1702 NEC-P17 **Final Action: Accept**
(680.55(B))

Submitter: Code-Making Panel 17,

Recommendation: Revise 680.55(B) to read as follows:

(B) Supplied by a Flexible Cord. Electrical equipment that is supplied by a flexible cord shall have all exposed non–current-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of this cord. The equipment grounding conductor shall be connected to ~~a~~ an equipment grounding terminal in the supply junction box, transformer enclosure, or other enclosure.

Revise 680.62(D)(1) to read as follows:

(D) Grounding.

(1) Fixed or Stationary Equipment. The equipment specified in (D)(1)(a) and (D)(1)(b) shall be ~~grounded~~ connected to the equipment grounding conductor .

Revise 680.62(D)(1)(a) to read as follows:

(a) Location. All electrical equipment located within 1.5 m (5 ft) of the inside wall of the tub shall be ~~grounded~~ connected to the equipment grounding conductor.

Revise 680.62(D)(1)(b) to read as follows:

(b) Circulation System. All electrical equipment associated with the circulating system of the tub shall be ~~grounded~~ connected to the equipment grounding conductor.

Substantiation: As Proposal 17-1 pertained to several articles (Articles 422, 426, 680 and 682), the panel chose to separate these into four (4) separate committee proposals to minimize confusion and act on them separately.

Panel Meeting Action: Accept

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

17-159 Log #2793 NEC-P17 **Final Action: Reject**
(680.55(B))

Submitter: Steven D. Holmes, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

680.55 Methods of Grounding.

(A) Applied Provisions . [no change]

~~**(B) Supplied by a Flexible Cord.** Electrical equipment that is supplied by a flexible cord shall have all exposed non-current-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of this cord. The grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure.~~

(B) Supplied by a Flexible Cord. Electrical equipment that is supplied by a flexible cord shall comply with (1) or (2):

(1) The electrical equipment shall have all exposed non-current-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of this cord. The grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure.

(2) The electrical equipment shall be listed as not requiring grounding.

Substantiation: Problem – The design of some flexible cord-supplied underwater luminaires for fountains with exposed non-current-carrying metal parts is such that not grounding one or more of the exposed non-current-carrying metal parts does not increase the risks of electric shock or fire. Requiring such exposed non-current-carrying metal parts to be bonded to the equipment grounding conductor of the flexible cord results in additional expense for both the luminaire manufacturer and users. Further requiring an equipment grounding conductor in the flexible cord for a luminaire with all exposed non-current-carrying metal parts not requiring grounding (and no other internal non-current-carrying metal parts requiring grounding) results in unnecessary expense for the luminaire manufacturer and users.

This same situation occurs or is likely to occur for other types of flexible cord-supplied electrical equipment associated with the fountain.

Substantiation – Standards for safety for flexible cord-supplied electrical equipment associated with a fountain provide for internal non-current-carrying metal parts that are not grounded. These electrical equipment designs are required to addresses the risks of electric shock and fire without the grounding of the internal non-current-carrying metal parts. One example is the Standard for Underwater Luminaires and Junction Boxes, UL676, which covers submersible luminaires intended for use in fountains. Section 680.55 should not require exposed non-current-carrying metal parts to be grounded where the electrical equipment is confirmed through listing to address the risks of electric shock and fire without the grounding of the exposed non-current-carrying metal parts.

Panel Meeting Action: Reject

Panel Statement: See panel action on Proposal on 17-158.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 10 Negative: 1

Explanation of Negative:

BLEWITT, T.: Panel should have Accepted in Principle. The Submitter did not make it clear that double insulated construction was intended.

UL 676, the Standard for Underwater Luminaires, specifies construction and performance requirements for line-voltage double-insulated luminaires.

Proposed new 680.55(B)(2) should therefore be amended as follows:
(2) The electrical equipment shall be listed with an approved system of double insulation.
The current 680.55(B) requires external metallic fasteners of a non-metallic junction box to be grounded. This is difficult to accomplish and is not necessary because they are not likely to become energized.
Additional text should therefore be added after proposed 680.55(B)(1)
Exception: Metallic fasteners that do not enter the interior of electrical equipment shall not be required to be grounded .
Comment on Affirmative:
HIRSCH, B.: See comment for Proposal 17-64.

17-160 Log #977 NEC-P17 **Final Action: Reject**
(680.56(D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
"Connections with flexible cord shall be ~~permanent~~ in accordance with 110.14 except with..." (remainder unchanged)
Substantiation: Edit. There is no definition of what constitutes a permanent connection. Plug and receptacle connections are inferred as not permanent connections even though permitted for many "permanently" installed utilization equipments.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 17-161.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-161 Log #1010 NEC-P17 **Final Action: Reject**
(680.56(D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Connections with flexible cord shall be ~~permanent~~ in accordance with 110.14 except that...(remainder unchanged.)
Substantiation: Edit. 110.14 is more specific; "permanent connection" is not defined; many permanent installations are permitted cord-and-plug connections.
Panel Meeting Action: Reject
Panel Statement: The submitter's proposal would incorrectly exclude the termination of attachment plugs and receptacles from compliance with 110.14.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-162 Log #540 NEC-P17 **Final Action: Reject**
(680.56(D), FPN (New))

Submitter: Chris Dreier, Ludvik Electric
Recommendation: Add a Fine Print note to read:
1. Terminations and connections with flexible cord shall be permanent, except that grounding type attachment plugs and receptacles shall be permitted to facilitate removal or disconnection for maintenance, repair or storage of fixed or stationary equipment not located in any water containing part of a fountain.
3. I wold like to see a fine print note added that would state, factory installed whips with molded plugs shall be permitted to be used for stationary submersible equipment [pumps, lights, etc]. That the receptacle have GFCI protection, and where the receptacle and cap are only accessible to authorized and qualified persons. To facilitate the removal for repair or storage of submersible equipment that are located in the water containing part of a fountain.
Substantiation: When installing store bought submersible pumps with cords and molded caps, according to the code you cannot place the pump in water unless it is permanently attached. The problem being, store bought pumps only have a twelve foot cord and are stationary at best. Without a fine print note, it makes it so you cannot use these pumps.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide a recommendation for consideration in accordance with the Regulations Governing Committee Projects, Section 4-3.3(c).
FPNs are informational only and are not enforceable as requirements of the Code; see 90.5(C).
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-163 Log #1511 NEC-P17 **Final Action: Reject**
(680.62(B) and (D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: (B) Revise first sentence:
The following parts shall be bonded together and grounded .
Revise (D)(1)(a):
Location: All exposed noncurrent-carrying metal equipment...(remainder unchanged).
(D)(1)(b): Circulation Systems. All exposed noncurrent-carrying metal equipment ...(remainder unchanged).
Substantiation: Edit. A grounding requirement should accompany bonding. Grounding should be limited to exposed and noncurrent-carrying metal. Equipment is a broad term including conductors, fuses, circuit breakers, etc. per Article 100, which cannot be grounded.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 17-151.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-164 Log #2343 NEC-P17 **Final Action: Accept in Principle**
(680.71)

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Add new text:
A GFCI receptacle shall not be located in the tub motor space or cavity.
Substantiation: The installation of a GFCI type receptacle in the tub motor space is not apparent to the average homeowner as evidenced by the many complaints received in our office. Even if the tub occupant is aware of the location of the receptacle, it does not seem appropriate to expect a person to exit the tub and remove the side of the tub or the access panel to reset the receptacle.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-165.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-165 Log #2547 NEC-P17 **Final Action: Accept in Principle**
(680.71)

Submitter: Robert P. McGann, City of Cambridge
Recommendation: Revise text to read as follows:
Hydromassage bathtubs and their associated electrical components must be on dedicated circuit(s) and shall be (protected by a) ground-fault interrupter.
Substantiation: If it is not spelled out in the listing papers, contractors are tapping in on hallway, living room and/or bedroom circuit without a violation.
Panel Meeting Action: Accept in Principle
Change 680.71 to read as follows:
Hydromassage bathtubs and their associated electrical components shall be on a dedicated circuit and protected by a readily accessible ground-fault circuit interrupter. All 125-volt, single-phase receptacles not exceeding 30 amperes and located within 1.5 m (5 ft) measured horizontally of the inside walls of a hydromassage tub shall be protected by a ground-fault circuit interrupter(s).

Panel Statement: The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-166 Log #347 NEC-P17 **Final Action: Accept in Principle**
(680.74)

TCC Action: The Technical Correlating Committee directs that the panel reconsider and clarify the panel action on this proposal by using mandatory language in accordance with the NEC Style Manual. This action will be considered by the panel as a public comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
680.74 Bonding. All metal piping systems and all grounded metal parts in contact with the circulating water shall be bonded together using a copper bonding jumper, insulated, covered, or bare, not smaller that 8 AWG solid. The bonding jumper shall be connected to the terminal on the circulating pump motor that is intended for this purpose. The bonding jumper shall not be required to be connected to a double insulated circulating pump motor.
FPN: The 8 AWG or larger solid copper bonding jumper is required for equipotential bonding in the area of the hydromasage bathtub and shall not be required to be extended or attached to any remote panelboard, service equipment, or any electrode.
Substantiation: This proposed wording is an effort to provided clear direction within this rule to users and enforcement about where the connections are required to be made. The new FPN is consistent with the FPN to 680.26 in an effort to inform the users of the Code, what the purpose of the bonding required by this section is intended to accomplish. There continues to be a significant number of enforcement officials requiring the bonding jumper covered by this section to be run to the serving panelboard or service, and connected to the grounding electrode. This connection is already accomplished through the equipment grounding conductor of the circulation motor equipment grounding conductor. The revision should provide the needed clarity and result in more consistent application of the rules to these types of installations.
Panel Meeting Action: Accept in Principle
Revise 680.74 to read as follows:
680.74 Bonding. All metal piping systems and all grounded metal parts in contact with the circulating water shall be bonded together using a copper bonding jumper, insulated, covered, or bare, not smaller that 8 AWG solid. The bonding jumper shall be connected to the terminal on the circulating pump motor that is intended for this purpose. The bonding jumper shall not be

required to be connected to a double insulated circulating pump motor. The 8 AWG or larger solid copper bonding jumper is required for equipotential bonding in the area of the hydromasage bathtub and shall not be required to be extended or attached to any remote panelboard, service equipment, or any electrode.
Panel Statement: The change meets the submitter's intent.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:
BLEWITT, T.: The terminal for bonding will not always be on the pump motor. The second sentence might better read:
"The bonding jumper shall be connected to the terminal identified for this purpose."

17-167 Log #618 NEC-P17 **Final Action: Accept in Principle**
(680.74)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
680.74 Bonding. All metal piping systems supplying hydromassage bathtubs, including metal piping and all grounded metal parts in contact with the circulating water, shall be bonded ~~together~~ using a copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG solid. The bonding jumper shall terminate at the pump motor on a terminal for this purpose.
FPN: The 8 AWG or larger solid copper bonding conductor shall not be required to be extended or attached to any remote panelboard, service equipment, or any electrode.
Substantiation: The proposed revision is for clarification purposes. There continues to be considerable confusion and inconsistency in how this requirement is being applied in the field. The common practices currently include bonding the hot and cold water piping supplying the tub to the terminal lug on the pump motor (other than double insulated types). The current text is being viewed and interpreted by some as only requiring "metal piping systems and grounded metal parts in contact with the circulation water" to be bonded. The piping for the circulation water of a hydromassage tub is typically nonmetallic. The questions arise as to the requirement for bonding the hot and cold water supply piping system that is connected to the tub. If the objective is to place all metal piping and metal parts such as faucets and valves associated with the hydromassage tub at the same equipotential plane, then the Code should clearly require that, and not leave users with any question as to what is required to be bonded and where the bonding jumper is required to be connected. The proposed FPN is the same one that follows 680.26 to help clarify that this bonding conductor does not have to be routed to a panelboard or service equipment or grounding electrode.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-166.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-168 Log #890 NEC-P17 **Final Action: Accept**
(680.74)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise 680.74 as follows:
"All metal piping systems and all grounded metal parts in contact with the circulating water shall be bonded together using a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG ~~solid~~ ."
Substantiation: According to the current language, an 8 AWG stranded conductor could be used because it is as big (or bigger) than an 8 AWG solid conductor. The application is essentially the same as 680.26(C) and 680.62(C)(4) and should have similar wording that ensures the use of a solid copper conductor.
Panel Meeting Action: Accept
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-169 Log #1035 NEC-P17 **Final Action: Accept in Principle**
(680.74)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise latter part:
"... ~~Not smaller than~~ using a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG ~~solid~~ ."
Substantiation: Edit. An 8 AWG aluminum conductor is not smaller than a solid copper conductor. Present wording infers but does not specifically require copper, but only relates to the size of 8 AWG solid conductors.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-168.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-170 Log #1370 NEC-P17 **Final Action: Accept in Principle**
(680.74)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Edit for clarification
Bonding.
All metal piping systems and all grounded metal parts in contact with the circulating water shall be bonded together using a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG ~~solid.~~
Substantiation: As written, the *Code* would permit a stranded bonding jumper, if larger than the circular mil of 8 AWG solid. If this is the intent, it should be spelled out to reflect the intent, as it is in 680.27(A)(2) and 680.26(C).
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 17-168.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

17-171 Log #3200 NEC-P17 **Final Action: Reject**
(680, Part VIII)

Submitter: Donald Cook, Shelby County Development Services
Recommendation: Add a new Part VIII to cover Baptisteries.
680.80 General. Baptisteries as defined in 680.2 shall comply with Part VIII of this article.
680.81 Protection.
(A) Baptistery Equipment. Baptistery electrical components shall be protected by a ground-fault circuit interrupter.
(B) Receptacles. Receptacles rated 125-volts and 30 amperes or less and located within 3.0 m (10 ft) of the inside walls of the baptistery vessel shall be protected by a ground-fault circuit interrupter.
680.82 Installations.
(A) Luminaires, Lighting Outlets, and Ceiling Fans. Luminaires (lighting fixtures), except as covered in 680.82(B), lighting outlets, and ceiling-suspended (paddle) fans located over the baptistery or within 1.5 m (5 ft) from the inside walls of the baptistery shall comply with the clearances specified in (A)(1), (A)(2) and (A)(3) above the maximum water level.
(1) Without GFCI. Where no GFCI protection is provided, the mounting height shall be not less than 3.7 m (12 ft).
(2) With GFCI. Where GFCI protection is provided, the mounting height shall be permitted to be not less than 2.3 m (7ft 6 in.).
(3) Below 2.3 m (7 ft 6 in.). Luminaires (lighting fixtures) meeting the requirements of item (a) or (b) and protected by a ground-fault circuit interrupter shall be permitted to be installed less than 2.3 m (7 ft 6in.) over a baptistery:
(a) Recessed luminaires (lighting fixtures) with a glass or plastic lens, nonmetallic or electrically isolated metal trim, and suitable for damp locations
(b) Surface-mounted luminaires (lighting fixtures) with a glass or plastic globe, a nonmetallic body, or a metallic body isolated from contact, and suitable for damp locations
(B) Underwater Applications. Underwater luminaires (lighting fixtures) shall comply with the provisions of 680.23 or 680.33.
(C) Wall Switches. Switches shall be located at least 1.5 m (5 ft), measured horizontally, from the inside wall of the baptistery.
(D) Bonding. The following parts shall be bonded together:
(1) All metal fittings within or attached to the baptistery structure
(2) Metal parts of electrical equipment associated with the baptistery circulating system, including pump motors.
(3) Metal conduit and metal piping that are within 1.5 m (5 ft) of the inside walls of the baptistery and that are not separated from the baptistery by a permanent barrier
(4) All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the baptistery and are not separated from the baptistery by a permanent barrier
(E) Method of Bonding. All parts required to be bonded by 680.82(D) shall bonded together using an insulated, covered, or bare, copper bonding jumper, not smaller than 8 AWG solid.
(F) Grounding. The following equipment shall be grounded:
(1) All electric equipment located within 1.5 m (5 ft) of the inside wall of the baptistery
(2) All electric equipment associated with the circulating system of the baptistery
Substantiation: Baptisteries are not currently covered by this article or any other special equipment requirements of the NEC. Many involve immersion of the user and the same electrical hazards as pools, hot tubs, spas, hydromassages, and other vessels included in Article 680. Currently, nothing in the NEC requires bonding of metal parts, GFCI protection of equipment, separation of electrical and electronic devices from the vessel. This and companion proposals address that lack of coverage. The attached newspaper article related to the death of a user is submitted for substantiation that requirements are needed.
●Based on NEC 90.2(A) and (B), the distribution system is within the scope of the NEC.
●The service point, which is defined in Article 100 is the line of demarcation and separates the "utility system" from the "premises wiring". See definitions

for service point and premises wiring. The combination of those definitions and the information in 90.2 clearly places this installation within the scope of the NEC.

● The value of the Fine Print Notes (FPN) to the enforcement of the installation can be determined by reading NEC 90.5(C).

● Based on 90.2(C), the authority having jurisdiction (Shelby County) may grant exceptions to the requirements found in the NEC for outdoor distribution work.

* Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) thick.Little or none of the equipment utilized in distribution installations has been evaluated by any NRTL.

● Although the NEC has some rules for installations over 600 volts, it was not developed to evaluate overhead distribution systems.

● After discussing this type installation with respected inspection agencies all over the US, with respected NEC experts all over the country, with NFPA staff, we have agreed to provide that exception based on the owner providing a third party evaluation of the equipment and the installation.

● We also provided an option of transferring ownership of the distribution system back to Alabama Power. If that choice was made, the service point would be re-located to each well site and the NEC would be much easier to use.

● We can not use the NESC. That document has not been adopted in this jurisdiction. We can accept an evaluation from an acceptable third party agency. Since the approval of any installation is the responsibility of the AHJ, it is the responsibility of Shelby County to determine what third party agency we will approve.

90.2 Scope.

(A) Covered. This Code covers the installation of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

FPN to (2): For additional information concerning such installations in an industrial or multibuilding complex, see ANSI C2-2002, National Electrical Safety Code.

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center.

(C) Special Permission. The authority having jurisdiction for enforcing this Code may grant exception for the installation of conductors and equipment that are not under the exclusive control of the electric utilities and are used to connect the electric utility supply system to the service-entrance conductors of the premises served, provided such installations are outside a building or terminate immediately inside a building wall.

90.5 Mandatory Rules, Permissive Rules, and Explanatory Material.

(A) Mandatory Rules. Mandatory rules of this Code are those that identify actions that are specifically required or prohibited and are characterized by the use of the terms shall or shall not.

(B) Permissive Rules. Permissive rules of this Code are those that identify actions that are allowed but not required, are normally used to describe options or alternative methods, and are characterized by the use of the terms shall be permitted or shall not be required.

(C) Explanatory Material. Explanatory material, such as references to other standards, references to related sections of this Code, or information related to a Code rule, is included in this Code in the form of fine print notes (FPNs). <u>**Fine print notes are informational only and are not enforceable as requirements of this Code.**</u>

ARTICLE 100 Definitions

Approved. Acceptable to the authority having jurisdiction.

Premises Wiring (System). That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed, that extends from the service point or source of power, such as a battery, a solar photovoltaic system, or a generator, transformer, or converter windings, to the outlet(s). Such wiring does not include wiring internal to appliances, luminaires (fixtures), motors, controllers, motor control centers, and similar equipment.

Service Point. The point of connection between the facilities of the serving utility and the premises wiring.

110.2 Approval. The conductors and equipment required or permitted by this Code shall be acceptable only if approved.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: Refer to panel action and statement on Proposal 17-60.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:

BLEWITT, T.: A baptistery is a type of pool. Article 680 already covers pools.

17-172 Log #3557 NEC-P17 **Final Action: Reject**
(680.80 (New))

Submitter: Donald Cook, Shelby County Building Inspections
Recommendation: Add new article to read as follows:

680.80 General. Baptistries as defined in 680.2 shall comply with Part VIII of this article.

680.81 Protection.

(A) Baptistery Equipment. Baptistery electrical components shall be protected by a ground-fault circuit interrupter.

(B) Receptacles. Receptacles rated 125-volts and 30 amperes or less and located within 3.0 m (10 ft) of the inside walls of the baptistery vessel shall be protected by a ground-fault circuit interrupter.

680.82 Installations.

(A) Luminaires, Lighting Outlets, and Ceiling Fans, Luminaires (lighting fixtures), except as covered in 680.82(B), lighting outlets and ceiling-suspended (paddle) fans located over the baptistery or within 1.5 m (5 ft) from the inside walls of the baptistery shall comply with the clearances specified in (A)(1), (A)(2) and (A)(3) above the maximum water level.

(1) Without GFCI. Where no GFCI protection is provided, the mounting height shall be not less than 3.7 m (12 ft).

(2) With GFCI. Where GFCI protection is provided, the mounting height shall be permitted to be not less than 2.3 m (7 ft 6 in.)

(3) Below 2.3 m (7 ft 6 in.). Luminaires (lighting fixtures) meeting the requirements of item (a) or (b) and protected by a ground-fault circuit interrupter shall be permitted to be installed less than 2.3 m (7 ft 6 in.) over a baptistery:

(a) Recessed luminaires (lighting fixtures) with a glass or plastic lens, nonmetallic or electrically isolated metal trim, and suitable for damp locations.

(b) Surface-mounted luminaires (lighting fixtures) with a glass or plastic globe, a nonmetallic body, or a metallic body isolated from contact, and suitable for damp locations.

(B) Underwater Applications. Underwater luminaires (lighting fixtures) shall comply with the provisions of 680.23 or 680.33.

(C) Wall Switches. Switches shall be located at least 1.5 m (5 ft), measured horizontally, from the inside wall of the baptistery.

(D) Bonding. The following parts shall be bonded together:

(1) All meal fittings within or attached to the baptistery structure.

(2) Metal parts of electrical equipment associated with the baptistery circulating system, including pump motors.

(3) Metal conduit and metal piping that are within 1.5 m (5 ft) of the inside walls of the baptistery and that are not separated from the baptistery by a permanent barrier.

(4) All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the baptistery and are not separated from the baptistery by a permanent barrier.

(E) Method of Bonding. All parts required to be bonded by 680.82(D) shall be bonded together using an insulated, covered, or bare, copper bonding jumper, not smaller than 8 AWG solid.

(F) Grounding. The following equipment shall be grounded:

(1) All electric equipment located within 1.5 m (5 ft) of the inside wall of the baptistery

(2) All electric equipment associated with the circulating system of the baptistery

680.83 Listing. All electrical equipment and all electrically powered utilization equipment associated with the baptistery vessel shall be listed.

Substantiation: Baptisteries are not currently covered by this article or any other special equipment requirements of the NEC. Many involve immersion of the user and the same electrical hazards as pools, hot tubs, spas, hydromassages, and other vessels included in Article 680. Currently, nothing in the NEC requires bonding of metal parts, GFCI protection of equipment, separation of electrical and electronic devices from the vessel. This and companion proposals address that lack of coverage. The newspaper article related t the death of a user is submitted for substantiation that requirements are needed.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: Refer to panel action and statement on Proposal 17-60.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11
Comment on Affirmative:

BLEWITT, T.: A baptistery is a type of pool. Article 680 already covers pools.

ARTICLE 682 — NATURAL AND ARTIFICALLY MADE BODIES OF WATER

17-173 Log #3256 NEC-P17 **Final Action: Reject**
(682.2)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because Code-Making Panel 19 did not agree that a common definition in Article 100 would meet their needs.
Submitter: Donald Dekker, N. Muskegon, MI
Recommendation: Delete the following text:
~~(Equipotential Plane. An area where wire mesh or other conductive elements are on, embedded in or placed under the walk surface within 75 mm (3 in.), bonded to all metal structures and fixed nonelectrical equipment that may become energized, and connected to the electrical grounding system to prevent a difference in voltage from developing within the plane.)~~
Substantiation: The term Equipotential Plane is defined in 2 separate sections of the Code and its methods are utilized in 3 distinct articles. I recommended deleting the 2 separate definitions and adding the definition of Equipotential Plane to 100-1. See companion proposals.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-174 Log #3423 NEC-P17 **Final Action: Accept**
(682.11)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Insert the words "shall be" after "live parts" and before "elevated."
Substantiation: Grammar and clarity call for parallel construction within this sentence.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-175 Log #3424 NEC-P17 **Final Action: Accept**
(682.13)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
Liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit with approved fittings shall be permitted for feeders and where flexible connections are required for services. Extra-hard usage portable power cable listed for both wet locations and sunlight resistance shall be permitted for a feeder or a branch circuit where flexibility is required. Other wiring methods, suitable for the location shall be permitted to be installed where flexibility is not required. Temporary wiring in accordance with 590.4 shall be permitted.
Substantiation: This section is perhaps the most blatant violation of the whole-article reference prohibition in the entire ROP. After reviewing the referenced articles and considering 90.3, the reference to Chapter 3 is unnecessary, and the relevant requirements in Articles 553 and 555 have been incorporated into this comment. Here, the proposed language in this proposal comes from 553.7, but the last sentence was broadened to include cable assemblies. The whole article reference to Article 590 has been limited to 590.4, which should include the necessary requirements.
This objection was part of a public comment in the 2005 cycle; CMP 17 failed to provide any substantiation for not accepting this part of that comment. If these references are not clarified at this point, the TCC should intervene and enforce 4.1.1 of the NEC Style Manual.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-176 Log #3425 NEC-P17 **Final Action: Reject**
(682.14)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
Submersible or Floating Equipment Power Connection(s). Submersible or floating equipment shall be cord- and plug-connected, using extra hard usage cord, as designated in Table 400.4 and listed with a "W" suffix. The plug and receptacle combination shall be arranged to be suitable for the location while in use. Disconnecting means shall be provided to isolate each submersible or floating electrical equipment from its supply connection(s) without requiring the plug to be removed from the receptacle.
(A) Type. The disconnecting means shall consist of a circuit breaker, switch, or both, or molded case switch, and shall be specifically marked todesignate which receptacle it controls.
(B) Location. The disconnecting means shall be readily accessible on land, located not more than 750 mm (30 in.) from the receptacle it controls, and shall be located in the supply circuit ahead of the receptacle. The disconnecting means shall be located within sight but not closer than 1.5 m (5 ft) from the shoreline. Uninsulated live parts shall be elevated not less than 300 mm (12 in.) above the datum plane.
Substantiation: This section needs to begin with language governing cords and cord- and plug-connections, because the rest of the section discusses disconnects for receptacles without ever requiring receptacles, so an essential element is missing. The cord designation comes from equivalent requirements for fountains. The wording of (A) reflects the fact that this is supposed to be a requirement that limits the permitted types of disconnecting means, but the wording is merely permissive. Molded case switches are added because there is no valid reason to exclude them in this context. The sentence also avoids the imprecise term "properly" in favor of text that complies with the NEC Style Manual.
(B) This wording is slightly editorially improved from the NEC text in terms of flow. It also uses the term "uninsulated" ahead of live parts in order to have a sensible requirement. (Refer to Article 100.)
Panel Meeting Action: Reject
Panel Statement: The proposal would limit connections of s ubmersible or floating equipment to cord-and-plug connected devices.
The disconnectiing means already includes switches and circuit breakers.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10
Comment on Affirmative:
BLEWITT, T.: The first part of Submitter's proposal deals with wiring methods and installation. This is covered under 682.13 not 682.14. Referenced requirements in Article 555 allow the use of cords in Table 400.4 with the "W" suffix.
No revision to 682.14(A) is necessary to allow the use of a molded case switch.
The Panel did not address the editorial correction requested at the end of 682.14(B). The last sentence should be amended to delete the words "and live parts". The requirements for live parts are already addressed in 682.12.

17-177 Log #902 NEC-P17 **Final Action: Reject**
(682.14(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
The disconnecting means shall ~~be permitted~~ consist of a circuit breaker(s), switch(es), or both, <u>that simultaneously disconnects all ungrounded conductors of the circuit it supplies,</u> and shall be properly identified as to which structure or equipment it controls.
Substantiation: Edit. No specific type of disconnect is required as in similar Code sections. The definition of disconnecting means in Article 100 is broad enough to include plug/receptacle, terminals. Wire connectors, relays, links (668.13(B)) etc.
Panel Meeting Action: Reject
Panel Statement: The proposal limits the disconnecting means to consist of a circuit breaker(s), switch(es), or both.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-178 Log #3426 NEC-P17 **Final Action: Accept in Principle**
(682.30)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 19 for Information.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Revise as follows:
682.30 System Grounding. The grounded circuit conductor (neutral) shall be an insulated conductor identified in conformance with 200.6. The neutral conductor shall be connected to the equipment grounding terminal in the service equipment, and, except for that connection, it shall be insulated from the equipment grounding conductors, equipment enclosures, and all other grounded parts.
Substantiation: This language corrects another sequence of blatant whole-article reference violations. The relevant requirements in Articles 553 and 555 have been suitably adapted and incorporated into this proposal. Here again, 4.1.1 of the NEC Style Manual should be enforced.
Panel Meeting Action: Accept in Principle
Change 682.30 to read as follows:
Grounding
Wiring and equipment within the scope of this article shall be grounded as specified in Part III of 553, 555.15 and with the requirements in Part III of this Article.
Panel Statement: The change meets the submitter's intent.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-178a Log #CP1703 NEC-P17 **Final Action: Accept**
(682.31(B))

Submitter: Code-Making Panel 17,
Recommendation: Revise 682.31(B) to read as follows:
Where a feeder supplies a remote panelboard, an insulated equipment ~~grounded~~ grounding conductor shall extend from a grounding terminal in the service to a grounding terminal and busbar in the remote panelboard.
Substantiation: As Proposal 17-1 pertained to several articles (Articles 422, 426, 680 and 682), the panel chose to separate these into four (4) separate committee proposals to minimize confusion and act on them separately.
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-179 Log #1060 NEC-P17 **Final Action: Accept**
(682.31(D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "required to be".
Substantiation: Edit. Where grounding is done by choice (not required) the requirement should apply. 250.1 indicates grounding requirements cover installations "permitted".
Panel Meeting Action: Accept
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-180 Log #2540 NEC-P17 **Final Action: Reject**
(682.33)

Submitter: Timothy D. Curry, Curry Electric, Inc.
Recommendation: Delete the entire section.
Substantiation: While I applaud the efforts of the committee to put a new article together, I do not believe that there is sufficient documented danger to require this plane especially when a large amount of this type equipment is placed in areas of soil/vegetation, and a plane would be approximately 7 in. in diameter.
Panel Meeting Action: Reject
Panel Statement: The submitter has not provided adequate substantiation.
This proposal reduces the level of safety provided by the current Code.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

17-181 Log #2541 NEC-P17 **Final Action: Accept in Principle**
(682.33)

Submitter: Timothy D. Curry, Curry Electric, Inc.
Recommendation: Revise text to read:
Equipotential Planes ~~and Bonding of Equipment Planes~~
Substantiation: After this title, no where in this or any other section is "Equipment Plane" mentioned, let alone defined. If we don't know what it is, and there are no rules pertaining to it, it should be deleted.
Panel Meeting Action: Accept in Principle
Revise the title of 682.33 to read as follows:
682.33 Equipotential Planes and Bonding of Equipotential Planes
Panel Statement: The change meets the submitter's intent.
Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

ARTICLE 685 — INTEGRATED ELECTRICAL SYSTEMS

12-152 Log #1713 NEC-P12 **Final Action: Reject**
(685.1, Table 685.3)

Submitter: Stephen McCluer, American Power Conversion Corp
Recommendation:
Revise 685.1 and Table 685.3 as noted:
685.1 Scope.
This article covers integrated electrical systems, other than unit equipment, in which orderly shutdown is necessary to ensure safe operation or to prevent disruption of mission-critical operation. An integrated electrical system as used in this article is a unitized segment of an industrial wiring system where all of the following conditions are met:

(1) An orderly shutdown is required to minimize personnel hazard and equipment damage or to prevent disruption of mission-critical operation.

Table 685.3 Application of Other Articles

Conductor/Equipment	Section
More than one building or other structure	225, Part II
Ground-fault protection of equipment	230.95, Exception No. 1
Protection of conductors	240.4
Electrical system coordination	240.12
Ground-fault protection of equipment	240.13(1)
Grounding ac systems of 50 volts to 1000 volts	250.21
Equipment protection	427.22
Orderly shutdown	430.44
Disconnection	430.74, Exception Nos. 1 and 2
Disconnecting means in sight from controller	430.102(A), Exception No. 2
Energy from more than one source	430.113, Exception Nos. 1 and 2
Disconnecting means	645.10, Exception Nos. 1. and 2
	645.10(1)**
Uninterruptible power supplies (UPS)	645.11(1)
Point of connection	705.12(A)

**(comment: This reference to "645.10, Exceptions" is contingent upon acceptance of a separate proposal that would add a 2nd exception to 645.10. Delete the reference here if that proposal is not accepted.)

Substantiation: This proposal expands the scope of Article 685 to include "mission-critical" equipment. "Orderly shutdown" of an industrial process is not the only situation where "safe operation" is jeopardized. Continuous operation of certain equipment, such as information technology (IT) equipment, is so critical that unplanned power interruption can have catastrophic financial as well as human safety consequences.
Examples of "mission critical" operations include:
- Financial organizations controlling the flow of international finances in real time
- Hospital operations in which such things as patient records, diagnostic procedures, radiological scans, and medicine dispensing are all critically tied into IT equipment
- Transportation companies tracking the location and status of every vehicle, ship or airplane in real time
- Management of U.S. communications, such as Voice over Internet
- Online transactions for e-base commerce, banks, and other commercial operations in real time

Panel Meeting Action: Reject
Panel Statement: Article 685 is developed to "…minimize personnel hazard and equipment damage." Examples mentioned in this proposal (with the possible exception of hospital operations) do not involve personnel hazard or equipment damage. Nothing in the code prevents these organizations from incorporating orderly shutdowns, or more important, alternate power sources. The proposal is too vague and would be difficult to enforce.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12
Comment on Affirmative:
JANIKOWSKI, R.: Integrated Electrical Systems today have far more reaching applications than even systems of a short three years ago. I am in favor of orderly shutdown of integrated electrical systems that not only minimize personnel hazard but also prevent the disruption of mission-critical operations. Word financial networks, networked hospital operations, global transportation, global communications and e-base commerce just to name of few of the mission-critical operations that utilize Integrated Electrical Systems.

12-153 Log #116 NEC-P12 **Final Action: Reject**
(685.3)

Submitter: Stephen Urick, STV Incorporated
Recommendation: Revise as follows:
685. ~~3~~ 2 Application of Other Articles. The articles/sections in Table 685. ~~3~~ 2 apply...
Substantiation: There may be confusion going from paragraph 1 to paragraph 3.
Panel Meeting Action: Reject
Panel Statement: Subsection 2 of an article is reserved for definitions, per 2003 NEC Style Manual, 2.2.2.2.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 690 — SOLAR PHOTOVOLTAIC SYSTEMS

13-17 Log #2582 NEC-P13 **Final Action: Accept in Principle**
(690)

Submitter: Timothy M. Croushore, Allegheny Power
Recommendation: **Listed below are the proposed text and the revised figures of Article 690.**

ARTICLE 690 Solar Photovoltaic Systems

I. General

690.1 Scope.

The provisions of this article apply to solar photovoltaic electrical energy systems, including the array circuit(s), inverter(s), and controller(s) for such systems. [See Figure 690.1(A) and Figure 690.1(B).] Solar photovoltaic systems covered by this article ~~may be~~ are either interactive with other electrical power production and distribution network sources or stand-alone, with or without electrical energy storage such as batteries. These systems may have ac or dc output for utilization.

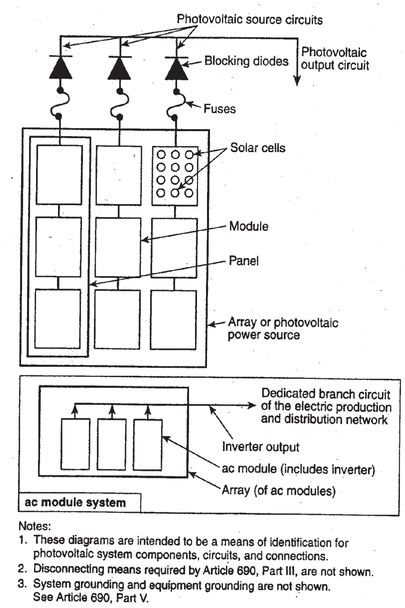


Figure 690.1(A) Identification of Solar Photovoltaic System Components.

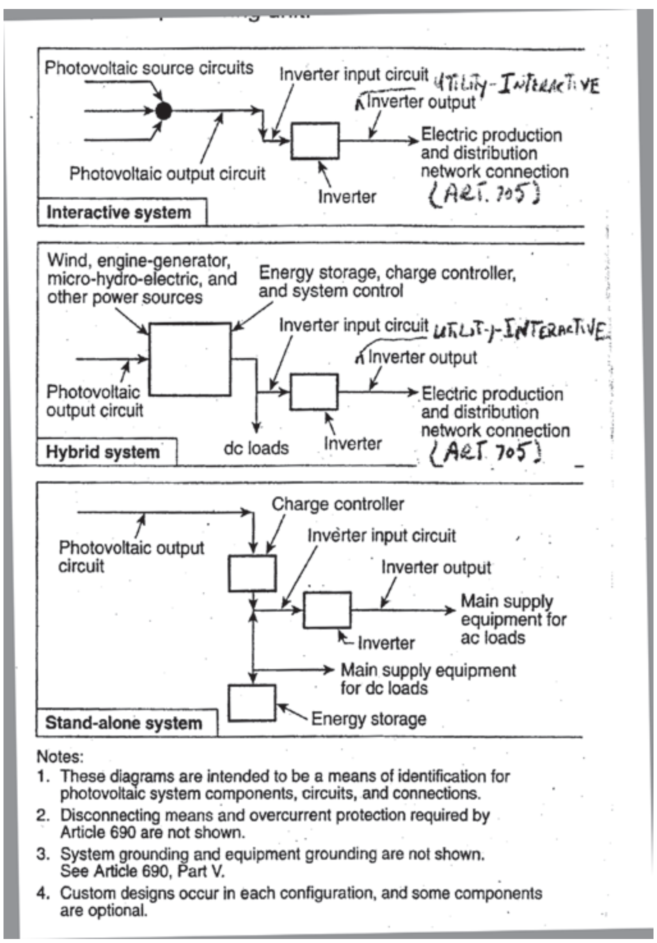


Figure 690.1(B) Identification of Solar Photovoltaic System Components in Common System Configurations.

690.2 Definitions.

Alternating-Current (ac) Module (Alternating-Current Photovoltaic Module). A complete, environmentally protected unit consisting of solar cells, optics, inverter, and other components, exclusive of tracker, designed to generate ac power when exposed to sunlight.

Array. A mechanically integrated assembly of modules or panels with a support structure and foundation, tracker, and other components, as required, to form a direct-current power-producing unit.

Bipolar Photovoltaic Array. A photovoltaic array that has two outputs, each having opposite polarity to a common reference point or center tap.

Blocking Diode. A diode used to block reverse flow of current into a photovoltaic source circuit.

Building Integrated Photovoltaics. Photovoltaic cells, devices, modules, or modular materials that are integrated into the outer surface or structure of a building and serve as the outer protective surface of that building.

Charge Controller. Equipment that controls dc voltage or dc current, or both, used to charge a battery.

Diversion Charge Controller. Equipment that regulates the charging process of a battery by diverting power from energy storage to direct-current or alternating-current loads or to an interconnected utility service.

~~**Electrical Production and Distribution Network.** A power production, distribution, and utilization system, such as a utility system and connected loads, that is external to and not controlled by the photovoltaic power system.~~

~~**Hybrid System.** A system comprised of multiple power sources. These power sources may include photovoltaic, wind, micro-hydro generators, engine-driven generators, and others, but do not include electrical production and distribution network systems. Energy storage systems, such as batteries, do not constitute a power source for the purpose of this definition.~~

~~**Interactive System.** A solar photovoltaic system that operates in parallel with and may deliver power to an electrical production and distribution network. For the purpose of this definition, an energy storage subsystem of a solar photovoltaic system, such as a battery, is not another electrical production source.~~

Inverter. Equipment that is used to change voltage level or waveform, or both, of electrical energy. Commonly, an inverter [also known as a power conditioning unit (PCU) or power conversion system (PCS)] is a device that changes dc input to an ac output. Inverters may also function as battery chargers that use alternating current from another source and convert it into direct current for charging batteries.

Inverter Input Circuit. Conductors between the inverter and the battery in stand-alone systems or the conductors between the inverter and the photovoltaic output circuits ~~for electrical production and distribution network~~.

Inverter Output Circuit. Conductors between the inverter and an ac panelboard for stand-alone systems. ~~or the conductors between the inverter and the service equipment or another electric power production source, such as a utility, for electrical production and distribution network.~~

Module. A complete, environmentally protected unit consisting of solar cells, optics, and other components, exclusive of tracker, designed to generate dc power when exposed to sunlight.

Panel. A collection of modules mechanically fastened together, wired, and designed to provide a field-installable unit.

Photovoltaic Output Circuit. Circuit conductors between the photovoltaic source circuit(s) and the inverter or dc utilization equipment.

Photovoltaic Power Source. An array or aggregate of arrays that generates dc power at system voltage and current.

Photovoltaic Source Circuit. Circuits between modules and from modules to the common connection point(s) of the dc system.

Photovoltaic System Voltage. The direct current (dc) voltage of any photovoltaic source or photovoltaic output circuit. For multiwire installations, the photovoltaic system voltage is the highest voltage between any two dc conductors.

Solar Cell. The basic photovoltaic device that generates electricity when exposed to light.

Solar Photovoltaic System. The total components and subsystems that, in combination, convert solar energy into electrical energy suitable for connection to a utilization load.

Stand-Alone System. A solar photovoltaic system that supplies power independently of an electrical production and distribution network.

690.3 Other Articles.

Wherever the requirements of other articles of this *Code* and Article 690 differ, the requirements of Article 690 shall apply. ~~and, if the system is operated in parallel with a primary source(s) of electricity, the requirements in 705.14, 705.16, 705.32, and 705.43 shall apply.~~ <u>Solar photovoltaic systems that are interactive with other electrical power production sources shall follow the requirements of Article 705</u>

Exception: Solar photovoltaic systems, equipment, or wiring installed in a hazardous (classified) location shall also comply with 500.1, 505.1, and 510.1.

690.4 Installation.

(A) Solar Photovoltaic System. A solar photovoltaic system shall be permitted to supply a building or other structure in addition to any service(s) of another electricity supply system(s).

(B) Conductors of Different Systems. Photovoltaic source circuits and photovoltaic output circuits shall not be contained in the same raceway, cable tray, cable, outlet box, junction box, or similar fitting as feeders or branch circuits of other systems, unless the conductors of the different systems are separated by a partition or are connected together.

(C) Module Connection Arrangement. The connections to a module or panel shall be arranged so that removal of a module or panel from a photovoltaic source circuit does not interrupt a grounded conductor to another photovoltaic source circuit. Sets of modules interconnected as systems rated at 50 volts or less, with or without blocking diodes, and having a single overcurrent device shall be considered as a single-source circuit. Supplementary overcurrent devices used for the exclusive protection of the photovoltaic modules are not considered as overcurrent devices for the purpose of this section.

(D) Equipment. Inverters or motor generators shall be identified for use in solar photovoltaic systems.

690.5 <u>DC</u> Ground-Fault Protection.

Roof-mounted dc photovoltaic arrays located on dwellings shall be provided with dc ground-fault protection to reduce fire hazards.

(A) Ground-Fault Detection and Interruption. The <u>DC</u> ground-fault protection device or system shall be capable of detecting a ground fault, interrupting the flow of fault current, and providing an indication of the fault.

(B) Disconnection of Conductors. The ungrounded conductors of the faulted source circuit shall be automatically disconnected. If the grounded conductors of the faulted source circuit are disconnected to comply with the requirements of 690.5(A), all conductors of the faulted source circuit shall be opened automatically and simultaneously. Opening the grounded conductor of the array or opening the faulted sections of the array shall be permitted to interrupt the ground-fault current path.

(C) Labels and Markings. Labels and markings shall be applied near the ground-fault indicator at a visible location, stating that, if a ground fault is indicated, the normally grounded conductors may be energized and ungrounded.

690.6 Alternating-Current (ac) Modules.

(A) Photovoltaic Source Circuits. The requirements of Article 690 pertaining to photovoltaic source circuits shall not apply to ac modules. The photovoltaic source circuit, conductors, and inverters shall be considered as internal wiring of an ac module.

(B) Inverter Output Circuit. The output of an ac module shall be considered an inverter output circuit.

(C) Disconnecting Means. A single disconnecting means, in accordance with 690.15 and 690.17, shall be permitted for the combined ac output of one or more ac modules. Additionally, each ac module in a multiple ac-module system shall be provided with a connector, bolted, or terminal-type disconnecting means.

(D) Ground-Fault Detection. Alternating-current-module systems shall be permitted to use a single detection device to detect only ac ground faults and to disable the array by removing ac power to the ac module(s).

(E) Overcurrent Protection. The output circuits of ac modules shall be permitted to have overcurrent protection and conductor sizing in accordance with 240.5(B)(2).

II. Circuit Requirements

690.7 Maximum Voltage.

(A) Maximum Photovoltaic System Voltage. In a dc photovoltaic source circuit or output circuit, the maximum photovoltaic system voltage for that circuit shall be calculated as the sum of the rated open-circuit voltage of the series-connected photovoltaic modules corrected for the lowest expected ambient temperature. For crystalline and multicrystalline silicon modules, the rated open-circuit voltage shall be multiplied by the correction factor provided in Table 690.7. This voltage shall be used to determine the voltage rating of cables, disconnects, overcurrent devices, and other equipment. Where the lowest expected ambient temperature is below -40°C (-40°F), or where other than crystalline or multicrystalline silicon photovoltaic modules are used, the system voltage adjustment shall be made in accordance with the manufacturer's instructions.

Table 690.7 Voltage Correction Factors for Crystalline and Multicrystalline Silicon Modules

Ambient Temperature (°C)	Correction Factors for Ambient Temperatures Below 25°C (77°F) (Multiply the rated open-circuit voltage by the appropriate correction factor shown below.)	Ambient Temperature (°F)
25 to 10	1.06	77 to 50
9 to 0	1.10	49 to 32
-1 to -10	1.13	31 to 14
-11 to -20	1.17	13 to -4
-21 to -40	1.25	-5 to -40

(B) Direct-Current Utilization Circuits. The voltage of dc utilization circuits shall conform with 210.6.

(C) Photovoltaic Source and Output Circuits. In one- and two-family dwellings, photovoltaic source circuits and photovoltaic output circuits that do not include lampholders, fixtures, or receptacles shall be permitted to have a maximum photovoltaic system voltage up to 600 volts. Other installations with a maximum photovoltaic system voltage over 600 volts shall comply with Article 690, Part I.

(D) Circuits Over 150 Volts to Ground. In one- and two-family dwellings, live parts in photovoltaic source circuits and photovoltaic output circuits over 150 volts to ground shall not be accessible to other than qualified persons while energized.

FPN: See 110.27 for guarding of live parts, and 210.6 for voltage to ground and between conductors.

(E) Bipolar Source and Output Circuits. For 2-wire circuits connected to bipolar systems, the maximum system voltage shall be the highest voltage between the conductors of the 2-wire circuit if all of the following conditions apply:

(1) One conductor of each circuit is solidly grounded.

(2) Each circuit is connected to a separate subarray.

(3) The equipment is clearly marked with a label as follows:

WARNING
BIPOLAR PHOTOVOLTAIC ARRAY.
DISCONNECTION OF NEUTRAL OR
GROUNDED CONDUCTORS MAY RESULT IN
OVERVOLTAGE ON ARRAY OR INVERTER.

690.8 Circuit Sizing and Current.

(A) Calculation of Maximum Circuit Current. The maximum current for the specific circuit shall be calculated in accordance with 690.8(A)(1) through (A)(4).

(1) Photovoltaic Source Circuit Currents. The maximum current shall be the sum of parallel module rated short-circuit currents multiplied by 125 percent.

(2) Photovoltaic Output Circuit Currents. The maximum current shall be the sum of parallel source circuit maximum currents as calculated in 690.8(A)(1).

(3) Inverter Output Circuit Current. The maximum current shall be the inverter continuous output current rating.

(4) Stand-Alone Inverter Input Circuit Current. The maximum current shall be the stand-alone continuous inverter input current rating when the inverter is producing rated power at the lowest input voltage.

(B) Ampacity and Overcurrent Device Ratings. Photovoltaic system currents shall be considered to be continuous.

(1) Sizing of Conductors and Overcurrent Devices. The circuit conductors and overcurrent devices shall be sized to carry not less than 125 percent of the maximum currents as calculated in 690.8(A). The rating or setting of overcurrent devices shall be permitted in accordance with 240.4(B) and (C).

Exception: Circuits containing an assembly, together with its overcurrent device(s), that is listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

(2) Internal Current Limitation. Overcurrent protection for photovoltaic output circuits with devices that internally limit the current from the photovoltaic output circuit shall be permitted to be rated at less than the value calculated in 690.8(B)(1). This reduced rating shall be at least 125 percent of the limited current value. Photovoltaic output circuit conductors shall be sized in accordance with 690.8(B)(1).

Exception: An overcurrent device in an assembly listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

(C) Systems with Multiple Direct-Current Voltages. For a photovoltaic power source that has multiple output circuit voltages and employs a common-return conductor, the ampacity of the common-return conductor shall not be less than the sum of the ampere ratings of the overcurrent devices of the individual output circuits.

(D) Sizing of Module Interconnection Conductors. Where a single overcurrent device is used to protect a set of two or more parallel-connected module circuits, the ampacity of each of the module interconnection conductors shall not be less than the sum of the rating of the single fuse plus 125 percent of the short-circuit current from the other parallel-connected modules.

690.9 Overcurrent Protection.

(A) Circuits and Equipment. Photovoltaic source circuit, photovoltaic output circuit, inverter output circuit, and storage battery circuit conductors and equipment shall be protected in accordance with the requirements of Article 240. Circuits connected to more than one electrical source shall have overcurrent devices located so as to provide overcurrent protection from all sources.

Exception: An overcurrent device shall not be required for circuit conductors sized in accordance with 690.8(B) and located where one of the following apply:

(a) There are no external sources such as parallel-connected source circuits, batteries, or backfeed from inverters.

(b) The short-circuit currents from all sources do not exceed the ampacity of the conductors.

FPN: Possible backfeed of current from any source of supply, including a supply through an inverter into the photovoltaic output circuit and photovoltaic source circuits, is a consideration in determining whether adequate overcurrent protection from all sources is provided for conductors and modules.

(B) Power Transformers. Overcurrent protection for a transformer with a source(s) on each side shall be provided in accordance with 450.3 by considering first one side of the transformer, then the other side of the transformer, as the primary.

Exception: A power transformer with a current rating on the side connected toward the photovoltaic power source, not less than the short-circuit output current rating of the inverter, shall be permitted without overcurrent protection from that source.

(C) Photovoltaic Source Circuits. Branch-circuit or supplementary-type overcurrent devices shall be permitted to provide overcurrent protection in photovoltaic source circuits. The overcurrent devices shall be accessible but shall not be required to be readily accessible.

Standard values of supplementary overcurrent devices allowed by this section shall be in one ampere size increments, starting at one ampere up to and including 15 amperes. Higher standard values above 15 amperes for supplementary overcurrent devices shall be based on the standard sizes provided in 240.6(A).

(D) Direct-Current Rating. Overcurrent devices, either fuses or circuit breakers, used in any dc portion of a photovoltaic power system shall be listed for use in dc circuits and shall have the appropriate voltage, current, and interrupt ratings.

(E) Series Overcurrent Protection. In series-connected strings of two or more modules, a single overcurrent protection device shall be permitted.

690.10 Stand-Alone Systems.

The premises wiring system shall be adequate to meet the requirements of this *Code* for a similar installation connected to a service. The wiring on the supply side of the building or structure disconnecting means shall comply with this *Code* except as modified by 690.10(A), (B), and (C).

(A) Inverter Output. The ac inverter output from a stand-alone system shall be permitted to supply ac power to the building or structure disconnecting means at current levels below the rating of that disconnecting means.

(B) Sizing and Protection. The circuit conductors between the inverter output and the building or structure disconnecting means shall be sized based on the output rating of the inverter. These conductors shall be protected from overcurrents in accordance with Article 240. The overcurrent protection shall be located at the output of the inverter.

(C) Single 120-Volt Supply. The inverter output of a stand-alone solar photovoltaic system shall be permitted to supply 120 volts to single-phase, 3-wire, 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no multiwire branch circuits. In all installations, the rating of the overcurrent device connected to the output of the inverter shall be less than the rating of the neutral bus in the service equipment. This equipment shall be marked with the following words or equivalent:

WARNING
SINGLE 120-VOLT SUPPLY. DO NOT CONNECT
MULTIWIRE BRANCH CIRCUITS!

III. Disconnecting Means

690.13 All Conductors.

Means shall be provided to disconnect all current-carrying conductors of a photovoltaic power source from all other conductors in a building or other structure. A switch or circuit breaker shall not be installed in a grounded conductor unless that switch or circuit breaker is part of a ground-fault detection system required by 690.5 and that switch or circuit breaker is automatically opened and indicated as a normal function of the device in responding to ground faults.

FPN: The grounded conductor may have a bolted or terminal disconnecting means to allow maintenance or troubleshooting by qualified personnel.

690.14 Additional Provisions.

Photovoltaic disconnecting means shall comply with 690.14(A) through 690.14(D).

(A) Disconnecting Means. The disconnecting means shall not be required to be suitable as service equipment and shall be rated in accordance with 690.17.

(B) Equipment. Equipment such as photovoltaic source circuit isolating switches, overcurrent devices, and blocking diodes shall be permitted on the photovoltaic side of the photovoltaic disconnecting means.

(C) Requirements for Disconnecting Means. Means shall be provided to disconnect all conductors in a building or other structure from the photovoltaic system conductors.

(1) Location. The photovoltaic disconnecting means shall be installed at a readily accessible location either on the outside of a building or structure or inside nearest the point of entrance of the system conductors.

Exception: Installations that comply with 690.31(E) shall be permitted to have the disconnecting means located remote from the point of entry of the system conductors.

The photovoltaic system disconnecting means shall not be installed in bathrooms.

(2) Marking. Each photovoltaic system disconnecting means shall be permanently marked to identify it as a photovoltaic system disconnect.

(3) Suitable for Use. Each photovoltaic system disconnecting means shall be suitable for the prevailing conditions. Equipment installed in hazardous (classified) locations shall comply with the requirements of Articles 500 through 517.

(4) Maximum Number of Disconnects. The photovoltaic system disconnecting means shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard.

(5) Grouping. The photovoltaic system disconnecting means shall be grouped with other disconnecting means for the system to comply with 690.14(C)(4). A photovoltaic disconnecting means shall not be required at the photovoltaic module or array location.

~~**(D) Utility-Interactive Inverters Mounted in Not-Readily-Accessible Locations.** Utility-interactive inverters shall be permitted to be mounted on roofs or other exterior areas that are not readily accessible. These installations shall comply with (1) through (4):~~

~~(1) A direct-current photovoltaic disconnecting means shall be mounted within sight of or in the inverter.~~

~~(2) An alternating-current disconnecting means shall be mounted within sight of or in the inverter.~~

~~(3) The alternating-current output conductors from the inverter and an additional alternating-current disconnecting means for the inverter shall comply with 690.14(C)(1).~~

~~(4) A plaque shall be installed in accordance with 705.10.~~

690.15 Disconnection of Photovoltaic Equipment.

Means shall be provided to disconnect equipment, such as inverters, batteries, charge controllers, and the like, from all ungrounded conductors of all sources. If the equipment is energized from more than one source, the disconnecting means shall be grouped and identified.

A single disconnecting means in accordance with 690.17 shall be permitted for the combined ac output of one or more inverters or ac modules in an interactive system.

690.16 Fuses.

Disconnecting means shall be provided to disconnect a fuse from all sources of supply if the fuse is energized from both directions and is accessible to other than qualified persons. Such a fuse in a photovoltaic source circuit shall be capable of being disconnected independently of fuses in other photovoltaic source circuits.

690.17 Switch or Circuit Breaker.

The disconnecting means for ungrounded conductors shall consist of a manually operable switch(es) or circuit breaker(s) complying with all of the following requirements:

(1) Located where readily accessible

(2) Externally operable without exposing the operator to contact with live parts

(3) Plainly indicating whether in the open or closed position

(4) Having an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment

Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and have the following words or equivalent:

WARNING
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS. TERMINALS
ON BOTH THE LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION.

Exception: A connector shall be permitted to be used as an ac or a dc disconnecting means, provided that it complies with the requirements of 690.33 and is listed and identified for the use.

690.18 Installation and Service of an Array.

Open circuiting, short circuiting, or opaque covering shall be used to disable an array or portions of an array for installation and service.

FPN: Photovoltaic modules are energized while exposed to light. Installation, replacement, or servicing of array components while a module(s) is irradiated may expose persons to electric shock.

IV. Wiring Methods

690.31 Methods Permitted.

(A) Wiring Systems. All raceway and cable wiring methods included in this *Code* and other wiring systems and fittings specifically intended and identified for use on photovoltaic arrays shall be permitted. Where wiring devices with integral enclosures are used, sufficient length of cable shall be provided to facilitate replacement.

FPN: Photovoltaic modules operate at elevated temperatures when exposed to high ambient temperatures and to bright sunlight. These temperatures may routinely exceed 70°C (158°F) in many locations. Module interconnection conductors are available with insulation rated for wet locations and a temperature rating of 90°C (194°F) or greater.

(B) Single-Conductor Cable. Types SE, UF, USE, and USE-2 single-conductor cable shall be permitted in photovoltaic source circuits where installed in the same manner as a Type UF multiconductor cable in accordance with Part II of Article 340. Where exposed to sunlight, Type UF cable identified as sunlight-resistant shall be used.

(C) Flexible Cords and Cables. Flexible cords and cables, where used to connect the moving parts of tracking PV modules, shall comply with Article 400 and shall be of a type identified as a hard-service cord or portable power cable; they shall be suitable for extra-hard usage, listed for outdoor use, water resistant, and sunlight resistant. Allowable ampacities shall be in accordance with 400.5. For ambient temperatures exceeding 30°C (86°F), the ampacities shall be derated by the appropriate factors given in Table 690.31(C).

Table 690.31(C) Correction Factors

	Temperature Rating of Conductor				
Ambient Temperature (°C)	**60°C (140°F)**	**75°C (167°F)**	**90°C (194°F)**	**105°C (221°F)**	**Ambient Temperature (°F)**
30	1.00	1.00	1.00	1.00	86
31–35	0.91	0.94	0.96	0.97	87–95
36–40	0.82	0.88	0.91	0.93	96–104
41–45	0.71	0.82	0.87	0.89	105–113
46–50	0.58	0.75	0.82	0.86	114–122
51–55	0.41	0.67	0.76	0.82	123–131
56–60	—	0.58	0.71	0.77	132–140
61–70	—	0.33	0.58	0.68	141–158
71–80	—	—	0.41	0.58	159–176

(D) Small-Conductor Cables. Single-conductor cables listed for outdoor use that are sunlight resistant and moisture resistant in sizes 16 AWG and 18 AWG shall be permitted for module interconnections where such cables meet the ampacity requirements of 690.8. Section 310.15 shall be used to determine the cable ampacity and temperature derating factors.

(E) Direct-Current Photovoltaic Source and Output Circuits Inside a Building. Where direct current photovoltaic source or output circuits of a utility-interactive inverter from a building-integrated or other photovoltaic system are run inside a building or structure, they shall be contained in metallic raceways or enclosures from the point of penetration of the surface of the building or structure to the first readily accessible disconnecting means. The disconnecting means shall comply with 690.14(A) through 690.14(D).

690.32 Component Interconnections.

Fittings and connectors that are intended to be concealed at the time of on-site assembly, where listed for such use, shall be permitted for on-site interconnection of modules or other array components. Such fittings and connectors shall be equal to the wiring method employed in insulation, temperature rise, and fault-current withstand, and shall be capable of resisting the effects of the environment in which they are used.

690.33 Connectors.

The connectors permitted by Article 690 shall comply with 690.33(A) through 690.33(E).

(A) Configuration. The connectors shall be polarized and shall have a configuration that is noninterchangeable with receptacles in other electrical systems on the premises.

(B) Guarding. The connectors shall be constructed and installed so as to guard against inadvertent contact with live parts by persons.

(C) Type. The connectors shall be of the latching or locking type.

(D) Grounding Member. The grounding member shall be the first to make and the last to break contact with the mating connector.

(E) Interruption of Circuit. The connectors shall be capable of interrupting the circuit current without hazard to the operator.

690.34 Access to Boxes.

Junction, pull, and outlet boxes located behind modules or panels shall be so installed that the wiring contained in them can be rendered accessible directly or by displacement of a module(s) or panel(s) secured by removable fasteners and connected by a flexible wiring system.

690.35 Ungrounded Photovoltaic Power Systems.

Photovoltaic power systems shall be permitted to operate with ungrounded photovoltaic source and output circuits where the system complies with 690.35(A) through 690.35(G).

(A) Disconnects. All photovoltaic source and output circuit conductors shall have disconnects complying with 690, Part III.

(B) Overcurrent Protection. All photovoltaic source and output circuit conductors shall have overcurrent protection complying with 690.9.

(C) Ground-Fault Protection. All photovoltaic source and output circuits shall be provided with a ground-fault protection device or system that complies with (1) through (3):

(1) Detects a ground fault.

(2) Indicates that a ground fault has occurred

(3) Automatically disconnects the conductors and/or shuts off the utility-interactive inverter or charge controller for that portion of the faulted array

(D) The photovoltaic source and output conductors shall consist of sheathed (jacketed) multi-conductor cables or shall be installed in a raceway.

(E) The photovoltaic power system direct-current circuits shall be permitted to be used with ungrounded battery systems complying with 690.71(G).

(F) The photovoltaic power source shall be labeled with the following warning at each junction box, combiner box, disconnect, and device where the ungrounded circuits may be exposed during service:

WARNING
ELECTRIC SHOCK HAZARD. THE DIRECT
CURRENT CIRCUIT CONDUCTORS OF THIS
PHOTOVOLTAIC POWER SYSTEM ARE
UNGROUNDED BUT MAY BE ENERGIZED
WITH RESPECT TO GROUND DUE TO
LEAKAGE PATHS AND/OR GROUND FAULTS.

(G) The inverters or charge controllers used in systems with ungrounded photovoltaic source and output circuits shall be listed for the purpose.

V. Grounding

690.41 System Grounding.

For a photovoltaic power source, one conductor of a two-wire system with a photovoltaic system voltage over 50 volts and the reference (center tap) conductor of a bipolar system shall be solidly grounded or shall use other methods that accomplish equivalent system protection in accordance with 250.4(A) and that utilize equipment listed and identified for the use.

Exception: Systems complying with 690.35.

690.42 Point of System Grounding Connection.

The dc circuit grounding connection shall be made at any single point on the photovoltaic output circuit.

FPN: Locating the grounding connection point as close as practicable to the photovoltaic source better protects the system from voltage surges due to lightning.

690.43 Equipment Grounding.

Exposed non–current-carrying metal parts of module frames, equipment, and conductor enclosures shall be grounded in accordance with 250.134 or 250.136(A) regardless of voltage.

690.45 Size of Equipment Grounding Conductor.

Where not protected by the ground-fault protection equipment required by 690.5, the equipment-grounding conductor for photovoltaic source and photovoltaic output circuits shall be sized for 125 percent of the photovoltaic-originated short-circuit currents in that circuit. Where protected by the ground-fault protection equipment required by 690.5, the equipment-grounding conductors for photovoltaic source and photovoltaic output circuits shall be sized in accordance with 250.122.

690.47 Grounding Electrode System.

(A) Alternating-Current Systems. If installing an ac system, a grounding electrode system shall be provided in accordance with 250.50 through 250.60. The grounding electrode conductor shall be installed in accordance with 250.64.

(B) Direct-Current Systems. If installing a dc system, a grounding electrode system shall be provided in accordance with 250.166 for grounded systems or 250.169 for ungrounded systems. The grounding electrode conductor shall be installed in accordance with 250.64.

(C) Systems with Alternating-Current and Direct-Current Grounding Requirements. Photovoltaic power systems with both alternating-current and direct-current (dc) grounding requirements shall be permitted to be grounded as described in (1) or (2):

(1) A grounding-electrode conductor shall be connected between the identified dc grounding point to a separate dc grounding electrode. The dc grounding-electrode conductor shall be sized according to 250.166. The dc grounding electrode shall be bonded to the ac-grounding electrode to make a grounding electrode system according to 250.52 and 250.53. The bonding conductor shall be no smaller than the largest grounding electrode conductor, either ac or dc.

(2) The dc grounding electrode conductor and ac grounding electrode conductor shall be connected to a single grounding electrode. The separate grounding electrode conductors shall be sized as required by 250.66 (ac) and 250.166 (dc).

690.48 Continuity of Equipment Grounding Systems.

Where the removal of equipment disconnects the bonding connection between the grounding electrode conductor and exposed conducting surfaces in the photovoltaic source or output circuit equipment, a bonding jumper shall be installed while the equipment is removed.

690.49 Continuity of Photovoltaic Source and Output Circuit Grounded Conductors.

Where the removal of the utility-interactive inverter or other equipment disconnects the bonding connection between the grounding electrode conductor and the photovoltaic source and/or photovoltaic output circuit grounded conductor, a bonding jumper shall be installed to maintain the system grounding while the inverter or other equipment is removed.

VI. Marking

690.51 Modules.

Modules shall be marked with identification of terminals or leads as to polarity, maximum overcurrent device rating for module protection, and with the following ratings:

(1) Open-circuit voltage

(2) Operating voltage

(3) Maximum permissible system voltage

4) Operating current

(5) Short-circuit current

6) Maximum power

690.52 Alternating-Current Photovoltaic Modules.

Alternating-current modules shall be marked with identification of terminals or leads and with identification of the following ratings:

(1) Nominal operating ac voltage

(2) Nominal operating ac frequency

(3) Maximum ac power

(4) Maximum ac current

(5) Maximum overcurrent device rating for ac module protection

690.53 Direct-Current Photovoltaic Power Source.

A marking for the direct-current photovoltaic power source indicating items (1) through (4) shall be provided by the installer at an accessible location at the disconnecting means for this power source:

(1) Operating current

(2) Operating voltage

(3) Maximum system voltage

(4) Short-circuit current

FPN: Reflecting systems used for irradiance enhancement may result in increased levels of output current and power.

~~**690.54 Interactive System Point of Interconnection.**~~

~~All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source with the maximum ac output operating current and the operating ac voltage.~~

690.55 Photovoltaic Power Systems Employing Energy Storage.

Photovoltaic power systems employing energy storage shall also be marked with the maximum operating voltage, including any equalization voltage and the polarity of the grounded circuit conductor.

690.56 Identification of Power Sources.

(A) Facilities with Stand-Alone Systems. Any structure or building with a photovoltaic power system that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable to the authority having jurisdiction. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system.

~~**(B) Facilities with Utility Services and PV Systems.** Buildings or structures with both utility service and a photovoltaic system shall have a permanent plaque or directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means, if not located at the same location.~~

~~**VII. Connection to Other Sources**~~

~~**690.60 Identified Interactive Equipment.**~~

~~Only inverters and ac modules listed and identified as interactive shall be permitted in interactive systems.~~

~~**690.61 Loss of Interactive System Power.**~~

~~An inverter or an ac module in an interactive solar photovoltaic system shall automatically de-energize its output to the connected electrical production and distribution network upon loss of voltage in that system and shall remain in that state until the electrical production and distribution network voltage has been restored.~~

~~A normally interactive solar photovoltaic system shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.~~

~~**690.62 Ampacity of Neutral Conductor.**~~

~~If a single-phase, 2-wire inverter output is connected to the neutral and one ungrounded conductor (only) of a 3-wire system or of a 3-phase, 4-wire wye-connected system, the maximum load connected between the neutral and any one ungrounded conductor plus the inverter output rating shall not exceed the ampacity of the neutral conductor.~~

~~**690.63 Unbalanced Interconnections.**~~

~~**(A) Single Phase.** Single-phase inverters for photovoltaic systems and ac modules in interactive solar photovoltaic systems shall not be connected to 3-phase power systems unless the interconnected system is designed so that significant unbalanced voltages cannot result.~~

~~**(B) Three Phase.** Three-phase inverters and 3-phase ac modules in interactive systems shall have all phases automatically de-energized upon loss of, or unbalanced, voltage in one or more phases unless the interconnected system is designed so that significant unbalanced voltages will not result.~~

~~**690.64 Point of Connection.**~~

~~The output of a photovoltaic power source shall be connected as specified in 690.64(A) or 690.64(B).~~

~~**(A) Supply Side.** A photovoltaic power source shall be permitted to be connected to the supply side of the service disconnecting means as permitted in 230.82(6).~~

~~**(B) Load Side.** A photovoltaic power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises, provided that all of the following conditions are met:~~

~~(1) Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.~~

~~(2) The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor.~~

~~*Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.*~~

~~(3) The interconnection point shall be on the line side of all ground-fault protection equipment.~~

~~*Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources.*~~

~~(4) Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.~~

~~*Exception: Equipment with power supplied from a single point of connection.*~~

~~(5) Circuit breakers, if backfed, shall be identified for such operation. Dedicated circuit breakers backfed from listed utility-interactive inverters complying with 690.60 shall not be required to be individually clamped to the panelboard bus bars. A front panel shall clamp all circuit breakers to the panelboard bus bars. Main circuit breakers connected directly to energized feeders shall also be individually clamped.~~

VIII. Storage Batteries

690.71 Installation.

(A) General. Storage batteries in a solar photovoltaic system shall be installed in accordance with the provisions of Article 480. The interconnected battery cells shall be considered grounded where the photovoltaic power source is installed in accordance with 690.41.

(B) Dwellings.

(1) Operating Voltage. Storage batteries for dwellings shall have the cells connected so as to operate at less than 50 volts nominal. Lead-acid storage batteries for dwellings shall have no more than twenty-four 2-volt cells connected in series (48-volts nominal).

Exception: Where live parts are not accessible during routine battery maintenance, a battery system voltage in accordance with 690.7 shall be permitted.

(2) Guarding of Live Parts. Live parts of battery systems for dwellings shall be guarded to prevent accidental contact by persons or objects, regardless of voltage or battery type.

FPN: Batteries in solar photovoltaic systems are subject to extensive charge–discharge cycles and typically require frequent maintenance, such as checking electrolyte and cleaning connections.

(C) Current Limiting. A listed, current-limiting, overcurrent device shall be installed in each circuit adjacent to the batteries where the available short-circuit current from a battery or battery bank exceeds the interrupting or withstand ratings of other equipment in that circuit. The installation of current-limiting fuses shall comply with 690.16.

(D) Battery Nonconductive Cases and Conductive Racks. Flooded, vented, lead-acid batteries with more than twenty-four 2-volt cells connected in series (48 volts, nominal) shall not use conductive cases or shall not be installed in conductive cases. Conductive racks used to support the nonconductive cases shall be permitted where no rack material is located within 150 mm (6 in.) of the tops of the nonconductive cases.

This requirement shall not apply to any type of valve-regulated lead-acid (VRLA) battery or any other types of sealed batteries that may require steel cases for proper operation.

(E) Disconnection of Series Battery Circuits. Battery circuits subject to field servicing, where more than twenty-four 2-volt cells are connected in series (48 volts, nominal), shall have provisions to disconnect the series-connected strings into segments of 24 cells or less for maintenance by qualified persons. Non–load-break bolted or plug-in disconnects shall be permitted.

(F) Battery Maintenance Disconnecting Means. Battery installations, where there are more than twenty-four 2-volt cells connected in series (48 volts, nominal), shall have a disconnecting means, accessible only to qualified persons, that disconnects the grounded circuit conductor(s) in the battery electrical system for maintenance. This disconnecting means shall not disconnect the grounded circuit conductor(s) for the remainder of the photovoltaic electrical system. A non–load-break-rated switch shall be permitted to be used as the disconnecting means.

(G) Battery Systems of More Than 48 Volts. On photovoltaic systems where the battery system consists of more than twenty-four 2-volt cells connected in series (more than 48 volts, nominal), the battery system shall be permitted to operate with ungrounded conductors, provided the following conditions are met:

(1) The photovoltaic array source and output circuits shall comply with 690.41.

(2) The dc and ac load circuits shall be solidly grounded.

(3) All main ungrounded battery input/output circuit conductors shall be provided with switched disconnects and overcurrent protection.

(4) A ground-fault detector and indicator shall be installed to monitor for ground faults in the battery bank.

690.72 Charge Control.

(A) General. Equipment shall be provided to control the charging process of the battery. Charge control shall not be required where the design of the photovoltaic source circuit is matched to the voltage rating and charge current requirements of the interconnected battery cells and the maximum charging current multiplied by 1 hour is less than 3 percent of the rated battery capacity expressed in ampere-hours or as recommended by the battery manufacturer.

All adjusting means for control of the charging process shall be accessible only to qualified persons.

FPN: Certain battery types such as valve-regulated lead acid or nickel cadmium can experience thermal failure when overcharged.

(B) Diversion Charge Controller.

(1) Sole Means of Regulating Charging. A photovoltaic power system employing a diversion charge controller as the sole means of regulating the charging of a battery shall be equipped with a second independent means to prevent overcharging of the battery.

(2) Circuits with Direct-Current Diversion Charge Controller and Diversion Load. Circuits containing a dc diversion charge controller and a dc diversion load shall comply with the following:

(1) The current rating of the diversion load shall be less than or equal to the current rating of the diversion load charge controller. The voltage rating of the diversion load shall be greater than the maximum battery voltage. The power rating of the diversion load shall be at least 150 percent of the power rating of the photovoltaic array.

(2) The conductor ampacity and the rating of the overcurrent device for this circuit shall be at least 150 percent of the maximum current rating of the diversion charge controller.

(3) PV Systems Using Utility-Interactive Inverters. Photovoltaic power systems using utility-interactive inverters to control battery state-of-charge by diverting excess power into the utility system shall comply with (1) and (2):

(1) These systems shall not be required to comply with 690.72(B)(2). The charge regulation circuits used shall comply with the requirements of 690.8.

(2) These systems shall have a second, independent means of controlling the battery charging process for use when the utility is not present or when the primary charge controller fails or is disabled.

690.74 Battery Interconnections.

Flexible cables, as identified in Article 400, in sizes 2/0 AWG and larger shall be permitted within the battery enclosure from battery terminals to a nearby junction box where they shall be connected to an approved wiring method. Flexible battery cables shall also be permitted between batteries and cells within the battery enclosure. Such cables shall be listed for hard-service use and identified as moisture resistant.

IX. Systems Over 600 Volts

690.80 General.

Solar photovoltaic systems with a maximum system voltage over 600 volts dc shall comply with Article 490 and other requirements applicable to installations rated over 600 volts.

690.85 Definitions.

For the purposes of Part IX of this article, the voltages used to determine cable and equipment ratings are as follows.

Battery Circuits. In battery circuits, the highest voltage experienced under charging or equalizing conditions.

Photovoltaic Circuits. In dc photovoltaic source circuits and photovoltaic output circuits, the maximum system voltage.

Substantiation: This proposal is part of 2 other proposals dealing with interconnecting electric power sources in Article 690, Article 692 and Article 705. This proposal is part of 3 other proposals to place common definitions in Article 100. The purpose of this proposal is to revise Article 690. This work incorporates the equipment that would be listed by Underwriters Laboratory Standard 1741 - Inverters, Converters and Controllers for Use in Independent Power Systems.

The figure in the substantiation section of this proposal shows the common wiring in building systems that should be covered by Article 705. It also shows technology specific wiring that would be covered by Articles 690 and 692. The main purpose of this proposal is to put all interconnection requirements in Article 705 and all technology specific issues in their respective articles.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

See panel action on Proposal 13-184, Article 705 and 13-71, Article 692.

Panel Statement: The panel did not accept the change as recommended in this proposal on Article 690. The panel concluded that this is a good idea and agreed to some of the recommended duplication of the interconnection issues in Article 705 (Proposal 17-184), but there was insufficient information provided as well as too little industry input to make the proposed change in Article 690. The panel has addressed elements of the issue in Proposal 13-184 (Article 705).

Number Eligible to Vote: 17
Ballot Results: Affirmative: 15 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: The Panel action should be Reject because the Panel did not accept the change and did not identify those items that are addressed in Proposal 13-184.
Comment on Affirmative:
BOWER, W.: I vote affirmative with comment. I agree with the panel action to **NOT** accept the sweeping change as recommended in this proposal on Article 690. Further, I disagree with the recommended duplication of the interconnection issues in Article 705 (Proposal 17-184) as accepted, without a thorough industry-supported substantiation for each change. The impacts for each technology must be assessed. There was insufficient substantiation provided with the proposal, and little industry input to make this proposed change in Article 690, 692 or 705. I believe this change that was accepted in principle for 705 brings the action to the attention of the industry and needs careful public and industry scrutiny.
HORNBERGER, B.: I agree with the panel action to accept in principle, however since the interconnection provisions have been incorporated in Article 705, the parallel redundant requirements for Photovoltaic utility interconnected power inverters should be removed from Article 690.
KRASTINS, K.: As indicated by the panel statements, none of the proposed language was included in Articles 690 or 692. There was no substantiation included in the originally submitted proposal, except for a statement as to the intent of the proposal. But even the intent of moving only those requirements applicable to all interconnected power systems from Articles 690 and 692 is not adhered to entirely by the submitter. In some instances, requirements have been moved directly from those articles, in other instances requirements have been cherry-picked from one article or the other, in some instances requirements were deleted, and in other instances entirely new requirements are introduced. Without substantiation for each proposed change, it is difficult to evaluate the validity of choosing the language of the proposed changes over requirements that could be more appropriate and technically sound. As just one example illustrates, there is no technical substantiation provided as to why rotating equipment is subject to a single requirement (705.43) while static inverters are subject to several pages of requirements (705.60 through 705.100).
The intent of the submitter is a laudable one but requires further industry input and review to ensure that technology-specific requirements are not inadvertently introduced into Article 705 or removed from Articles 690 and 692.
STAFFORD, T.: This Panel Member agrees with the intent of the submitter that all of the interconnection issues should be addressed in a single article of the NEC. The action taken by the panel is welcomed as a first step to determine a uniform acceptance of interconnection issues within the NEC.
ZGONENA, T.: More input is needed from the DG industries that will be impacted by Article 705 to ensure it addresses the nuances of the various DG products.

13-18 Log #546 NEC-P13 **Final Action: Accept in Principle**
(690 and 690.50 (New))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal since 250.120(C) deals with equipment grounding conductors, not equipment bonding jumpers. This action will be considered by the Panel as a Public Comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise the title of Part V of Article 690 as follows:
Part V Grounding <u>and Bonding</u> .
Add a new section that covers bonding jumper sizes and physical protection as follows:
<u>690.50 Bonding Jumpers. Bonding jumpers installed exposed between modules shall be not less than 6 AWG and shall not be subject to physical damage.</u>
Substantiation: 690.48 and 690.49 cover bonding requirements. It is logical for the title of Part V of Article 690 to include bonding since bonding is covered in 690.48 and 690.49. The definition of Bonded (Bonding) includes the concept of maintaining continuity between metallic parts to form an electrically conductive path. 690.48 and 690.49 are both related to establishing and maintaining continuity and both sections use the term “bonding jumper.”
Photovoltaic modules installed in arrays are often required to be bonded together with bonding jumpers but no Code rules currently exist that address concerns about protection from physical damage of such bonding jumpers. These bonding jumpers are installed exposed and requirements for a minimum size will ensure a greater degree of protection.
Panel Meeting Action: Accept in Principle
Add a new section 690.50
<u>690.50 Equipment Bonding Jumpers. Equipment bonding jumpers, if used, shall comply with 250.120(C).</u>
Panel Statement: The proposed wording should satisfy the intent of the submitter, as this change affords equivalent protection while using existing language from Article 250.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 15 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: The Panel Action is contrary to the proposal recommendation. The proposed change requires that the bonding jumper be 6 AWG or larger. The Panel reference to 250.120(C) refers to equipment grounding conductors, not bonding jumpers, and is for conductors smaller than 6 AWG, not larger. Additionally, the proposed change to add “and Bonding” is appropriate since the Panel Action refers to “Bonding Jumpers”.
Comment on Affirmative:
BOWER, W.: I vote affirmative with comment on the panel action’s new language “690.50 Equipment Bonding Jumpers. “Equipment bonding jumpers, if used, shall comply with 250.120(C).” There an inconsistency in the terminology in that the new 690.50 actually refers to Equipment Grounding Conductors therefore the title should be changed to “ **Equipment Grounding Conductors** ” and the first sentence changed to “ **Equipment grounding conductors ~~, if used,~~ shall comply...** ” I also note there is an excellent chance that this reference to 250.120(C) will be interpreted to mean “ **all** ” equipment-grounding conductors used between PV modules must be 6 AWG minimum. The language in Article 690 must be explicit and clear therefore I suggest a fine print note to address the issues listed below. A suggested fine print note would read
FPN: Physical limitations associated with PV modules often limit the size of equipment grounding conductors that can be attached, with some as small as 10AWG. PV module instruction manuals often dictate the size of directly attached wire connections. When conductors are less than 6AWG, stress relief of the conductor is recommended for wire lengths less than 6 inches. Approved alternate methods of grounding will be provided with PV modules where applicable.
This FPN addresses the following:
1. Most, if not all, PV modules are constructed so as they cannot accept greater than a 10 AWG conductor without additional hardware.
2. Some modules have pre-punched grounding holes that are located where the addition of hardware to accommodate 6 AWG conductors is difficult or impossible.
3. UL 1703 and IEC 61730 PV module standards are being revised to allow several alternate methods of grounding.
4. The term “bonding jumper” as accepted propagates the “equipment grounding” confusion and is not appropriate for these “equipment-grounding conductors”. In fact the reference in the accepted language refers to 250.120(C), which is the section for equipment grounding conductors.

13-19 Log #1524 NEC-P13 **Final Action: Reject**
(690 and 702)

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise Articles 690 and 702 as described in the following, relative to the terms bonding and grounding.
690.47(C)(1) Revise 690.47(C)(1) as follows:
(1) A grounding-electrode conductor shall be connected between the identified dc grounding point to a separate dc grounding electrode. The dc grounding-electrode conductor shall be sized according to 250.166. The dc grounding electrode shall be ~~bonded~~ <u>connected</u> to the ac grounding electrode to make a grounding electrode system according to 250.52 and 250.53. The bonding conductor shall be no smaller than the largest grounding electrode conductor, either ac or dc.
702.10(B)Revise 702.10(B) as follows:
(B) Nonseparately Derived System Where a portable optional standby source is used as a nonseparately derived system, the equipment grounding conductor shall be <u>connected</u> ~~bonded~~ to the system grounding electrode.
Substantiation: 690.47(C)(1): Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).
702.10(B): Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).
This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms “bonded”, “grounded”, and “equipment grounding conductor” in Article 100 relative to this Task Group’s recommendations. These changes clarify the present requirement in more prescriptive language.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The text in question has been deleted by another proposal (13-51).
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.

13-20 Log #891 NEC-P13 **Final Action: Accept**
(690.3 Exception)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise 690.3, Exception as follows:
"Solar photovoltaic systems, equipment, or wiring installed in a hazardous (classified) location shall also comply with the applicable portions of Articles 500 through 516 ~~500.1, 505.1, and 510.1.~~
Substantiation: The current language refers only to scope sections that contain no requirements. The requirements that might apply are elsewhere in the articles and the referenced requirements should include all classified areas, not just Class I areas.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
BOWER, W.: I vote affirmative with a comment because the reference to Articles 500 through 516 is better than the reference to scopes being replaced, but in contradiction with the style manual and makes using the code even more cumbersome. A task group or knowledgeable person should use the public comment period to search through the Articles 500 through 516 and reference only the applicable sections.

13-21 Log #2083 NEC-P13 **Final Action: Accept in Principle**
(690.4(D))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
690.4(D) Equipment. Inverters ~~or motor generators~~ , photovoltaic modules, photovoltaic panels, ac photovoltaic modules, source-circuit combiners, and charge controllers intended for use in photovoltaic power systems shall be identified and listed for the application .
Substantiation: Motor generators are removed from the requirement since motor generators have not been used in PV systems for more than 10 years. The complexity of PV system equipment and PV system designs dictate that the PV modules, the combiner boxes, the charge controllers, and the inverters be identified for use in PV systems and examined for safety (listed) by a third party against standards established by Underwriters Laboratory (UL). Electrical inspectors, sometimes faced with systems containing unlisted equipment in these categories, have requested that this complex equipment be specifically listed to assist them in their jobs. Also the identification and proper listing of these components would rule out the inappropriate use of electrical components such as inverters and charge controllers that may be listed to inappropriate standards such as telecom and marine standards.
Panel Meeting Action: Accept in Principle
Revise proposal to read as follows:
690.4(D) Equipment. Inverters, ~~or~~ motor generators, photovoltaic modules, photovoltaic panels, ac photovoltaic modules, source-circuit combiners, and charge controllers intended for use in photovoltaic power systems shall be identified and listed for the application .
Panel Statement: The panel does not accept the deletion of motor generators, as this would allow unlisted devices to be used.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.

13-22 Log #2060 NEC-P13 **Final Action: Accept**
(690.5)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal on Exception No. 2 since the size of an equipment grounding conductor is based on overcurrent protective devices in accordance with 250.122, not based upon the ampacity of the conductor with temperature and conduit fill correction factors. The Technical Correlating Committee directs that the Panel Action on Exception No. 2 be referred to Code-Making Panel 5 for comment.
Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
690.5 Ground-Fault Protection. ~~Roof-mounted dc photovoltaic arrays located on dwellings shall be provided with dc ground-fault protection to reduce fire hazards.~~
Grounded dc photovoltaic arrays shall be provided with dc ground-fault protection meeting the requirements of 690.5 (A) through (C) to reduce fire hazards. Ungrounded dc photovoltaic arrays shall comply with 690.35.
Exception 1: Ground-mounted or pole-mounted photovoltaic arrays with not more than two paralleled source circuits and with all dc source and dc output circuits isolated from buildings shall be permitted without ground-fault protection.
Exception 2: PV arrays mounted on other than dwelling units shall be permitted without ground-fault protection if each equipment-grounding conductor has an ampacity of at least two (2) times the temperature and conduit fill corrected circuit conductor ampacity.
Substantiation: Recent ground-fault events and analyses of different types of PV systems, possible types of ground faults, and circulating ground-fault currents have revealed the necessity of requiring these ground-fault protection devices (fire hazard reduction) on nearly all PV arrays, not just PV arrays on the roofs of dwellings. Ground faults in PV source and output circuits can result in continuously circulating full output short-circuit currents that do not trip overcurrent devices. It is not possible to place an overcurrent device in a circuit conductor (either grounded or ungrounded) that can interrupt these ground-fault currents without affecting the ability of the circuits to carry normal and expected operating currents. The current-limited characteristic of PV modules, sub arrays, and arrays and the ability to generate sustained ground-fault currents dictate that these ground-fault currents are sensed and interrupted at current levels depending on the system size to eliminate the need for significant over sizing of equipment-grounding conductors. Over-sizing of equipment-grounding conductors is also an option on installations that do not involve dwelling units. UL listing of the applicable equipment (inverters, charge controllers, and separate ground-fault devices) will determine the fault detection level. Ground faults involving arcing fault currents will also be interrupted at this value. Related proposals are also being made for 690.5(A) and 690.45.
UL is developing parallel requirements in UL Standard 1741 for PV inverters. The ground-fault protective device will be integral with utility-interactive inverters and any inverter that has the output of the PV array connected directly to the inverter (for example, some inverters that have battery back up capabilities). Stand-alone PV systems (usually 12-48 volts nominal) will use the separate ground-fault protective devices already available.
The first exception is added because there is little danger of fire (either in the PV array wiring or in a building) on a ground-mounted or pole-mounted PV array with the dc circuits isolated from any building where there are not more than two parallel-connected source circuits.
The second exception applies to non-dwelling unit installations. All dwelling unit installations must have ground-fault protection to reduce fire hazards. In other than dwelling unit installations, the use of equipment-grounding conductors with an ampacity two times the ampacity of the circuit conductors will provide adequate safety for the possibly large circulating ground-fault currents discussed above.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 15 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: Exception 2 should be rejected. It is not apparent why an equipment grounding conductor that is twice the size of the circuit conductor will provide safety since this same ground fault current would also flow in the circuit conductors. It would appear, then, that the circuit conductors should also be doubled in size. Will this sizing be adequate to provide the additional fault current necessary to operate the overcurrent device?

13-23 Log #2065 NEC-P13 **Final Action: Accept in Principle**
(690.5(A))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
690.5(A) Ground-Fault Detection and Interruption . The ground-fault protection device or system shall be capable of detecting a ground-fault current, interrupting the flow of fault current, and providing an indication of the fault.
Automatically opening the grounded conductor of the faulted circuit to interrupt the ground-fault current path shall be permitted. If a grounded conductor is opened to interrupt the ground-fault current path, all conductors of the faulted circuit shall be automatically and simultaneously opened.
Manual operation of the main PV dc disconnect shall not activate the ground-fault protection device or result in grounded conductors becoming ungrounded.
Substantiation: The added second paragraph is moved from 690.5(B) to 690.5(A) because it describes the various optional methods of interrupting the fault current as required by 690.5(A). A minor grammatical error was corrected.
The addition of the third paragraph establishes requirements that prevent interconnecting the main dc PV disconnect with the ground-fault protection device that could leave the PV array ungrounded when the PV disconnect was opened manually during normal service operations or in other situations. The intent is to keep a grounded PV system solidly grounded under all normal operating conditions including when the main PV or other disconnect is opened. This procedure minimizes the hazards of having white-colored grounded conductors possibly floating and energized. Only during automatic ground-fault actions (an abnormal condition) should these conductors be allowed to be ungrounded to deal with the ground fault.
Panel Meeting Action: Accept in Principle
Revise the section to read as follows:
690.5(A) Ground-Fault Detection and Interruption . The ground-fault protection device or system shall be capable of detecting a ground-fault current, interrupting the flow of fault current, and providing an indication of the fault.

Automatically opening the grounded conductor of the faulted circuit to interrupt the ground-fault current path shall be permitted. If a grounded conductor is opened to interrupt the ground-fault current path, all conductors of the faulted circuit shall be automatically and simultaneously opened.

Exception: Product listing shows equivalent protection

When the main PV dc disconnect also activates the ground-fault protection device or results in grounded conductors becoming ungrounded, it shall be labeled: Warning: PV CIRCUIT CONDUCTORS ARE UNGROUNDED WHEN IN THE OFF POSITION.

Panel Statement: The panel added an exception to allow listed equipment that is capable of interrupting the flow of fault current to be used.

In addition, the requirement for a redundant disconnect was changed to a labelling requirement, as no known safety hazard exists.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

ZGONENA, T.: Subsequent to the panel meeting, it was determined that this proposal is in direct conflict with the following requirement that was recently added to UL 1741 for PV inverters. This requirement becomes effective on May 7, 2007.

31.9 An integral ground-fault detector/interrupter (GFDI) or a separate device shall not be linked to any main photovoltaic disconnect (internal or external to the unit) and operation of the main photovoltaic disconnect shall not affect the normal grounding of the system.

The justification for the UL 1741 requirement included:

1. A combined GFDI/disconnect would not allow for differentiation between the functions. If the system is approached and the GFDI/disconnect is in the “Off” position, it is not possible to known whether a ground fault occurred or if the system was merely turned off. If a ground fault occurs when the switch is opened, a ground fault will not be indicated. If the ground-fault clears itself, then there will be no indication that a ground fault has occurred.

2. Every time a combined PV GFDI/disconnect is opened, whether to service the equipment or during a ground fault, the PV array becomes ungrounded. Grounded conductors, marked white, are now ungrounded and energized presenting a safety hazard for service persons that expects white conductors to be either at ground potential or not energized.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment. The action described in the last paragraph of the accepted language “When the main PV dc disconnect also activates the ground-fault protection device or results in grounded conductors becoming ungrounded, it shall be labeled: Warning: PV CIRCUIT CONDUCTORS ARE UNGROUNDED WHEN IN THE OFF POSITION.” is contrary to the current version of the UL1741 standard for listing inverters, so either the new code language or the UL standard needs revision.

13-24 Log #224 NEC-P13 **Final Action: Reject**
(690.5(B))

NOTE: The following proposal consists of Comment 13-12 on Proposal 13-26 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 13-26 was:

Change the title of the section and revise the text:

690.5(B) Shutting Down the Faulted System. The ground-faults device or system shall automatically disconnect the ungrounded faulted conductors and/or shut off the utility-interactive inverter or charge controller for that portion of the faulted array. If the grounded conductor of the faulted source or output circuit is disconnected to comply with 690.5(A), all conductors of the faulted source or output circuit shall be opened automatically and simultaneously. Opening the grounded conductor of the faulted source or output circuit shall be permitted to interrupt the ground-fault current path.

The Technical Correlating Committee directs that the Panel Action on Comment 13-12 be reported as “Hold” consistent with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects.

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University

Recommendation: Revise the proposal as follows:

690.5(B) Disabling the Faulted System. The ground-fault device or system shall automatically disconnect the ungrounded faulted conductors and/or shut off the utility-interactive inverter or charge controller for that portion of the faulted array. If the grounded conductor of the faulted source or output circuit is disconnected to comply with 690.5(A), all conductors of the faulted source or output circuit shall be opened automatically and simultaneously. Opening the grounded conductor of the faulted source or output circuit shall be permitted to interrupt the ground-fault currents.

Substantiation: The words “Shutting Down” in the Section Title were replaced with the less awkward term “Disabling.”

While the current 690.5(A) and 690.5(B) ensure adequate language to safely disable the PV array and remove faults as mentioned in the Panel Statement, it is becoming increasingly difficult to provide automatic disconnect equipment that can operate at the higher voltages (up to 600) and/or currents (more than 100 amps) that are occurring more frequently in modern residential PV systems. While such disconnect equipment is available (i.e. industrial motor-driven safety switches), the cost and size of this equipment precludes using it in residential PV systems. Electronic shutdown of the inverters or charge controllers provides equivalent system protection since it provides the same alerting feature as disconnected conductors - no power/current is allowed through the faulted system. Underwriters Standard for Safety 1741 (Inverters and Charge Controllers) allows such electronic shutdown and UL-listed equipment is being sold and installed throughout the country.

This proposal adds an optional method of disabling the faulted circuits (i.e. shutting down the electronic equipment). It does not necessarily increase the complexity of meeting the requirement and many low-voltage, low-power PV systems mounted on the roofs of dwellings will continue to meet the requirements of this section by using ground-fault systems that disconnect ungrounded conductors.

Panel Meeting Action: Reject

Panel Statement: See Panel action of Proposal 13-25, which completely revised this section. Proposal 13-25 more accurately reflects the intent and requirements of this section. Also, the last two sentences of this section were moved to 690.5(A) in the panel action on Proposal 13-23.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-25 Log #2084 NEC-P13 **Final Action: Accept**
(690.5(B))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

(B) ~~Disconnection of Conductors.~~ ~~The ungrounded conductors of the faulted source circuit shall be automatically disconnected. If the grounded conductors of the faulted source circuit are disconnected to comply with the requirements of 690.5(A), all conductors of the faulted source circuit shall be opened automatically and simultaneously. Opening the grounded conductor of the array or opening the faulted sections of the array shall be permitted to interrupt the ground-fault current path.~~

(B) Isolating Faulted Circuits. The faulted circuits shall be isolated by one of the two following methods.

(1) The ungrounded conductors of the faulted circuit shall be automatically disconnected.

(2) The inverter or charge controller fed by the faulted circuit shall automatically cease to supply power to output circuits.

Substantiation: Revising the title from “Disconnection of Conductors” to “Isolating Faulted Circuits” more accurately reflects the intent and requirements of the section. An inverter that ceases to supply power provides the desired effect: The faulted PV circuit (including the inverter) produces no power, is essentially isolated from other circuits in the system, and the lack of output power provides additional safety and an additional indication that there is a problem. UL is currently listing inverters that cease to supply power under ground-fault conditions as meeting this requirement as written in the *2005 NEC* . These utility-interactive inverters do not fully shut down or turn off because they must continually provide an indication of the ground fault. A similar requirement would apply to charge controllers if option (1) were not used. The rewording allows the code requirements to agree with the existing listed hardware that has been deemed to meet safety standards.

The last two sentences in this section are moved to 690.5(A) where they properly describe options for interrupting fault currents. These sentences do not deal with isolating faulted circuits.

Panel Meeting Action: Accept

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-26 Log #2066 NEC-P13 **Final Action: Accept in Principle**
(690.5(C))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

(C) Labels and Markings. A warning label ~~Labels and markings~~ shall appear on the utility-interactive inverter or be applied by the installer near the ground-fault indicator at a visible location stating ~~that, if a ground fault is indicated, the normally grounded conductors may be energized and ungrounded~~ the following :

WARNING
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED, ALL NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

When the photovoltaic system also has batteries, the same warning shall also be applied by the installer in a visible location at the batteries.

Substantiation: A ground fault in a PV system and the response of the required ground-fault protection device modify the normal grounding of the system. The need for an appropriate warning label on the inverter containing the ground-fault device or an installer-applied label on those systems with a separate ground-fault device must be clearly defined. Requiring specific wording and a second label on the battery banks (if installed and usually operating at or less than 48 volts, nominal) will increase user/operator awareness and is required since the battery banks may also become ungrounded during ground faults.
Panel Meeting Action: Accept in Principle
Revise to read the section as follows:
(C) Labels and Markings. A warning label ~~Labels and markings~~ shall appear on the utility-interactive inverter or be applied by the installer near the ground-fault indicator at a visible location stating ~~that, if a ground fault is indicated, the normally grounded conductors may be energized and ungrounded~~ the following :

WARNING
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED, NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

When the photovoltaic system also has batteries, the same warning shall also be applied by the installer in a visible location at the batteries.
Panel Statement: The panel deleted the word "all" in the warning label from the proposal, as it was deemed unnessary.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
BOWER, W.: I vote affirmative with a comment to better define the language. I suggest that the last sentence be changed from "When the photovoltaic system also has batteries, the same warning shall also be applied by the installer in a visible location at the batteries" to "When the photovoltaic system includes batteries an identical warning shall be applied at a visible location at the batteries."

13-27 Log #2085 NEC-P13 **Final Action: Accept**
(690.7(A))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add the following sentence to this section as a second paragraph and completely replace the Table 690.7 as follows:
When open-circuit voltage temperature coefficients are supplied in the instructions for listed PV modules, they shall be used to calculate the maximum photovoltaic system voltage as required by 110.3(B) instead of using Table 690.7.

Table 690.7 Voltage Correction Factors for Crystalline and Multicrystalline Silicon Modules

Correction Factors for Ambient Temperatures Below 25°C (77°F). (Multiply the rated open circuit voltage by the appropriate correction factor shown below)

Ambient Temperature (°C)	Factor	Ambient Temperature (°F)
24 to 20	1.02	76 to 68
19 to 15	1.04	67 to 59
14 to 10	1.06	58 to 50
9 to 5	1.08	49 to 41
4 to 0	1.10	40 to 32
-1 to -5	1.12	31 to 23
-6 to -10	1.14	22 to 14
-11 to -15	1.16	13 to 5
-16 to -20	1.18	4 to -4
-21 to -25	1.20	-5 to -13
-26 to -30	1.21	-14 to -22
-31 to -35	1.23	-23 to -31
-36 to -40	1.25	-32 to -40

Substantiation: Some PV module manufacturers are supplying the necessary open-circuit voltage temperature coefficients in the instruction manuals for their modules. The use of these coefficients to determine the maximum system voltage at temperatures below 25°C (77°F) will be more accurate than using Table 690.7. Section 110.3(B) requires that these instructions be followed for listed products.
Table 690.7 has been expanded to provide more resolution in the look-up procedure. This expansion can result in more accurate maximum system voltage calculations.
The temperatures in the table have been rounded to whole numbers and the °F values have been adjusted to provide continuous ranges with no gaps.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 15 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This proposal should be rejected because it does not provide information to all who may have a need for it. The Authority Having Jurisdiction does not have access to instructions and must rely on the Code. If a module is replaced with one having a different temperature coefficient, the maximum circuit voltage may change. This is similar to Article 430 Part XIV where the table values rather than nameplate are used for ampacity rating.

13-28 Log #2769 NEC-P13 **Final Action: Reject**
(690.8(A)(1))

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Delete the words "multiplied by 125 percent" from the end of the sentence so the section reads as follows:
(1) Photovoltaic Source Circuit Currents. The maximum current shall be the sum of parallel module rated short-circuit currents ~~multiplied by 125 percent~~ .
Substantiation: Minimum size of conductor and overcurrent protection is specified in 690.8(B) and are required to be rated at 125 percent. Is it the intent to multiply the source circuited current by 125 percent twice? In 690.8(A)(1) photovoltaic source circuit current is determined by taking the sum of the parallel module short circuit currents and multiplying by 1.25. In 690.8(A)(2) the output circuit current is the sum of the source circuit currents. In 690.8(B)(1) the conductors and overcurrent device are required to carry 125 percent of the output circuit current which is already based on 125 percent of the rated maximum module shot circuit current. Is it necessary to increase the size by 25 percent twice? The conductor is, therefore, sized at 156 percent of the rated maximum short circuit current.
Panel Meeting Action: Reject
Panel Statement: Double de-rating is required due to the continuous nature of the power source and enhanced solar radiation.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
SWAYNE, R.: I agree with the Reject action but there still appears to be a problem with whether or not double derating is required. There should be an explicit requirement for double derating as indicated by the Panel Statement.

13-29 Log #2067 NEC-P13 **Final Action: Accept in Principle**
(690.10(A))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
(A) Inverter Output. The ac ~~inverter~~ output from the stand-alone inverter(s) ~~system~~ shall be permitted to supply ac power to the building or structure service disconnecting means at current levels ~~below the rating of that disconnecting means.~~ less than the calculated load connected to that disconnect. The inverter output rating or the rating of an alternate energy source shall be equal to or greater than the load posed by the largest single utilization equipment that may be connected to the system. Calculated, general lighting loads shall not be considered as a single load.
Substantiation: Some AHJs are requiring that the PV system have an output rated equal to the rating of the service entrance equipment and/or calculated loads. For example, some AHJs are requiring a PV system with a 240-volt, 200-amp ac output.
Stand-alone PV systems (PV array, inverters, batteries) are designed and operated based on the available solar energy. Energy conservation by the users permits the supplied buildings or structures to be operated on significantly less power and energy than would normally be used in similar buildings. While the building wiring meets all *Code* requirements from the main service disconnect through the branch circuits for safety reasons as required by 690.10, the power and energy supplied by the stand-alone system need meet only the actual use requirements of the building as controlled by the user.
Article 702, Optional Standby Systems, also allows for the standby source to be sized for the supply of all equipment intended to be operated at one time
702.5 Capacity and Rating. An optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. Optional standby system equipment shall be suitable for the maximum available fault current at its terminals. The user of the optional standby system shall be permitted to select the load connected to the system.
Although not a safety issue, good system design ensures that the electrical system is able to start and run the largest load on the site. This largest load may remain disconnected or turned off until needed by the user. The largest load might be a well pump, microwave oven, vacuum cleaner, furnace blower or the

like. This large load may be either hardwired or plug connected. Many systems have an alternate energy source (for example, backup or standby generator, wind system, or hydro system) that is used routinely to start and run larger loads. Either the inverter or the alternate energy source should be rated to start that single largest load. The inverter may be sized to start smaller loads than the alternate energy source can start. Because calculated lighting loads (3 watts/square foot) are under the direct control of the users, are intermittent in nature, and may be reduced to zero as desired, they should not considered a single load in the operation of a stand-alone PV system.

Panel Meeting Action: Accept in Principle

Revise the section to read as follows:

(A) Inverter Output. The ac ~~inverter~~ output from the stand-alone inverter(s) ~~system~~ shall be permitted to supply ac power to the building or structure service disconnecting means at current levels ~~below the rating of that disconnecting means.~~ less than the calculated load connected to that disconnect. The inverter output rating or the rating of an alternate energy source shall be equal to or greater than the load posed by the largest single utilization equipment connected to the system. Calculated, general lighting loads shall not be considered as a single load.

Panel Statement: The panel deleted "that may be" from the proposal, as it referred to the future and the assessment should be at the present.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 14 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

STAFFORD, T.: The proposed change would be redundant code. Taking a look at the scope for Article 702, a stand-alone PV system would fall under Article 702's scope. Article 702.5 already states what the submitter wishes to add. The necessity for non repetitious code is apparent; if we change how the capacity and rating of Optional Standby Systems it should be done uniformly and with the same provisions and requirements for all Systems.

SWAYNE, R.: The word "service" should not be added since not all buildings have an electrical supply directly from a utility.

13-30 Log #2086 NEC-P13 **Final Action: Accept in Principle**
(690.10(D))

TCC Action: The Technical Correlating Committee directs that the panel action be revised to change the Panel Action text from "are not required" to "shall not be required" to comply with 90.5(B) for permissive text.

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Add the new section as follows:

690.10(D) Energy Storage Requirements. This code neither requires nor specifies the size of any energy storage system in a stand-alone photovoltaic power system.

Substantiation: Some AHJs are requiring an energy storage source with any PV system, even where such energy storage sources are not necessary (such as water pumping systems). Other AHJs are requiring a minimum sized energy storage system that is not based on any particular knowledge of how the PV system is going to be used.

Stand-alone PV systems (PV array, inverters, batteries) are designed and operated based on the available solar energy. Some stand-alone PV systems are directly connected to the loads without any energy storage (for example, water pumping systems). When energy storage systems are employed, energy conservation by the users permits the supplied buildings or structures to be operated on significantly less power and energy than would normally be used in similar buildings. Users of these systems manually adjust energy usage to match available solar energy and the size of the energy storage system. Energy use may be reduced to zero or near zero during extended periods of cloudy weather, or a back-up energy supply may be used. Specifying some specific minimum size in the Code for the energy storage system is not practical given the numerous variables, nor is such a specification an electrical safety issue. This section should be added to the Code because some AHJs are trying to require a minimum size of battery bank.

Panel Meeting Action: Accept in Principle

Revise to read as follows:

690.10(D) Energy Storage or Backup Power System Requirements. Energy storage or backup power supplies are not required.

Panel Statement: Section 690.10 is written to expect the PV system to replace a typical utility service. Energy storage and backup power supplies should not be required if the loads are not expected to operate during low light levels. Storage may be other than electrical, such as stored water in a tank. Section 690.10(D) is another exception to the general rule in 690.10.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-31 Log #2068 NEC-P13 **Final Action: Accept in Principle**
(690.10(E))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Add the new section as follows:

690.10(E) Backup Power System. This code neither requires nor specifies the size of any backup power system in a stand-alone photovoltaic power system.

Substantiation: Some AHJs are requiring that stand-alone, off grid PV systems have backup generators. This requirement is not consistent with the design of many stand-alone PV systems.

Stand-alone PV systems (PV array, inverters, batteries) are designed and operated based on the available solar energy. Many stand-alone PV systems do not employ backup power systems. Energy conservation by the users allows the supplied buildings or structures to be operated on significantly less power and energy than would normally be used in similar buildings. Users of these systems manually adjust energy usage to match available solar energy and the size of the energy storage system. Energy use may be reduced to zero or near zero during extended periods of cloudy weather. Specifying the requirement in the Code for a backup power system is not practical given the numerous variables, would commonly entail the use of non-renewable fuels, nor is such a requirement an electrical safety issue. This section should be added to the Code because some AHJs are trying to require a backup power system for stand-alone PV systems.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 13-30, which should satisfy the intent of the submitter.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-31a Log #CP1301 NEC-P13 **Final Action: Accept**
(690-13)

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal only revises the first sentence. The second sentence and the FPN remain unchanged.

Submitter: Code-Making Panel 13,

Recommendation: Revise 690-13 to read as follows:

Means shall be provided to disconnect all ~~current-carrying~~ ungrounded conductors of a photovoltaic power source from all other conductors in a building or other structure.

Substantiation: The first sentence in 690-13 was inconsistent with the second sentence.

Panel Meeting Action: Accept

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment. Although the new language corrects the inconsistency in the first and second sentence of the 690.13 language, it appears to violate the original intent of the requirement. A thorough study is suggested.

KRASTINS, K.: The language proposed by the panel, requiring that a means shall be provided to disconnect all ungrounded current carrying conductors, could be misinterpreted to imply that a means for disconnecting ungrounded conductors (outside of ground fault protection) is not permitted. The panel should consider clarifying the language further to indicate that means for disconnecting grounded conductors is permitted.

13-32 Log #2087 NEC-P13 **Final Action: Accept**
(690.13)

TCC Action: The Technical Correlating Committee understands that the Panel Action on Proposal 13-31a modifies the Panel Action on this Proposal. The Technical Correlating Committee directs the panel to reconsider the use of the term "may" to be consistent with the NEC Style Manual. This action will be considered by the panel as a public comment.

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

690.13 All Conductors. Means shall be provided to disconnect all current-carrying conductors of a photovoltaic power source from all other conductors in a building or other structure. A switch, circuit breaker, or other device, ~~unless that switch or circuit breaker is part of a ground-fault detection system required by 690.5 and that switch or circuit breaker is automatically opened and indicated as a normal function of the device in responding to ground faults.~~ either ac or dc, shall not be installed in a grounded conductor if operation of that switch, circuit breaker, or other device may leave the marked, grounded conductor in an ungrounded and energized state.

Exception: A switch or circuit breaker that is part of a ground-fault detection system required by 690.5 may be permitted to open the grounded conductor when that switch or circuit breaker is automatically opened and indicated only as a normal function of the device in responding to ground faults.

Substantiation: Other sections of the *Code* (240.22) allow a multi-pole overcurrent device to open a grounded conductor. This allowance is acceptable in a load circuit where the disconnected and the now ungrounded conductor becomes unenergized when it is disconnected from the source of energy. However, in many power source circuits such as dc PV source circuits and ac generator or inverter output circuits, the grounded circuit conductor is usually bonded to ground at a central location on the load side of any disconnecting means. If the disconnecting means or overcurrent device opens the grounded circuit conductor, then that conductor (usually marked white as a grounded conductor) on the source side of the disconnect may be energized and ungrounded. This is an unsafe condition and should only occur under abnormal conditions such as during a ground fault. This proposal addresses the issue for PV source/supply circuits (ac and dc), where these types of circuits may be more common than load circuits that are used (and ungrounded) in other electrical systems, and prevents the ungrounded conductor from being opened under normal operation.

The exception is slightly reworded to allow the grounded conductor to be opened when and only when opened as an automatic function of a code-required ground-fault device. This clarified requirement will ensure that 690.5 ground-fault protection devices are not included as part of the main user-accessible PV disconnect switch that could open a grounded conductor or unground the PV array under normal, manual shutdown operations.

Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.

13-33 Log #2909 NEC-P13 **Final Action: Reject**
(690.13)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the words "and indicated" from the last sentence, and add the following sentence at the end: "The switch or circuit breaker shall be indicating."
Substantiation: Editorial. Expressing the indication requirement as a complete sentence is much more understandable. In addition, it uses a word ("indicating") that is customary in the NEC for this intent. Undoubtedly that was a factor in the kind expression of support for this wording by the senior member of the NEC Committee in the previous cycle.
Panel Meeting Action: Reject
Panel Statement: It is the occurrence of the ground fault that is required to be indicated, not the state of the switch.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:

STAFFORD, T.: Although I agree with panel's action and statement, when we use a switch or circuit breaker in a ground fault detection system, that device does the indicating. Instead of adding the following sentence at the end: "The switch or circuit breaker shall be indicating." We should have completed the sentence to read, "The switch or circuit breaker shall indicate the presence of a ground fault."

13-34 Log #2069 NEC-P13 **Final Action: Reject**
(690.14)

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:

690.14 Additional Provisions. <u>The main, direct-current (dc)</u> photovoltaic <u>output circuit</u> disconnecting means shall comply with 690.14(A) through 690.14(D).

Substantiation: The proposal clarifies the intent of this section to apply to the main (primary) dc PV disconnect and not to any secondary dc disconnects, or ac disconnects that may be installed in the same system, such as PV source-circuit combiner disconnects, PV disconnects between charge controllers and batteries, equipment servicing disconnects, or the ac disconnect on the output of a utility-interactive inverter.
Panel Meeting Action: Reject
Panel Statement: The proposed wording would prevent the provisions of 690.14(A) through 690.14(D) from applying to other disconnecting means in the system.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 15 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

BOWER, W.: I vote negative to the reject. The panel statement was "The proposed wording would prevent the provisions of 690.14(A) through 690.14(D) from applying to other disconnecting means in the system." Actually the proposed wording applies only to 690.14(A) through 690.14(C). In my opinion, the intent of the proposal was to clarify that 690.14 applies to the main disconnect and <u>not</u> to other disconnects in the system. The requirements for other disconnects are spelled out in 690.13, 690.15 and 690.17.

13-35 Log #1492 NEC-P13 **Final Action: Accept in Principle**
(690.14(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete:

"...and shall be rated in accordance with 690.17."

Substantiation: Edit. "Rated" is usually associated with voltage or current; 690.17 has additional requirements and makes the proposed deletion superfluous.
Panel Meeting Action: Accept in Principle

Revise proposal to read as follows:

"...and shall <u>comply</u> with 690.17".

Panel Statement: The panel agrees with the intent of the submitter, and by changing the wording to "and shall comply with 690.17" fulfills the submitters original substantiation.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.

13-35a Log #CP1300 NEC-P13 **Final Action: Accept**
(690-14(C))

TCC Action: The Technical Correlating Committee understands that this change does not affect existing (1) through (5) of 690.14(C).
Submitter: Code-Making Panel 13,
Recommendation: Revise 690-14(C) to read as follows:

Requirements for Disconnecting Means. Means shall be provided to disconnect all <u>ungrounded</u> conductors in a building or other structure from the photovoltaic system conductors.

Substantiation: The existing language was inconsistent with 690-13.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:

BOWER, W.: I vote affirmative with comment. Although the new language corrects the inconsistency in the first and second sentence of the 690.14(C) language, it appears to violate the original intent of the requirement. A thorough study is suggested.

KRASTINS, K.: See my affirmative with comment on Proposal 13-31a.

13-36 Log #140 NEC-P13 **Final Action: Reject**
(690.14(C)(5))

Submitter: Daniel McIntyre, Town of Westwood, MA
Recommendation: Delete or change last sentence.

Means shall be provided to disconnect Array from source conductors outside the building at the Array.

Substantiation: All electric sources have some means of disconnection at the source including utility power. Fire departments and roof repair crews should be able to isolate the Array so the wiring across the roof is dead, to facilitate venting due to fire, ladder placement and roof repairs.
Panel Meeting Action: Reject
Panel Statement: A means to disconnect at the PV array is not always accessible or practical. The required use of metallic conduit from entrance into the building [690.31(E)] to the accessible disconnect provides safety similar to that of a service entrance drop.

In addition, the photovoltaic modules will still be energized even if the output circuits are disconnected.

Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:

STAFFORD, T.: The submitter's intent is recognized as a potentially hazardous operating independent power production source. The panel action was correct in that all systems would be required to implement such disconnecting means, even for systems that are not practical or accessible to have such provisions incorporated.

13-37 Log #2088 NEC-P13 **Final Action: Accept in Principle**
(690.31(A))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal only added a second paragraph to (A) and did not change the text nor combine the two sentences in the first paragraph into one sentence. The Technical Correlating Committee directs that this proposal be referred to Code-Making Panel 3 for comment.
Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

(A) Wiring Systems. All raceway and cable wiring methods included in this Code and other wiring systems and fittings specifically intended and identified for use on photovoltaic arrays shall be permitted. When ~~Where~~ wiring devices with integral enclosures are used, sufficient length of cable shall be provided to facilitate replacement.

When PV source and output circuits operating at system voltages greater than 50 volts are installed in readily accessible locations, circuit conductors shall be installed in a raceway.

FPN: Photovoltaic modules operate at elevated temperatures when exposed to high ambient temperatures and to bright sunlight. These temperatures may routinely exceed 70°C (158°F) in many locations. Module interconnection conductors are available with insulation rated for wet locations and a temperature rating of 90°C (194°F) or greater.

Substantiation: PV source and output circuits may operate at dc voltages up to 600 volts. Voltages greater than 50 volts are deemed to be more dangerous than lower voltages. Single-conductor, exposed cables as allowed by 690.31(B) in readily accessible locations are subject to ready access by the unqualified public and are not generally designed to resist casual contact and/or abuse, either inadvertent or intentional. Public safety considerations dictate that they be afforded added physical protection by being installed in raceways. These same conductors in more protected areas that are not readily accessible (such as a close-to-roof mounted PV array) are not subject to casual contact and are afforded more physical protection by the location of the installation. These cables do not need to be installed in raceways.

Panel Meeting Action: Accept in Principle

Revise the proposal as follows:

(A) Wiring Systems. All raceway and cable wiring methods included in this Code and other wiring systems and fittings specifically intended and identified for use on photovoltaic arrays shall be permitted where wiring devices with integral enclosures are used, sufficient length of cable shall be provided to facilitate replacement.

Where photovoltaic source and output circuits operating at system voltages greater than 30 volts are installed in readily accessible locations, circuit conductors shall be installed in a metallic raceway.

FPN: Photovoltaic modules operate at elevated temperatures when exposed to high ambient temperatures and to bright sunlight. These temperatures may routinely exceed 70°C (158°F) in many locations. Module interconnection conductors are available with insulation rated for wet locations and a temperature rating of 90°C (194°F) or greater.

Panel Statement: The proposal was revised by deleting "when" in sentence two of first paragraph and the first word in paragraph two; and change "50" to "30" and adding "metallic" before "raceway" to make it consistent with Table 11(B), Note 4 for accessible Class II circuits in wet locations.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment to the panel action because the added term "metallic" before raceway should be removed. The other changes are technically correct. Adding the term "metallic" makes connections of the PV array impossible. Consider that the plastic module junction boxes manufactured on PV modules, when they exist with conduit knockouts, may be spaced as closely as 18 inches in some installations of adjacent PV modules. These are not easily connected with EMT without the possibility of over stressing them during the installation. There are no PV modules with metal junction boxes. Most module installations using conduit today use flexible, nonmetallic, liquidtight conduit with the appropriate fittings. Flexible, metallic liquidtight does not have sufficient temperature ratings and the metallic fittings provide no thermal isolation. Furthermore grounding metallic raceways connected between non-metallic junction boxes which contain no grounding provisions is impossible.

13-38 Log #2070 NEC-P13 **Final Action: Accept**
(690.31(B))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise text to read:

(B) Single-Conductor Cable. Single-conductor cable type ~~s~~ ~~SE, UF, USE, and~~ USE-2, and single-conductor cable listed and labeled as Photovoltaic (PV) Wire shall be permitted in exposed outdoor locations in photovoltaic source circuits for photovoltaic module interconnections within the photovoltaic array . ~~where installed in the same manner as a Type UF multiconductor cable in accordance with Part II of Article 340. Where exposed to sunlight, Type UF cable, identified as sunlight-resistant shall be used~~ .

Exception: Raceways shall be used when required by 690.31(A).

Substantiation: Type USE cable was removed from the list of acceptable cables because it does not have the necessary 90°C, wet-rated insulation required in PV module wiring. Type UF cable was removed from the list because it is not readily available as a single conductor, and even when available, is restricted in the Code (340.8) and in the UL *White Book (General Equipment Directory-2005)* to a 60°C temperature rating. Type SE was removed from the list because it is commonly available only as a multi-conductor cable and may have only a 75°C insulation. A listed and labeled Photovoltaic (PV) Wire, complying with a new UL Subject 4703 for such cable, was added and is available for these installations. This cable has a 90°C, wet-rated insulation that is more durable than SE and USE cable insulation and it has passed the long-duration 720-hour accelerated sunlight/UV exposure tests. Passing such a test will allow the new PV wire to be marked "Sunlight Resistant." This PV Wire will also meet the requirements for PV cables on the ungrounded PV systems allowed by 690.35. The revised sentence restricts the use of these exposed cables to module interconnections within the PV array, and that should prevent them from being used away from the PV array (as some installers are doing). The reference to Article 340 is removed because connecting and routing conductors between modules has little relationship to the wiring requirements in 340 II. Long series-connected strings of PV modules and the marked grounding points on PV module frames (at the sides of the modules and away from the module junction boxes) preclude routing all conductors of a circuit together inside the PV array as required in 340 II. All conductors routed away from the PV array will be grouped together as a normal *NEC* Chapter 3 wiring system. See a related proposal for 690.43.

The new Exception is added to comply with the restrictions established for exposed conductors in readily accessible areas that are made in a proposal for 690.31(A).

Panel Meeting Action: Accept

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-39 Log #2089 NEC-P13 **Final Action: Accept in Part**
(690.31(E))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

690.31(E) Direct-Current Photovoltaic Source and Output Circuits Inside a Building. ~~Where~~ When direct current photovoltaic source or output circuits of a utility-interactive inverter from a building-integrated or other photovoltaic system are run inside a building or structure, they shall be contained in metallic raceways, metallic cable assemblies , or metallic enclosures, from the point of penetration of the surface of the building or structure to the first readily accessible disconnecting means. The disconnecting means shall comply with 690.14(A) through 690.14(D).

Substantiation: This proposal adds metallic cable assemblies to the list of allowable raceways. For new construction, the preferred wiring method is type MC cable or EMT for direct-current photovoltaic source circuits or the output circuits of a utility-interactive inverter from a building-integrated or other photovoltaic system run inside a building or structure. Other flexible metallic raceways or cable assemblies can be used that can meet the installation conditions (concealed spaces, length, etc.).

Panel Meeting Action: Accept in Part

Revise the section as follows:

690.31(E) Direct-Current Photovoltaic Source and Output Circuits Inside a Building. Where d irect current photovoltaic source or output circuits of a utility-interactive inverter from a building-integrated or other photovoltaic system are run inside a building or structure, they shall be contained in metallic raceways or metallic enclosures, from the point of penetration of the surface of the building or structure to the first readily accessible disconnecting means. The disconnecting means shall comply with 690.14(A) through 690.14(D).

Panel Statement: The panel preferred "Where" instead of "When" in compliance with the NEC Manual of Style. Most metallic cable assemblies are limited in their rating associated with grounding (250.118). The panel deleted "metallic cable assemblies."

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

BOWER, W.: I vote affirmative for the panel action with the comment that the "metallic cable assemblies" term deleted by the panel should be reinstated. Other changes are technically correct. Every wiring system, including "metallic cable assemblies" has uses permitted and uses not permitted, as well as other restrictions. "Metallic cable assembles" are allowed for electrical wiring inside buildings and these are the only assemblies that can be readily installed in a retrofit in an existing dwelling. Furthermore, these PV systems installed on the roofs of dwellings employ a ground fault protection device that will typically limit any ground fault currents to about 1 amp or less (eliminating the concern that faults might stress the equipment grounding provisions in metallic cable assemblies).

FLACH, G.: Change AIP to read:

"Where direct current photovoltaic source or output circuits of a utility-interactive inverter from a building-integrated or other photovoltaic system are run inside a building or structure they shall be contained in metallic raceways, Type MI cable, Type MC cable with an impervious outer jacket or metallic enclosures...".

13-40 Log #2061 NEC-P13 **Final Action: Accept in Principle**
(690.31(F) (New))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add the new section as follows:
690.31(F) Flexible, Fine-Stranded Cables. Flexible, fine-stranded cables shall only be terminated with terminals, lugs, or connectors that are identified and listed for such use.
Substantiation: UL Standard 486 A and B requires that connectors, lugs, and terminals that are intended for use with fine-stranded cables be so marked for use with such cables. Very few connectors and terminals have been listed for such use and few are so marked. The vast majority of connectors and terminals are unsuitable for use with flexible, fine-stranded cables. However, the limited distribution and wording of the standard has resulted in these non-marked connectors being used improperly with flexible, fine-stranded cables. Failures in several widely different industries have been reported.
A similar proposal has been submitted for 110.14(A).
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Add the new section as follows:
690.31(F) Flexible, Fine-Stranded Cables. Flexible, fine-stranded cables shall only be terminated with terminals, lugs, devices, or connectors that are identified and listed for such use.
Panel Statement: The panel added the word "devices," as there may be other devices that are listed for the purpose.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 15 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
NASBY, J.: The proposal is overly restrictive. It imposes a burden on all fine strand cable regardless of gauge and regardless of what circuit the cable is used and whether or not every circuit is covered by this section. Further, it discourages the use of fine strand cable in favor of building type wire or cable when fine strand cable may be more appropriate. The proposal also fails to recognize other, commercially available, suitable means of handling the purported cable termination problem.
Moreover, this is a workmanship issue not a Code issue per Article 110.12. Multiple sources of wire ferrules exist that address this issue.

13-41 Log #2071 NEC-P13 **Final Action: Accept in Principle**
(690.33(C))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add a second sentence to this section as follows:
Connectors that are readily accessible in circuits operating at over 50 volts (maximum system voltage for dc circuits or nominal voltage for ac circuits) shall require a tool to open.
Substantiation: Circuits with operating voltages above 50 volts (either dc maximum systems voltages or ac nominal voltages) pose shock hazards when the energized conductors are exposed. Note the grounding requirement established at this voltage limit in 690.41. Connectors are allowed in PV systems (690.33), and they are commonly used in PV source circuits where the voltages typically range from 27 volts to 600 volts. Most of the currently used connectors are of the latching type and may be opened by just pulling them apart. Although these existing connectors are manufactured as "touch safe," they are not designed to be opened under load. If inadvertently opened under load, the resulting arc (particularly on dc circuits) may disable the "touch-safe" feature by carbonizing the insulation. The carbonized connector part now has a conductive tip, is energized, and represents a shock hazard. Where these connectors are installed in readily accessible locations, they should be of a type that requires a tool to open. In not-readily-accessible locations, it is doubtful that the unqualified person will have access to these areas and the "tool-required" feature is not needed. The "tool" may be a connector-specific opening device or merely the blade of a screwdriver or other pointed instrument. In some cases, the connector may consist of a latching connector with a locking shell that prevents the connector from being pulled apart. UL is developing changes to UL Standard 1703 that will apply these requirements to the connectors attached to listed PV modules. This proposal will ensure that other field-installed connectors used in the system will meet the same safety requirement. An Exception is being proposed for 690.33(E) that will require a warning label on these connectors.
Panel Meeting Action: Accept in Principle
Change "50 volts" to "30 volts"
Panel Statement: See panel action on Proposal 13-37. The panel changed the voltage from "50" to "30" to make it consistent with Table 11(B), Note 4 for accessible Class II circuits in wet locations.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.

13-42 Log #2090 NEC-P13 **Final Action: Accept in Principle**
(690.33(E) Exception (New))

TCC Action: The Technical Correlating Committee understands that the Panel Action on Proposal 13-41 modifies the Panel Action on this Proposal.
The Technical Correlating Committee directs that the action on this Proposal be rewritten to comply with the NEC Style Manual to read as follows: "Connectors shall comply with either (1) or (2):".
Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add the new exception as follows:
690.33(E) Interruption of Circuit . The connectors shall be capable of interrupting the circuit current without hazard to the operator.
Exception: Connectors marked: "Do Not Disconnect Under Load" or "Not for Current Interrupting"
Substantiation: All existing latching type and locking type (locks are releasable by hand) connectors used in PV systems today suffer damage if disengaged under load and may present a shock hazard even though the basic design is "touch safe". Therefore, all of them have to be labeled as mentioned in the exception as a matter of fact. The exception establishes the requirement that will apply to all connectors available today while the basic 690.33(E) remains unchanged and can be applied when new connectors are developed.
Panel Meeting Action: Accept in Principle
Revise text to read as follows:
690.33 Connectors. The connectors permitted by Article 690 shall comply with 690.33(A) through 690.33(E).
(A) Configuration. The connectors shall be polarized and shall have a configuration that is noninterchangeable with receptacles in other electrical systems on the premises.
(B) Guarding. The connectors shall be constructed and installed so as to guard against inadvertent contact with live parts by persons.
(C) Type. The connectors shall be of the latching or locking type.
(D) Grounding Member. The grounding member shall be the first to make and the last to break contact with the mating connector.
(E) Interruption of Circuit. ~~The c~~ Connectors shall either (1) or (2):
1. Be rated for interrupting current without hazard to the operator.
2. Be a type that requires the use of a tool to open and marked "Do Not Disconnect Under Load" or "Not for Current Interrupting ."
Panel Statement: The proposed exception without additional qualification may allow unsafe conditions to occur.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.

13-43 Log #2072 NEC-P13 **Final Action: Reject**
(690.35(C)(3))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
(3) Automatically disconnects ~~the~~ all conductors ~~and/or shuts off the utility-interactive inverter or charge controller for that portion of the faulted array~~ or causes the inverter or charge controller connected to ~~that portion of~~ the faulted ~~array~~ circuit to automatically cease supplying power to output circuits .
Substantiation: Aligns the text for these ungrounded systems with the text in 690.5 dealing with grounded PV systems. Establishes that the faulted circuit may be isolated by disconnecting the conductors (typically done on low-voltage systems (12, 24, and 48)) or by causing the connected inverter or charge controller to cease supplying power (typically done on higher voltage systems). Either of these methods serves the purpose of ceasing power production and providing an additional indication that something has happened that needs attention.
Panel Meeting Action: Reject
Panel Statement: The submitter's recommendation is unclear in that there are more words being deleted than are in the current language.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 15 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
BOWER, W.: I vote negative to the reject. The language as proposed is " **690.35(C)(3). Automatically disconnects all conductors or causes the inverter or charge controller connected to the faulted circuit to automatically cease supplying power to output circuits.** " The language is very clear, clarifies the existing code and does not match the panel statement that the recommendation is unclear in that there are more words being deleted than are in the current language. The panel statement is likely a result of the strikeout/underline format causing some confusion in what the final language was.
This proposal allows the ungrounded inverter to cease supplying power to the output under ground-fault conditions. This allowance would be an acceptable substitute to opening the ungrounded conductors. UL allows this interpretation in existing listed inverters. This is the same as isolating the faulted PV array on grounded PV arrays that was accepted in 13-25 [690.5(B)].

13-44 Log #2091 NEC-P13 **Final Action: Accept in Part**
(690.35(D))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
The photovoltaic source ~~and output~~ conductors shall consist of <u>(1) sheathed (jacketed) multi-conductor cables, (2) conductors installed in raceways, or (3) conductors listed and identified as Photovoltaic (PV) Wire installed as exposed, single-conductor cable.</u>
Substantiation: In addition to jacketed, multi-conductor cables and conductors in raceways, a new single-conductor cable is added to the allowable wiring methods.
UL has developed a new cable specification/standard (UL Subject 4703) for a cable type specifically designed for PV installations where exposed, single-conductor cable is used. The cable is intended to meet the safety requirements associated with cables used in the <u>ungrounded</u> PV installations permitted by 690.35. This cable has a 90°C, wet-rated insulation that is more durable than SE and USE cable insulation, and it has passed the long-duration, 720-hour accelerated sunlight exposure tests. It has the necessary durability to meet both the longevity and safety requirements required in ungrounded PV systems when used as a single-conductor exposed cable. Additionally, if the PV Wire also qualifies (by the listing agency) as type USE-2 and is so marked, it will automatically fall under the provisions of 690.31(B). The reverse is not true, and cables marked <u>only</u> with the USE-2 designation will not be acceptable for use in ungrounded PV source circuits.
The PV output conductors are deleted from this section because they are typically in the circuits routed away from the PV combiner boxes and would not be included in these wiring provisions. A proposal for 690.31(B) restricts the use of single-conductor cable to the area within the PV array.
Panel Meeting Action: Accept in Part
Revise the section to read as follows:
The photovoltaic source and output conductors shall consist of <u>(1) sheathed (jacketed) multi-conductor cables, (2) conductors installed in raceways, or (3) conductors listed and identified as Photovoltaic (PV) Wire installed as exposed, single-conductor cable.</u>
Panel Statement: The panel retained the words “and output” to ensure that the text covers both source and output circuits.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
BOWER, W.: I vote affirmative with comment to the panel action. Because the words “and output” were retained, the section needs categorization. The new language should read “ **The photovoltaic source conductors shall consist of (1) sheathed (jacketed) multi-conductor cables, (2) conductors installed in raceways, or (3) conductors listed and identified as Photovoltaic (PV) Wire installed as exposed, single-conductor cable** ” and should pertain to only the PV source circuit. Further, for the output circuit conductors, the requirements should read “ **The photovoltaic output circuit conductors shall consist of (1) sheathed (jacketed) multi-conductor cables, or (2) conductors installed in raceways.** ”
The PV output circuits (as defined in 690.2) are run between the source circuits and the inverter or other dc equipment. These circuits are typically the outputs of combiner boxes and are routed away from the PV array and should NOT be wired with single-conductor exposed cable or exposed jacketed cable. PV output circuits typically need to be run in raceways or should be sheathed (jacketed) multi-conductor cables to afford them the physical protection needed in these exposed locations (across the roof and down the outside of the buildings).

13-45 Log #2073 NEC-P13 **Final Action: Accept in Principle**
(690.35(F))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
(F) The photovoltaic power source shall be labeled with the following warning at each junction box, combiner box, disconnect, and device ~~where~~ <u>when</u> energized, <u>uninsulated terminals or connections</u> ~~the ungrounded circuits~~ may be exposed during service

WARNING
ELECTRIC SHOCK HAZARD.
THE <u>DC</u> ~~DIRECT~~
~~CURRENT CIRCUIT~~ CONDUCTORS ~~OF THIS~~
~~PHOTOVOLTAIC POWER SYSTEM~~ ARE
UNGROUNDED AND MAY BE ENERGIZED
WITH RESPECT TO GROUND DUE TO
LEAKAGE PATHS AND/OR GROUND FAULTS.

Substantiation: The section is modified to indicate that the label shall be required only where there are exposed, uninsulated, energized terminals. Pull boxes where there are no exposed, energized terminals would not require the label. The Warning is simplified to reduce the space needed for installation, while keeping the intent clear.
Panel Meeting Action: Accept in Principle
Revise the section to read as follows:
(F) The photovoltaic power source shall be labeled with the following warning at each junction box, combiner box, disconnect, and device where energized, ungrounded circuits may be exposed during service

WARNING
ELECTRIC SHOCK HAZARD.
THE <u>DC</u> ~~DIRECT~~
~~CURRENT CIRCUIT~~ CONDUCTORS OF THIS
PHOTOVOLTAIC ~~POWER~~ SYSTEM ARE
UNGROUNDED AND MAY BE ENERGIZED
~~WITH RESPECT TO GROUND DUE TO~~
~~LEAKAGE PATHS AND/OR GROUND FAULTS.~~

Panel Statement: The submitter’s substantiation references a pull box where there are no exposed energized terminals. Not having a label on that pull box with 600 v dc conductors exposed during service would create a greater hazard to the installer/maintainer than presently exists now in current language. The panel’s wording accomplishes this. Words were eliminated to clarify the language.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
SWAYNE, R.: The words “DIRECT CURRENT” are more descriptive to the general public, who will be seeing this sign, than “DC” and should be retained.

13-46 Log #2092 NEC-P13 **Final Action: Accept in Principle**
(690.42 Exception (New))

TCC Action: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual by replacing “may…” with “shall be permitted to…” and understands that the new Exception will be located immediately following 690.42, before the FPN.
Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add the new Exception as follows:
690.42 Point of System Grounding Connection.
<u>*Exception: Systems with a 690.5 ground-fault protection device, either as a separate device or as a part of the inverter, may have the required grounding point (bond) made by the ground-fault protection device. This bond, if internal to the ground-fault equipment, shall not be duplicated with an external connection.*</u>
Substantiation: Section 690.5 ground-fault protection devices actually make the grounded conductor-to-ground bond for the entire dc system. It is important that no additional bond (as required by 690.42) be made in a system employing one of these devices. While many PV systems employ such a device, there are still numerous ground-mounted PV systems that do not require them. A proposal (690.5) has been submitted to require a ground-fault protection device on all PV systems. The basic 690.42 is still required but may be deleted in future revisions of the *Code* if the ground-fault protection device becomes a requirement on all PV systems.
Panel Meeting Action: Accept in Principle
Add the new Exception as follows:
690.42 Point of System Grounding Connection.
<u>*Exception: Systems with a 690.5 ground-fault protection device may have the required grounding bond made by the ground-fault protection device. This bond, if internal to the ground-fault equipment, shall not be duplicated with an external connection.*</u>
Panel Statement: The panel deleted “either as a separate device or as part of the inverters” as it was deemed unnecessary language. In addition, grounding point (bonds) was changed to grounding bond in accordance with Article 100 terminology.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
BOWER, W.: I vote affirmative with comment. The new language as accepted in principle by the panel violates a style manual rule in that it uses discretionary language. The exception as accepted is “ **690.42 Point of System Grounding Connection** .
Exception: Systems with a 690.5 ground-fault protection device may have the required grounding bond made by the ground-fault protection device. This bond, if internal to the ground-fault equipment, shall not be duplicated with an external connection.”
The word “may,” in the first sentence should be replaced with “is permitted to”.

13-47 Log #2074 NEC-P13 **Final Action: Accept in Principle**
(690.43)

TCC Action: The Technical Correlating Committee directs that the panel reconsider the Action on this Proposal to comply with the NEC Style Manual by changing "are permitted" to "shall be permitted" in both sentences of the new second paragraph and changing the proposed text from "when required" to "where installed" in the second paragraph of the Proposal which becomes the new third paragraph in the section.
This action will be considered by the Panel as a Public Comment.
Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Add a second and third paragraph to the existing section as follows:
Devices listed and identified for grounding the metallic frames of PV modules are permitted to ground the exposed metallic frames of PV modules to grounded mounting structures. Devices identified and listed for bonding the metallic frames of PV modules are permitted to bond the exposed metallic frames of PV modules to the metallic frames of adjacent PV modules.
Equipment-grounding conductors for the PV array and structure (when required) shall be contained within the same raceway or cable, or otherwise run with the PV array circuit conductors when those circuit conductors leave the vicinity of the PV array.
Substantiation: The proposed second paragraph is added because module grounding clips and other devices are being developed and listed that will effectively penetrate the oxide or anodizing on aluminum framed PV modules and ground them to grounded PV array mounting structures or effectively bond them to adjacent PV modules which, in turn, may be grounded. The existing grounding and bonding requirements in Sections 250.134 or 250.136 do not specifically or generally allow the use of such devices. Nor do they prohibit the use of such devices. Clarification is needed in Article 690.

The proposed third paragraph is required because Section 250.134(B) Exception 2 allows dc equipment-grounding conductors to be routed separately from the circuit conductors. A proposal has been submitted to remove this exception.

With the resurgence of dc power systems (renewable energy systems, fuel cells, uninterruptible power systems, and various industrial processes), the routing of dc equipment-grounding conductors needs to be reconsidered. *IEEE/ANSI Standard 1375, Guide for the Protection of Stationary Battery Systems* provides an excellent tutorial on the issues associated with using overcurrent devices in dc circuits. One of the many issues that this standard points out is the difficulty in getting proper overcurrent device operation as the circuit time constant goes above 10 milliseconds (the time constant limit of testing in UL Standards 198 and 489). The Guide points out that fuses and circuit breakers may not operate properly when inductance in the circuit results in a time constant exceeding 10 milliseconds. Calculations shown in the IEEE Standard indicate that the normal circuit inductance in many dc systems results in time constants between 5 and 10 milliseconds. It wouldn't take much spacing between the equipment-grounding conductor and the circuit conductors to increase the fault-circuit time constant to greater than 10 milliseconds. If Exception number 2 in 250.134(B) is followed, the routing of the equipment-grounding conductor away from the circuit conductors may allow the time constant under ground-fault conditions to exceed 10 milliseconds. These longer time constants, under ground-fault conditions, could prevent the dc overcurrent devices from functioning properly and possibly affect the operation of 690.5-required dc ground-fault protection equipment.

PV module frames are commonly large rectangles of aluminum (1' x 4' to 4' x 6' or larger) that are generally grounded by equipment-grounding conductors at one point on the frame. In PV arrays with modules mounted side by side, the UL-designated grounding points on the modules allow one equipment-grounding conductor to be connected to a number of modules, grounding all at one time. The junction boxes on the modules for the dc power leads are some distance (1-3 feet) away from the grounding points on the same modules. Since the grounded frames are in close proximity to the junction boxes, the equipment-grounding conductors are effectively close to the circuit conductors throughout the array field. However, once the circuit conductors leave the vicinity of the PV array, the equipment-grounding conductor(s) should be routed with the circuit conductors to minimize the time constant described above.
Panel Meeting Action: Accept in Principle
In the second paragraph change "(when required)" to "(where installed)".

Add a second and third paragraph to the existing section as follows:
Devices listed and identified for grounding the metallic frames of PV modules are permitted to ground the exposed metallic frames of PV modules to grounded mounting structures. Devices identified and listed for bonding the metallic frames of PV modules are permitted to bond the exposed metallic frames of PV modules to the metallic frames of adjacent PV modules.
Equipment-grounding conductors for the PV array and structure (when required) shall be contained within the same raceway or cable, or otherwise run with the PV array circuit conductors when those circuit conductors leave the vicinity of the PV array.
Panel Statement: This change more accurately complies with the NEC Manual of Style.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:

GALLO, E.: This proposal and Panel Action address grounding of PV arrays. However, the substantiation submitted with the proposal seems to address grounding of other types of dc systems. Statements in the substantiation related to routing of dc equipment grounding conductors are not valid for other types of dc systems. As IEEE 1375 points out, long time constant in excess of level used in UL testing are unlikely for stationary battery systems.

STAFFORD, T.: The panel meeting action stated is correct, but the change does not take place in the rewrite of the paragraph. The words "when required" are still there.

13-48 Log #3587 NEC-P13 **Final Action: Accept in Principle**
(690.43)

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the Panel Action and correct the wording by replacing "is required" with "shall be required" to comply with the NEC Style Manual. This action will be considered by the panel as a public comment.
Submitter: Robert H. Wills, Intergrid, LLC
Recommendation: Revise as follows:

690.43 Equipment Grounding. Exposed noncurrent-carrying metal parts of module frames, equipment, and conductor enclosures shall be grounded in accordance with 250.134 or 250.136(A) regardless of voltage. An equipment grounding conductor is required between a PV array and other equipment even if multiple grounding electrodes are used.
Substantiation: Supplementary grounding electrodes are often installed at PV arrays to help with lightning protection. Some installers interpret the use of a supplementary grounding electrode as sufficient to meet the requirements of 690.43 and so do not install a grounding equipment conductor between the PV array metal frame and other equipment (such as inverters and charge controllers).

This leads to a hazardous situation as a PV groundfault may cause a high voltage between the grounding electrodes, and may also cause PV ground fault protection devices to malfunction.

The proposed language makes this requirement explicit.
Panel Meeting Action: Accept in Principle
Add a second sentence to 690.43 to read as follows:

An equipment grounding conductor between a PV array and other equipment is required in accordance with 250.110.
Panel Statement: The panel revised the proposal to simplify the language.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:

STAFFORD, T.: The panel action was correct in requiring that the required equipment grounding conductor is specified in accordance with 250.110. However, this is repetitious code. The requirements of Article 250.110 already apply without having to specify requirements in Article 690.43.

13-49 Log #2093 NEC-P13 **Final Action: Accept in Principle in Part**
(690.45)

TCC Action: It was the action of the Technical Correlating Committee that the Panel Action be clarified by writing the exception in a complete sentence to comply with the NEC Style Manual.

This action will be considered by the Panel as a Public Comment.
Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
690.45 Size of Equipment-Grounding Conductor : ~~Where not protected by the ground-fault protection equipment required by 690.5, the equipment-grounding conductor for photovoltaic source and photovoltaic output circuits shall be sized for 125 percent of the photovoltaic-originated short-circuit currents in that circuit. Where protected by the ground-fault protection equipment required by 690.5, the equipment-grounding conductors for photovoltaic source and photovoltaic output circuits shall be sized in accordance with 250.122.~~
690.45 Size of Equipment-Grounding Conductor. Equipment-grounding conductors in photovoltaic source and photovoltaic output circuits shall be sized in accordance with Table 250.122. When no overcurrent protective device is used in the circuit, an assumed overcurrent device rated at the photovoltaic rated short-circuit current shall be used in Table 250.122. Increases in equipment-grounding conductor size to address voltage drop considerations shall not be required. If equipment-grounding conductors sized per 690.5(A) Exception 2 are used, the above sizing requirements are not to be used. The equipment-grounding conductor shall be no smaller than 14 AWG.
Substantiation: This proposal is a result of the proposed new ground-fault protection device requirements in 690.5 and 690.5(A). The language simplifies and clarifies the requirement. The ground-fault protective devices will interrupt

any dc ground-fault currents that are in excess of a maximum value determined by Underwriters Laboratories based on the size of the utility-interactive inverter. Values of 1 amp or lower per 10 kW are being used. This means that the equipment-grounding conductor will never have to carry but a small fraction of the available short-circuit current as circulating ground-fault current on a continuous basis. Requiring the size to be based on Table 250.122 (or an assumed overcurrent device rated at the short-circuit current where there are no overcurrent devices in the circuit) will size the equipment-grounding conductors to an acceptable size that will minimize physical/mechanical abuse when being installed along with circuit conductors sized at 1.56 times the short-circuit current. Because even a 20 AWG conductor can carry the 1 amp maximum current on a smaller system, there is no increase in size required by 250.122(B) where circuit conductors have been increased in size for voltage drop. Also, there are no overcurrent devices that need a low-impedance equipment-grounding connection for proper operation because the ground-fault device will activate at a significantly lower current level than any overcurrent device in the circuits. Typically, inverters up to about 10 kW are using 0.5-1.0 amp ground-fault trigger levels and higher power inverters will have the value set at 1 amp per 10kW or lower. UL Standard 1741 will establish the ground-fault detection/interruption limits. Off-grid, stand-alone systems are commonly using a 1-amp ground-fault-protection-device-trip level. The 690.5(A) Exception 2 that allows equipment-grounding conductors to be sized to twice the size of the circuit conductors will result in a suitable equipment-grounding conductor that is significantly larger than that required here.

Panel Meeting Action: Accept in Principle in Part

Reword proposal as follows:

690.45 Size of Equipment-Grounding Conductors. Equipment-grounding conductors in photovoltaic source and photovoltaic output circuits shall be sized in accordance with Table 250.122. Where no overcurrent device is used in the circuit, an assumed overcurrent device rated at 125% of the photovoltaic rated short-circuit current shall be used. Increases in equipment-grounding conductor size to address voltage drop considerations shall not be required.

Exception: Equipment-grounding conductors sized per 690.5 (A) Exception No. 2.

Panel Statement: The over-sizing of the equipment grounding conductor recognizes that the ground fault condition without an overcurrent device may continue for a period of 3 hours or greater. Overheating of the conductor's insulation is the issue, not voltage drop. Table 250-122 does not permit ground conductor sizes smaller than #14 CU.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: The exception should be deleted because the reference to 690.5(A) Exception 2 does not exist in the 2005 NEC. In addition, Table 250.122 specifies minimum size. An equipment grounding conductor sized to twice the circuit conductor would always comply.

13-50 Log #2094 NEC-P13 **Final Action: Accept in Principle**
(690.47(C))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

690.47(C) Systems with Alternating and Direct - Current Grounding Requirements. <u>Utility-interactive and stand-alone inverters employing either an internal or external power transformer shall require both alternating-current (ac) and direct-current (dc) grounding systems.</u> <u>Alternating Current PV modules are not included in this requirement. For utility-interactive inverters, the</u> <u>premises grounding system serves as the ac grounding system.</u> Photovoltaic power systems with both <u>ac</u> ~~alternating-current~~ and <u>dc</u> ~~direct-current (dc)~~ grounding requirements shall be permitted to be grounded as described in (1) or (2):

Substantiation: The existing language, while stating how to provide both ac and dc grounding, did not establish any requirement or guidance as to when it should apply.

The power transformer in either a utility-interactive or standalone inverter effectively isolates the grounded, dc-circuit conductor from the grounded, ac-circuit conductor. This isolation dictates that each of these circuits be properly grounded. In many cases, the ac output of these inverters is effectively grounded outside the inverter through the existing ac distribution system, however standalone systems must establish the ac bond, as there is no existing distribution system. The dc circuit system being isolated from the grounded ac system must be properly grounded. In most utility-interactive inverters, the dc grounded-conductor-to-ground bond is made in the inverter as part of the ground-fault detection device. However, a code-compliant dc grounding electrode conductor terminal and appropriate path for surge currents is still required external to the inverter. While the ac and dc equipment-grounding conductors meet at the inverter chassis, the size requirements may differ between them due to different ac and dc circuit currents and overcurrent protection. The sizes, routing, and multiple splices allowed for equipment-grounding conductors do not meet the requirements for a dc grounding-electrode conductor. These grounding requirements make the code consistent with UL Standard requirements for the internal construction of the inverters.

Alternating Current PV modules have no external dc circuitry and are grounded via the ac equipment-grounding conductor.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel action and statement on Proposal 13-51 should satisfy the intent of the submitter.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment to the panel action to accept in principle because the follow-on proposal and the rewrite of 690.47 needs another rewrite or to be rejected as is. This proposal should have been accepted in order to retain the requirements for dc grounding. This affirmative vote applies only if suggested changes to the 13-51 are incorporated since the current rewrite is lacking the proper grounding requirements in a few areas.

13-51 Log #3585 NEC-P13 **Final Action: Accept in Principle**
(690.47(C))

TCC Action: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual by replacing "may…" with "shall be permitted to…" in (5) and (6).

The Technical Correlating Committee understands that (3) should read "for equipment bonding jumpers (250.102)" to correlate with the title of 250.102.

These actions will be considered by the panel as a public comment.

Submitter: Robert H. Wills, Intergrid, LLC

Recommendation: Change 690.47(C) to the following:

(C) Systems with Alternating-Current and Direct-Current Grounding Requirements.

<u>When photovoltaic power systems have both alternating -current (ac) and direct-current(D) grounding requirements, the dc grounding system shall be bonded to the ac grounding system. The bonding conductor shall be sized according to 690.45. A single common grounding electrode and grounding bar may be used for both systems in which case the common grounding electrode conductor shall be sized to meet the requirements of both 250.66(ac) and 250.166(dc).</u>

Substantiation: The previous language for 690.4(C) was new to the 2005 code.

It required that:

- the dc to ac ground system bond be run directly from electrode to electrode (if separate ac and dc electrodes were used).
- that the bond be sized as a grounding electrode conductor.
- redundant, dual grounding electrode conductors when a single electrode was used for both ac and dc.

These requirements were excessive and have unnecessarily increased the installation cost of photovoltaic power systems.

The intent of bonding is to hold both ground systems and all equipment,, whether ac or dc, at the same potential. As fault current does not run through this bond (the ac and dc systems are separate), a conductor sized the same as an equipment grounding conductor (as defined in 690.45) is sufficient to meet this intent.

The bonding conductor between the ac and dc grounding systems should not be confused with main or system bonding conductors that are required to carry full fault currents. Both the ac and dc grounding systems will have bonds from the ground system to their respective grounded conductors that need to be sized according to 250.66(ac) and 250.166(dc).

Panel Meeting Action: Accept in Principle

Change 690.47(C) to the following:

(C) Systems with Alternating-Current and Direct-Current Grounding Requirements

Systems with alternating-current and direct-current grounding requirements shall comply with items (1) through (7) below:

<u>(1) Where photovoltaic power systems have both alternating-current (ac) and direct-current (dc) grounding requirements, the dc grounding system shall be bonded to the ac grounding system.</u>

<u>(2) A bonding conductor between these systems and equipment grounding conductors in these systems shall be sized as the larger of the dc requirement (according to 690.45) and the ac requirement (based on the inverter alternating-current overcurrent device rating and 250.122).</u>

<u>(3) A conductor that serves as both an equipment grounding conductor and as part of the bond between ac and dc systems for an inverter incorporating dc ground-fault protection shall meet the requirements of equipment grounding jumpers (250.102) but shall not be subject to the requirements for bonding jumpers (250.28).</u>

<u>(4) A bonding conductor or equipment grounding conductor that serves multiple inverters shall be sized based on the sum of applicable maximum currents used in (2).</u>

(5) A common ground bus may be used for both systems.

(6) A common grounding electrode may be used for both systems in which case the grounding electrode conductor shall be connected to the ac ground system bonding point.

(7) Grounding electrode conductor(s) shall be sized to meet the requirements of both 250.66 (ac system) and 250.166 (dc system).

Existing Text

690.43 Equipment Grounding

Exposed non–current-carrying metal parts of module frames, equipment, and conductor enclosures shall be grounded in accordance with 250.134 or 250.136(A) regardless of voltage.

690.47 Grounding Electrode System

(A) Alternating-Current Systems If installing an ac system, a grounding electrode system shall be provided in accordance with 250.50 through 250.60. The grounding electrode conductor shall be installed in accordance with 250.64.

(B) Direct-Current Systems If installing a dc system, a grounding electrode system shall be provided in accordance with 250.166 for grounded systems or 250.169 for ungrounded systems. The grounding electrode conductor shall be installed in accordance with 250.64.

(C) Systems with Alternating-Current and Direct-Current Grounding Requirements Photovoltaic power systems with both alternating-current and direct-current (dc) grounding requirements shall be permitted to be grounded as described in (1) or (2):

(1) A grounding-electrode conductor shall be connected between the identified dc grounding point to a separate dc grounding electrode. The dc grounding-electrode conductor shall be sized according to 250.166. The dc grounding electrode shall be bonded to the ac grounding electrode to make a grounding electrode system according to 250.52 and 250.53. The bonding conductor shall be no smaller than the largest grounding electrode conductor, either ac or dc.

(2) The dc grounding electrode conductor and ac grounding electrode conductor shall be connected to a single grounding electrode. The separate grounding electrode conductors shall be sized as required by 250.66 (ac) and 250.166 (dc).

Panel Statement: The wording of the proposal was changed to clarify requirements and to define the connection location for a single grounding electrode conductor (located at the ac ground system bonding point, as the ac system will have greater available fault current). Sizing requirements in general were changed to be based on the larger of the ac and dc requirements to reflect the fact that both ac and dc fault currents could be carried in either grounding system. Language was added to address multiple inverter installations.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 14 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

STAFFORD, T.: The action taken by the panel was not consistent with the intent of the submitter. The submitter's intent was to clarify the intent of the NEC. The action taken by the panel was to rewrite the proposal at the ROP meeting to add multiple items with which the installation could comply with the NEC. The submitter did not seek to add the multiple items', specifically the submitter wanted to require a single provision for ac and dc grounding requirements. It is felt that adequate time is needed to review and verify proposals submitted for adoption, not to write proposals at the ROP meeting.

SWAYNE, R.: The Panel Action is commendable in form and provides an improvement from the present wording. There are, however, several items that need correction, as follows:

1) In Section 690.47(C)(3), the term "equipment grounding conductor" needs to be changed to "equipment bonding conductor" to coordinate with the title of Section 250.102.

2) It is not clear, nor is there any substantiation for, what the need is for Section 690.47(C)(5).

3) In Section 690.47(C)(6), the word "may" should be changed to "shall" in order to make it a requirement that there be a single electrode for the building or structure.

4) In Section 690.47(C)(6), all of the words after "both systems" should be deleted because it implies that there is only one grounding electrode conductor. In fact, there are two, one for each system. Each grounding electrode conductor may be connected to a single common grounding electrode or each may be connected to two separate grounding electrodes provided that the two separate grounding electrodes are bonded together to be a single grounding electrode as specified in Section 250.58.

Comment on Affirmative:

BOWER, W.: My vote is affirmative with comments.

The currently adopted language in the 2005 NEC is:

"690.45(C) Systems with Alternating-Current and Direct-Current Grounding Requirements Photovoltaic power systems with both alternating-current and direct-current (dc) grounding requirements shall be permitted to be grounded as described in (1) or (2):

(1) A grounding-electrode conductor shall be connected between the identified dc grounding point to a separate dc grounding electrode. The dc grounding-electrode conductor shall be sized according to 250.166. The dc grounding electrode shall be bonded to the ac grounding electrode to make a grounding electrode system according to 250.52 and 250.53. The bonding conductor shall be no smaller than the largest grounding electrode conductor, either ac or dc.

(2) The dc grounding electrode conductor and ac grounding electrode conductor shall be connected to a single grounding electrode. The separate grounding electrode conductors shall be sized as required by 250.66 (ac) and 250.166 (dc)."

The panel accepted language for the 2008 NEC is:

"690.47(C) Systems with Alternating-Current and Direct-Current Grounding Requirements; Systems with alternating-current and direct-current grounding requirements shall comply with items (1) through (7) below:

(1) Where photovoltaic power systems have both alternating-current (ac) and direct-current (dc) grounding requirements, the dc grounding system shall be bonded to the ac grounding system.

(2) A bonding conductor between these systems and equipment grounding conductors in these systems shall be sized as the larger of the dc requirement (according to 690.45) and the ac requirement (based on the inverter alternating-current overcurrent device rating and 250.122).

(3) A conductor that serves as both an equipment grounding conductor and as part of the bond between ac and dc systems for an inverter incorporating dc ground-fault protection shall meet the requirements of equipment grounding jumpers (250.102) but shall not be subject to the requirements for bonding jumpers (250.28).

(4) A bonding conductor or equipment grounding conductor that serves multiple inverters shall be sized based on the sum of applicable maximum currents used in (2).

(5) A common ground bus may be used for both systems

(6) A common grounding electrode may be used for both systems in which case the grounding electrode conductor shall be connected to the ac ground system bonding point.

(7) Grounding electrode conductor(s) shall be sized to meet the requirements of both 250.66 (ac system) and 250.166 (dc system)."

My suggested language appears below in strikeout/underline format.

" **690.47(C) Systems with Alternating-Current and Direct-Current Grounding Requirements.**

Inverters converting direct-current (dc) photovoltaic energy to alternating current (ac) shall ac and dc grounding systems. Alternating-current PV modules are not included in this requirement. For utility-interactive inverters, the premises ac grounding system serves as the ac grounding system.

Systems with alternating-current and direct-current grounding requirements shall comply with items (1) through (8) below:

1) A grounding-electrode conductor shall be connected between the identified dc grounding point to a separate dc grounding electrode.

2) ~~Where photovoltaic power systems have both alternating-current (ac) and direct-current (dc) grounding requirements,~~ The dc grounding system shall be bonded to the ac grounding system according to 250.52 .

3) Grounding electrode conductor(s) shall be sized to meet the requirements of both 250.66 (ac system) and 250.166 (dc system)."

4) A bonding conductor between the ~~se~~ dc and ac grounding systems and equipment grounding conductors ~~in these systems~~ shall be sized as the larger of the dc requirement according to 690.45 ~~and~~ or the ac requirement based on the inverter alternating-current overcurrent device rating and 250.122.

5) ~~A~~ The bonding conductor or equipment grounding conductor that serves multiple inverters shall be sized based on the sum of applicable maximum currents used in (4).

6) A conductor that serves as both an equipment grounding conductor and as part of the bond between ac and dc systems for an inverter incorporating dc ground-fault protection shall meet the requirements of equipment grounding jumpers (250.102), but shall not be subject to the requirements for bonding jumpers (250.28).

7) A common ground bus ~~may~~ is permitted to be used for both systems

8) A common grounding electrode ~~may~~ is permitted to be used for both systems with the requirement that the dc grounding electrode conductor shall be connected to the ac ground system bonding point.

The suggested language now includes a requirement for dc grounding. Redundancy in the wording has been minimized. The sentences in which discretionary language was used are modified to use required or permitted language.

13-52 Log #2075 NEC-P13 **Final Action: Accept in Principle**
(690.47(C)(3))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Add the new section as follows:

690.47(C)(3) DC Grounding-Electrode Conductors for Multiple Inverter Installations. A single, direct-current common grounding electrode conductor shall be permitted with tap conductors to each separate inverter in grounded, multi-inverter systems. The tap conductors for each inverter and the common-grounding electrode conductor shall each be sized in accordance with 250.166.

The taps shall be made with a listed irreversible connector or exothermic welding.

Also: Add the number (3) to the end of 690.47(C) to include this proposal in that list.

Substantiation: Utility interactive PV systems using multiple smaller inverters (i.e. 1000-6000 watts) are frequently installed to provide additive power at much higher levels. Systems with multiple small inverters up to nearly 100 kW have been installed in the US, and larger systems are being planned. Each inverter normally has an internal transformer and, therefore, the dc side of the system must be grounded. Since each PV inverter represents a separate PV system for the building or structure, faults in the dc PV array for one inverter do not affect any of the other inverter systems. For this reason, the size of the common equipment-grounding conductor should be no larger than that required for a single inverter and should be based on 250.166. There is no technical or safety reason to have the common, dc grounding-electrode conductor any larger than the sizes required by 250.166 as is required for ac multiple separately derived systems in 250.30(A)(4)(a).

Panel Meeting Action: Accept in Principle

Panel Statement: The panel action and statement on Proposal 13-51 should satisfy the intent of the submitter.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 14 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

BOWER, W.: I vote negative to the panel action to accept in principle with the statement that 13-51 covers the requirements of the proposal. I disagree that the accept-in-principle 13-51 covers the requirements proposed. The proposal " **690.47(C)(3) DC Grounding-Electrode Conductors for Multiple Inverter Installations.** A single, direct-current common grounding electrode conductor shall be permitted with tap conductors to each separate inverter in grounded, multi-inverter systems. The tap conductors for each inverter and the common-grounding electrode conductor shall each be sized in accordance with 250.166. The taps shall be made with a listed irreversible connector or exothermic welding." is not covered or addressed with the accepted rewrite of 690.47(C).

Note: I believe the exothermic welding requirement applies only to grounding electrode conductors and not to equipment grounding conductors. There is confusion whether the proposal meant to apply to grounding electrode conductors or to equipment grounding conductors with its multiple inverter taps.

SWAYNE, R.: The Panel Action taken on Proposal 13-51 makes no reference to a common grounding electrode conductor and tap conductors which are the subject of this proposal. This proposal should be Accepted and added to the list in Proposal 13-51.

13-53 Log #2076 NEC-P13 **Final Action: Accept in Principle**
(690.47(D) (New))

TCC Action: The Technical Correlating Committee directs that the Panel reconsider the proposal and clarify the language and the placement of the text. In addition, the text needs to be rewritten to be in compliance with the NEC Style Manual.

This action will be considered by the Panel as a Public Comment.

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Add the new section as follows:

690.47(D) Additional Grounding Electrodes for Equipment Grounding. Additional, supplementary grounding electrodes for equipment grounding shall be installed in accordance with the methods described in 250.54 as modified by (1) and (2). They are not required to be bonded to the main dc grounding electrode.

(1) A grounding electrode shall be installed at the location of ground-mounted or pole-mounted PV arrays.

(2) A grounding electrode shall be installed at the location of any PV array that is mounted on a building or structure that is separate from the building or structure containing other power equipment in the system.

Substantiation: PV arrays may be mounted in locations that are some distance from the structure that holds the other power equipment in the system (inverters, batteries, interface equipment, etc.). To maintain the potential of the exposed metal surfaces as close to the potential of the local earth as possible, supplementary grounding electrodes are required at the remote locations where the PV arrays are located. These grounding electrodes do not have to be bonded directly to other grounding electrodes in the system. The equipment-grounding conductors, however, indirectly connect them to other grounding electrodes in the systems. The installation provisions of 250.54 are appropriate, but these grounding electrodes are required, not permissive.

Panel Meeting Action: Accept in Principle

Add the following text:

690.47(D) Grounding Electrodes for Array Grounding.
Grounding electrodes for equipment grounding shall be installed in accordance with 250.50 at the location of all ground and pole-mounted photovoltaic arrays and as close as possible to the location of roof-mounted photovoltaic arrays. The electrodes shall be connected to the array frame(s) or structure.

The structure of a ground or pole-mounted photovoltaic array can be considered a grounding electrode if it meets the requirements of 250.52. Roof-mounted photovoltaic arrays may use the metal frame of a building or structure if the requirements of 250.52(3) are met.

Exception No 1: Where the load served by the array is integral with the array.

Exception No 2: Where the grounding electrode would be adjacent to the main grounding electrode.

Panel Statement: The addition of grounding electrodes has been a recommended practice for all PV array installations for many years. The electrode and grounding electrode conductor are installed to provide a direct path to ground for lightning.

The panel decided that there is a safety benefit in making this practice mandatory for all.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: This proposal should be rejected for several reasons. The first sentence implies that the grounding electrode could replace the need for an equipment grounding conductor. This is not the case and an equipment grounding conductor is required whether or not supplementary grounding electrodes are installed and connected to the equipment grounding conductor. The words "for equipment grounding" in the first sentence should be deleted. The reference to 250.50 is not for installation of electrodes but for the interconnection of all electrodes that are part of the system grounding system (not equipment grounding). Electrodes that are installed and connected to the equipment grounding conductor are not required to be separately bonded together. The reference for metal frame use as a grounding electrode should be 250.52(A)(2).

Comment on Affirmative:

BOWER, W.: I vote affirmative to the panel action because the proposal as submitted for supplementary grounding electrodes should considered separately and agree that the supplementary terminology should not have been used. This does create a new mandatory requirement for grounding the array whether it be a rooftop or ground mounted but I also believe the new requirement will help keep lightning induced surges on the outside of buildings.

The panel-accepted language

" **690.47(D) Grounding Electrodes for Array Grounding. Grounding electrodes for equipment grounding shall be installed in accordance with 250.50 at the location of all ground and pole-mounted photovoltaic arrays and as close as possible to the location of roof-mounted photovoltaic arrays. The electrodes shall be connected to the array frame(s) or structure.**

The structure of a ground or pole-mounted photovoltaic array can be considered a grounding electrode if it meets the requirements of 250.52. Roof-mounted photovoltaic arrays may use the metal frame of a building or structure if the requirements of 250.52(3) are met.

Exception No 1: Where the load served by the array is integral with the array.

Exception No 2: Where the grounding electrode would be adjacent to the main grounding electrode. "

is correct and I believe the panel acted correctly by removing the supplementary terminology.

ZGONENA, T.: Revise Exception No. 1 to read:

"Where the array serves only loads which are integral to the array."

This clarifies that ungrounded arrays may not be interconnected with other equipment.

13-54 Log #2095 NEC-P13 **Final Action: Accept in Principle**
(690.53)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal so that the text is in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

690.53 Direct-Current Photovoltaic Power Source. A ~~marking~~ permanent label for the direct-current photovoltaic power source indicating items (1) through ~~(4)~~ (5) shall be provided by the installer at the photovoltaic disconnecting means ~~for this power source~~ :

(1) ~~Operating current~~ . Rated maximum power-point current

(2) ~~Operating voltage.~~ Rated maximum power-point voltage

(3) Maximum system voltage (690.7)

(4) Maximum ~~short-circuit~~ current (690.8)

(5) Maximum rated output current of the charge controller (if installed)

Substantiation: The basic paragraph is reworded to indicate that a label is required rather than a marking and to eliminate unnecessary words. The term "rated" is added to items (1), (2), and (4) to clarify exactly what values should be on the label. This term is not required on item (3) because Maximum System Voltage is defined in 690.7. Item (5) is added to identify the maximum rated output of the charge controller since that device, where installed, may significantly increase the current from the PV array. The PV disconnecting means must be readily accessible per 690.14.

Panel Meeting Action: Accept in Principle

Revise the section as follows:

690.53 Direct-Current Photovoltaic Power Source. A <u>permanent</u> <u>label or</u> marking for the direct-current photovoltaic power source indicating items (1) through (4) shall be provided by the installer at the <u>photovoltaic</u> disconnecting means ~~for this power source~~ :

(1) Operating current.
(2) Operating voltage.
(3) Maximum system voltage <u>(690.7)</u>
(4) Short-circuit current <u>(690.8)</u>

Panel Statement: The term maximum power point is not defined in the code. Item (5) was deleted, as that rating is shown on the product.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-55 Log #2077 NEC-P13 **Final Action: Accept**
(690.54)

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

690.54 Interactive System Point of Interconnection. All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source <u>and</u> with the <u>rated</u> ~~maximum~~ ac output ~~operating~~ current and the <u>nominal</u> operating ac voltage.

Substantiation: Clarifies the required marking to show the rated ac-output current (of the inverter), which is the current upon which conductors and overcurrent devices are based (690.8, 690.9). The existing text is sometimes interpreted as the maximum operating current for the installed system, which may be considerably less than the rated output current. Some installers were also marking a range of ac voltages. Both changes provide inspectors with better information to use in determining if *Code* requirements have been met.

Panel Meeting Action: Accept

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-56 Log #225 NEC-P13 **Final Action: Accept in Principle**
(690.57)

TCC Action: The Technical Correlating Committee directs that the panel reconsider this proposal and clarify where the text is to be placed since 690.57 is in Part VI, dealing with marking.

This action will be considered by the Panel as a Public Comment.

NOTE: The following proposal consists of Comment 13-37 on Proposal 13-52 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 13-52 was:

Add a new Section 690.57 to read as follows:

690.57 Interactive System Point of Interconnection. All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source with the maximum ac output operating current and the operating ac voltage. Where interactive systems may operate as a Stand-Alone System through bypassing the inverter, disconnecting means shall indicate normal and bypass positions.

The Technical Correlating Committee directs that the Panel Action on Comment 13-37 be reported as "Hold" and additional consideration be given to the negative votes in the 2004 NEC Report on Comments.

Submitter: Michael I. Callanan, IBEW

Recommendation: The Panel should have accepted this proposal in principle to read as follows:

690.57 Where Interactive Systems operate as a Stand-Alone System through bypassing of the inverter, disconnecting means shall indicate both normal and bypass positions.

Substantiation: We recognize that the bypass function performed by the inverter is performed with internal circuitry as stated by the panel, but this does not alleviate the potential for hazards to personnel working on the system branch circuits. Inverters may operate in a "Bypass" mode where AC power is routed through the inverter to critical loads. Presently some disconnecting means on inverters indicate an "off" position but allow AC Utility Power to supply loads driven by the inverter. The intent here is not to prevent inverters from operating in the bypass mode but rather to have marking indicate when an inverter is operating in a bypass mode. Someone performing work upon the system could come into contact with energized branch circuits that are indicated "off" at its source, i.e., the inverter. The branch circuits supplied by an interactive inverter operating in the stand-alone mode are not internal to the inverter, they are accessible.

We also recognize the panel's attempt to alleviate the same hazard identified by proposal 13-77. The panel action taken on proposal 13-77 removes the same hazard identified for fuel cell systems which is identical to the one stated above. The new Section 690-57 attempts to alleviate the same hazard for photovoltaic systems and it is desired for the same level of system safety to be present for both power sources, fuel cells and photovoltaics. This Comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept in Principle

Add a New Section 690.57, Load Disconnect, to read as follows:

690.57 Load Disconnect. A load disconnect that has multiple sources of power shall disconnect all sources when in the off position.

Panel Statement: The submitter's first sentence was already in 690.54. Revised text better addresses the safety issue and should satisfy the concerns of the submitter.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment on the panel action to accept in principle. I agree with the language for load disconnects that are not internal to an inverter. However, this may be an area where inspectors become confused, and they may require a second load disconnect when one is part of an inverter. If the load disconnect is within the inverter, then this is a listing issue and not a code issue.

13-57 Log #1619 NEC-P13 **Final Action: Accept**
(690.62)

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Make the following change in 690.62:

Change "neutral" to "neutral conductor."

The revised text would appear as follows:

If a single-phase, 2-wire inverter output is connected to the neutral <u>conductor</u> and one ungrounded conductor (only) of a 3-wire system or of a 3-phase, 4-wire wye-connected system, the maximum load connected between the <u>neutral</u> conductor and any one ungrounded conductor plus the inverter output rating shall not exceed the ampacity of the neutral conductor.

Substantiation: This proposal was developed by the TCC Task Group on the definition of "Neutral Conductor." Task Group members were: Jeffrey Boksiner (Chair) (CMP 5, TCC), Paul Dobrowsky (CMP 5), Walter Skuggevig (CMP 5), Doug White (CMP 5), Michael Toman (CMP 2, TCC), Bob Wilkinson (CMP 2), Jim Daly (CMP 6, CMP 7, TCC), Bill Laidler (CMP 6), and Oran Post (CMP 6).

The Task Group has proposed the following definitions to be added to Article 100:

● **Neutral conductor.** A circuit conductor connected to the neutral point of a system.

● **Neutral point.** The common point of a wye-connection in a polyphase system or midpoint of a single-phase, 3-wire system or midpoint of a single-phase portion of a 3-phase delta system or midpoint of a 3-wire, direct-current system.

This is a correlating proposal to provide uniform usage of the terms in the NEC in accordance with the proposed definitions. The Task Group used the following guidelines to develop correlating change proposals

● The use of the word "neutral" as a noun should be avoided. The terms "neutral conductor" or "neutral point" should be used wherever grammatically possible.

● The phrase "grounded circuit conductor (neutral)" should be avoided. The phrases "grounded circuit conductor" or "grounded circuit conductor or neutral conductor" should be used as appropriate.

Additional information is available in the Task Group report.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

STAFFORD, T.: Based on comments made by Task Group members it doesn't look like this proposal was completed at the TG level. Based upon supporting material submitted to the Panel it appears that the work on the Task Group was not complete, nor in agreement. Supporting materials submitted also specified that the entire list of proposals created and submitted by the task group should be rejected.

13-58 Log #2096 NEC-P13 **Final Action: Accept in Principle**
(690.62)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal so that the text is in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Add the following second paragraph:
A neutral conductor connection to a single-phase or 3-phase utility-interactive inverter used solely for instrumentation or voltage or phase detection purposes and not for power transmission shall be permitted to be as small as 14 AWG.
Substantiation: Many utility interactive inverters have a 240V, 208V, or 480V output that requires no connection to a neutral conductor for power transmission. However, due to various IEEE Standards and local jurisdiction requirements, a connection to the electrical power system neutral conductor is required to detect a loss of phase and/or to monitor unbalanced line-to-neutral voltages of the inverter. This neutral connection, used only for phase detection or instrumentation, carries no appreciable power and can safely be made very small. A minimum requirement of 14 AWG ensures that this conductor is physically robust enough to be pulled through conduits with the power conductors.
Panel Meeting Action: Accept in Principle
Revise the second paragraph to read as follows:
A neutral conductor connection to a single-phase or 3-phase utility-interactive inverter used solely for instrumentation or voltage or phase detection purposes and not for power transmission shall be no smaller than the equipment grounding conductor.
Panel Statement: A 14 AWG may not be sufficient to carry fault current from the branch circuit breaker. Changing the requirement that the minimum conductor size be no smaller than the equipment grounding conductor ensures that this instrumentation conductor will be able to carry fault current and trip the circuit overcurrent device.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
STAFFORD, T.: My panel notes indicate the requirement of the minimum conductor size be no smaller than the equipment grounding conductor allowed for the proposal to pass at the ROP meeting.

13-59 Log #2100 NEC-P13 **Final Action: Accept**
(690.64)

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
690.64 Point of Connection. The output of a ~~photovoltaic power source~~ utility-interactive inverter shall be connected as specified in 690.64(A) or 690.64(B).
Substantiation: Over the evolution of article 690 since 1984, the definition of Photovoltaic Power Source has referred to the dc output of a PV array. All of Part VII in 690 has always referred to the ac output of utility-interactive inverters. The terms "photovoltaic power source" was used incorrectly in this section. The wording change makes the section consistent with the intent of Part VII and removes any ambiguity.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.

13-60 Log #2078 NEC-P13 **Final Action: Accept**
(690.64(A))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
(A) Supply Side. ~~A photovoltaic power source~~ The output of a utility-interactive inverter shall be permitted to be connected to the supply side of the service disconnecting means as permitted in 230.82(6).
Substantiation: Over the evolution of article 690 since 1984, the definition of Photovoltaic Power Source has referred to the dc output of a PV array. All of Part VII in 690 has always referred to the ac output of utility-interactive inverters. The terms "photovoltaic power source" was used incorrectly in this section. The wording change makes the section consistent with the intent of Part VII and removes any ambiguity.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
SWAYNE, R.: It should be recognized that the utility-interactive inverter is designed and tested to shut down in the event of loss of voltage from the utility. Otherwise, there is a danger to utility workmen.

13-61 Log #2081 NEC-P13 **Final Action: Accept in Principle**
(690.64(B))

TCC Action: The Technical Correlating Committee understands that the Panel Action on Proposal 13-69 modifies the Panel Action on this Proposal. The Technical Correlating Committee directs that this proposal be referred to Code-Making Panel 9 for comment relative to the overcurrent protection for the panelboard.
Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum
Recommendation: Revise the section as follows:
(B) Load Side. ~~A photovoltaic power source~~ The output of a utility-interactive inverter shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises, provided that all of the following conditions are met:
Substantiation: Over the evolution of article 690 since 1984, the definition of Photovoltaic Power Source has referred to the dc output of a PV array. All of Part VII in 690 has always referred to the ac output of utility-interactive inverters. The terms "photovoltaic power source" was used incorrectly in this section. The wording change makes the section consistent with the intent of Part VII and removes any ambiguity.
Panel Meeting Action: Accept in Principle
Revise text to read as follows:
690.64 Point of Connection. The output of a ~~photovoltaic power source~~ utility-interactive inverter shall be connected as specified in 690.64(A) or 690.64(B).
(A) Supply Side. ~~A photovoltaic power source~~ The output of a utility-interactive inverter shall be permitted to be connected to the supply side of the service disconnecting means as permitted in 230.82(6).
(B) Load Side. ~~For a photovoltaic power source~~ The output of a utility-interactive inverter shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises. Connections shall comply with 690.64(B)(1) through 690.64(B)(5)
(1) Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.
(2) The interconnection point shall be on the line side of all ground-fault protection equipment.
Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources. Ground-fault protection devices used with supplies connected to the load-side terminals shall be identified and listed as suitable for backfeeding.
(3) Equipment containing more than one circuit supplying power to a busbar or conductor shall be marked at the overcurrent device for each supply.
(4) Circuit breakers, if backfed, shall be identified for such operation. Dedicated circuit breakers backfed from listed utility-interactive inverters complying with 690.60 shall not be required to be individually clamped to the panelboard busbars. A front panel shall clamp all circuit breakers to the panelboard busbars. Main circuit breakers connected directly to energized feeders shall also be individually clamped.
FPN. Circuit breakers that are marked "Line" and "Load" are not identified as suitable for backfeeding.
(5) The rating of the bus or conductor to which the utility-interactive inverter breaker or fusible disconnect is connected shall meet all of the conditions in 690.65(B)(5)(a) or 690.65(B)(5)(b)
(a) Where connected at other than the opposite (farthest) end of the busbar from the feeder or service, the sum of all overcurrent devices supplying the busbar or conductor shall not exceed the rating of the busbar or conductor, except in dwelling unit installations where the sum of all overcurrent devices supplying the busbar or conductor shall not exceed 120 percent of the busbar or conductor rating.
(b) Where connected at the opposite (farthest) end of the busbar from the feeder or service, the sum of ampere rating of the backfed PV supply overcurrent /disconnect device(s) shall not exceed the rating of the busbar or conductor. The following permanent plaque shall be installed at the PV supply connection or circuit breaker location:

WARNING: THIS PV SUPPLY CONNECTION MUST REMAIN CONNECTED OR INSTALLED AT THIS LOCATION, WHICH IS FARTHEST FROM THE FEEDER OR SERVICE CONNECTION.

Panel Statement: The panel placed existing and revised proposed language in 690.64(B) to meet the intent of the proposal and fit into the new formatting for Section 690.64(B).
Number Eligible to Vote: 17
Ballot Results: Affirmative: 14 Negative: 2
Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

HORNBERGER, B.: This rewording of 690.64(B) will permit the sum of the overcurrent devices supplying current to a bus or conductor to exceed the ampacity rating of the bus or conductor by 200%. If the bus or conductor is not sized for the loads served, in accordance with article 220, an overload condition may exist on the bus or conductor that would not be detected by any of the overcurrent devices supplying current to the system. In addition, this is a "generic" requirement for utility interactive inverters and not specifically a photovoltaic system issue. Please see recommended rewording as part of my comment on 13-184 to incorporate a reference to article 220 and move the text to article 705.

NASBY, J.: NEMA is voting negative on the panel action for the following reasons:

1) The FPN proposed in 690.64(B)(4) is misleading and actually creates more confusion relative to what circuit breakers can be backfed. In reality, the main text of 690.64(B)(4) is incorrect in that circuit breakers that are suitable for backfeeding are not required to have any additional identification. Those circuit breakers that are identified with "Line" and "Load" markings are not suitable for backfeeding. Thus, the FPN is incorrect because the "Line" and "Load" markings are actually identification that the circuit breaker is not suitable for backfeeding.

To correct the confusion, the panel should delete the first sentence of 690.64(B)(4), delete the FPN and add a new last sentence to the main paragraph that states "Circuit breakers with "Line" and "Load" markings are not suitable for backfeeding.

2) The new text in 690.64(B)(5)(b) is not proper and can lead to overloading of the panelboard. The text implies that that you can have a feeder/service supply that is rated the full ampere rating of the panelboard and also have a backfed PV supply overcurrent device that is also rated the full ampere rating of the panelboard. This will allow the panelboard to be overloaded and circumvents the basic rule in Article 408 that a lighting and appliance branch circuit panelboard be provided with protection that does not exceed the rating of the panelboard. There is not justification to allow a panelboard applied in a PV application to be misapplied in this manner and be subjected to possible overloading.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment. This is to address some concerns by an inspector that have developed after the CMP meetings. There are some concerns about thermal overloading of a panel board with power being fed from both ends. This does not appear to be a problem that comes out of additional power being available, but by marginal designs of the panel boards, the circuit breakers and the like. Some have argued that panel boards will overheat and cause plastic failures or nuisance trips when loads are increased. It seems the increase in loads will cause nuisance trips or overheating regardless if more energy is available. The question in the case of increased loads is "will the main breaker trip or will a branch breaker trip from overcurrent or overtemperature?" Increasing the loads on panel boards, especially those that are running hot or of marginal design, likely will require new load calculations that will determine if a new panel board is needed. At this point in time, I see no reason why the additional source of power, in itself presents a problem.

SWAYNE, R.: The Panel Statement should indicate that this Panel Action includes proposed changes in Proposals 13-66, 13-67, and 13-68.

13-61a Log #CP1302 NEC-P13 **Final Action: Accept**
(690.64(B)(1) Exception)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal so that the text is in accordance with the NEC Style Manual, and the Panel clarify the Panel Action on this Proposal by adding the word "and" following the end of requirement (d), and commas after requirements (a) through (d) rather than periods.

This action will be considered by the Panel as a Public Comment.

Submitter: Code-Making Panel 13,

Recommendation: Add the following exception after 690.64(B)(1).

Exception: The output of a utility interactive inverter may be connected to a dedicated branch circuit serving permanently connected loads provided:

(a) a load overcurrent protection device is installed to limit the available current to the load(s).

(b) coordination for the load overcurrent device meets the requirements of 240.12.

(c) the line terminals of the load overcurrent device are rated for the combined current of the branch circuit overcurrent device and the utility interactive inverter

(d) the branch circuit disconnect device is marked according to 690.14(C)(2).

(e) the load(s) are connected between the utility interactive inverter and the branch circuit overcurrent device.

Substantiation: This proposal resulted from a concept presented Proposal 13-63. However, the focus of that proposal was cord-connected inverters which are not allowed. The Panel developed this text to make the concept permissible.

Additional text may be required if Proposal 13-64 is accepted; the branch circuit breaker may have to be moved to the opposite end of the panel bus from the utility feed, e.g.,

(f) the branch overcurrent device shall be located according to (690.64(8)(2)).

Panel Meeting Action: Accept

Number Eligible to Vote: 17

Ballot Results: Affirmative: 14 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

HORNBERGER, B.: This proposal should be rejected. Sources of electrical power to a premise must be connected through a dedicated switch/fuse or circuit breaker at a panel board, to properly manage branch circuit overcurrent protection and for the proper qualified person to control all sources of energy.

STAFFORD, T.: Panel action taken on proposal 13-63 specified why the connection to branch circuits is not allowed. See panel action taken on Proposal 13-63. The same branch circuit connect issues for plug and cord connected inverters apply to permanently installed connections as well.

13-62 Log #2469 NEC-P13 **Final Action: Reject**
(690.64(B)(1) Exception (New))

Submitter: David Zinck, Newburyport Wiring Inspector

Recommendation: Add the following exception:

Exception 1: For A/C modules listed to be cord connected, the point of connection shall be permitted to be by way of a weatherproof receptacle. The receptacle shall be supplied by a separate circuit of equal or greater rating than the A/C module output with a cover complying with 406.8(B), and shall be of the locking type.

Substantiation: A/C modules are currently being installed across the country with direct connections to panelboards through backfed circuit breakers as per 690.64(B)5. One company has had its product tested and listed as a cord connected unit. It was tested by ITS to UL standards (Report #3073899). There are two units available; 1-480W (120 volt) and 1 - 960W (240 Volt). The units work equally well on groundfault protected or non-groundfault protected circuits. Upon loss of normal power either due to power failure or a ground fault tripping, the A/C Module output stops in a couple of milliseconds.

These low wattage units are designed for the residential market. There is no compromise in safety to allow this cord and plug set up to be used as a disconnect as the code allows in other areas. By allowing the twistlock receptacle to be used as a disconnect, the homeowner can have an electrician install the receptacle, then purchase and set up these units themselves.

Many states across the nation have set initiatives for the advancement of "Green" energy. There is a national initiative to have 17 percent of all electricity produced by "green" sources by 2030. I field questions all year long from citizens who want to explore solar and other environmentally friendly sources. I believe units like these are a way to get people involved on a grass roots level with clean power and will help to swell support for things like windmills, trash-to-energy power plants, underwater (tidal and river) production and the like.

Panel Meeting Action: Reject

Panel Statement: Plug and receptacle connections for interconnected power systems would encourage connection of these devices into premise branch circuits. Such a connection may result in overloading a section of the circuit, as the circuit's overcurrent protective device will not see the total current flowing in the circuit. Additionally, UL 1741 requires permanent connections.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-63 Log #2470 NEC-P13 **Final Action: Reject**
(690.64(B)(1) Exception No. 2 (New))

Submitter: David Zinck, Newburyport Wiring Inspector

Recommendation: Add the following exception:

Exception 2: For A/C modules listed to be cord connected, the point of connection shall be permitted to be made to the load side of a disconnect for an exterior appliance (such as an air conditioner condenser) which is fed by a separate circuit.

Substantiation: A/C modules are currently being installed across the country with direct connections to panelboards through backfed circuit breakers as per 690.64(B)5. One company has had its product tested and listed as a cord connected unit. It was tested by ITS to UL standards (Report #3073899). There are two units available; 480W (120 volt) and 960W (240 Volt). The units work equally well on groundfault protected or non-groundfault protected circuits. Upon loss of normal power either due to power failure or the shutting off the disconnect, the A/C output from the A/C Module stops in a couple of milliseconds.

These low wattage units are designed for the residential market. Air conditioning condensers are already separate circuits from a dedicated circuit breaker. To require a separate feed from a circuit breaker to another disconnect just for the A/C Module is redundant and a burden to the customer. By allowing this connection at the condenser disconnect, the disconnect will serve two purposes; the required disconnecting means for the condenser, the disconnecting means for the A/C module. Also, these solar panels will be putting out their peak power at the time that the home uses its peak air conditioning so essentially it just helps supplement the power consumed.

Many states across the nation have set initiatives for the advancement of "Green" energy. There is a national initiative to have 17 percent of all electricity produced by "Green" energy. There is a national initiative to have 17 percent of all electricity produced by "green" sources by 2030. I field questions all year long from citizens who want to explore solar and other environmentally friendly sources. I believe units like these A/C modules are an affordable way to get people involved on a grass roots level with clean power and will help swell support for things like windmills, trash-to-energy power plants, underwater (tidal and river) production, large scale solar arrays and the like.

Panel Meeting Action: Reject

Panel Statement: Interconnection of a PV system on a branch circuit will allow an overcurrent to occur without tripping the branch overcurrent protection device. Power sources shall be brought back to the service panel for distribution through the premise wiring. The cord and plug connection is not allowed per Section 400.8.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-64 Log #2097 NEC-P13 **Final Action: Accept in Principle**
(690.64(B)(2))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section as follows:

690.64(B)(2) ~~The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor.~~

~~*Exception: For a dwelling unit, the sum of the ampere ratings of overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.*~~

The ampere rating of the backfed PV supply overcurrent /disconnect device shall not exceed the rating of the busbar or conductor when, and only when, the busbar or conductor has the feeder or service connected to only one end.

When the busbar or conductor is not end-fed, the sum of all overcurrent devices supplying the busbar or conductor shall not exceed the rating of the busbar or conductor except in dwelling unit installations where the sum of all overcurrent devices supplying the busbar or conductor shall not exceed 120 percent of the busbar or conductor rating.

Substantiation: The changes proposed for 690.64(B)(2), 690.64(B)(4), and 690.64(B)(6) will clarify the interconnection requirements and make the code requirements for residential (dwelling unit) and commercial installations similar and more easily installed and inspected. The proposal for 690.64(B)(2) establishes the requirement that will limit the PV supply overcurrent devices to a value that is not greater than the rating of the busbar or the conductor. This requirement only applies when that busbar or conductor is fed from one end and would not apply to center fed busbars or busbars or conductors fed from some intermediate point

When a busbar or conductor is fed from one end and a PV system feeds it from the farthest end (the opposite end) as required by the new proposal for 690.64(B)(6), there is no place on the busbar or conductor where any loads may be connected that can draw current from either source that can overload any portion of the busbar. From any point on the busbar or conductor, currents up to the busbar rating may be supplied from either the utility source or the PV source or both. However, the overcurrent devices for each of these sources are limited to the busbar rating and will prevent the busbar between either source and the load from being overloaded

The second paragraph merges the exception into the code text, essentially repeats the existing code, and continues the existing requirements when the busbar is not end fed. All other requirements established by (1) and (3)-(6) will also apply to this situation.

Panel Meeting Action: Accept in Principle

Panel Statement: The intent of this proposal has been met by the changes made in the panel action on Proposal 13-61.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

HORNBERGER, B.: Please see my Negative vote comment on 13-61.

13-65 Log #2562 NEC-P13 **Final Action: Accept in Principle**
(690.64(B)(2) Exception No. 2 (New))

Submitter: James Bing, New Energy Options, Inc.

Recommendation: Add new text as follows:

690.64(B)(2)

Exception 2: For other than dwelling units, for utility-interactive inverters that are not capable of dispatching stored energy from external batteries, generators, flywheels or sources other than photovoltaic arrays, and where the existing loads on the feeder or service supplying the busbar or conductor do not exceed 80 percent of the busbar rating as calculated in 220.87, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.

Substantiation: It is common practice, when designing building electrical distribution, to size the service disconnect means and feeder overcurrent protection at the same level as the ampere rating of the switchgear, panelboards and load centers that they supply. For this reason photovoltaic systems designed for existing commercial and industrial buildings, even if small compared to the size of the building service, are prohibited from being installed without major upgrades to building distribution. This new exception assures the safety of busbars and conductors in switchgear, panelboards and load centers from overloading in two ways. It uses 220.87, Optional Calculations for Determining Existing Loads, to first determine that the maximum demand upon an existing installed busbar or conductor has not exceeded 80 percent of its rating. And second, it limits the exception to only those inverters that are only capable of being supplied by photovoltaic arrays. The power output of a photovoltaic array is by nature a varying, non-periodic source, and is always zero between dusk and dawn. These types of inverters are not capable of dispatching stored energy at a predefined time, thus further decreasing the possibility of overloading the busbar due to coincidence of maximum loads and added capacity from a parallel source supplying the busbar.

Panel Meeting Action: Accept in Principle

Panel Statement: The intent of this proposal has been met by the changes made in the panel action on Proposal 13-61.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-66 Log #2079 NEC-P13 **Final Action: Accept in Principle**
(690.64(B)(3))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the Exception as follows:

Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources. All ground-fault protection devices used with supplies connected to the load-side terminals shall be identified and listed as suitable for backfeeding.

Substantiation: To comply with the first sentence of the exception, some sort of ground-fault equipment must be connected to the output of the utility-interactive inverter. Any such equipment will be backfed by the inverter when it is processing power. Additionally, the existing main ground-fault protection device between the utility service or feeder may be subject to backfeeding. Therefore, the second sentence is required to ensure that all ground-fault devices that may have load-side connections to possible sources are suitable (identified and listed) for backfeeding.

Ground-fault protection devices (5 ma sensing GFCI 15-20 amp circuit breakers, 30 ma sensing 15-60 amp equipment protection breakers, and 15-200 amp feeder protection equipment), will generally be damaged if tripped by a ground fault while being backfed. This damage will disable the ground-fault protection mechanism of the device while still allowing normal operation (circuit breaker operation and current flow). This damage has been confirmed by testing the smaller devices at the Southwest Technology Development Institute and Sandia National Laboratories and by information obtained from manufacturers of the larger equipment. The damage may not be visible or obvious. Ground-fault protection equipment should never be backfed unless the equipment is specifically designed, identified, and listed to allow backfeeding.

Panel Meeting Action: Accept in Principle

Panel Statement: The intent of this proposal has been met by the changes made in the panel action on Proposal 13-61.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-67 Log #2098 NEC-P13 **Final Action: Accept in Principle**
(690.64(B)(4))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section and delete the exception as follows:

~~Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.~~

~~*Exception: Equipment with power supplied from a single point of connection.*~~

690.64(B)(4) Equipment containing more than one circuit supplying power to a busbar or conductor shall be marked at the overcurrent device for each supply. The following permanent plaque shall be installed at the PV supply connection or circuit breaker location.

WARNING: THIS PV SUPPLY CONNECTION MUST REMAIN CONNECTED OR INSTALLED AT THIS LOCATION, WHICH IS FARTHEST FROM THE FEEDER OR SERVICE CONNECTION.

Substantiation: The changes proposed for 690.64(B)(2), 690.64(B)(4), and 690.64(B)(6) will clarify the interconnection requirements and make the code requirements for residential (dwelling unit) and commercial installations similar and more easily installed and inspected. Section 690.64(B)(2) establishes the requirement that will limit the PV supply overcurrent device(s) to a value that is not greater than the rating of the busbar or the conductor. This requirement only applies when that busbar or conductor is fed from one end and would not apply to center-fed busbars or busbars or conductors fed from some intermediate point.

When a busbar or conductor is fed from one end and a PV system feeds it from the farthest end (the opposite end) as required by the new proposal for 690.64(B)(6), there is no place on the busbar or conductor where any loads may be connected that can draw current from either source that can overload any portion of the busbar. From any point on the busbar or conductor, currents up to the busbar rating may be supplied from either the utility source or the PV source or both. However, the overcurrent devices for each of these sources are limited to the busbar rating and will prevent the busbar between either source and the load from being overloaded. The exception has been merged into the wording of the revised text.

The permanent plaque required by this proposal will ensure that the PV supply connection or breaker location will not be moved.

Panel Meeting Action: Accept in Principle

Panel Statement: The intent of this proposal has been met by the changes made in the panel action on Proposal 13-61.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-68 Log #2080 NEC-P13 **Final Action: Accept in Principle**
(690.64(B)(5))

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Revise the section and add the Fine Print Note as follows:

(5) Circuit breakers, if backfed, shall be identified for such operation. Dedicated circuit breakers backfed from listed utility-interactive inverters complying with 690.60 shall not be required to be individually clamped to the panelboard busbars. A front panel shall clamp all circuit breakers to the panelboard busbars. Main circuit breakers connected directly to energized feeders shall ~~also~~ be individually clamped.

FPN. Circuit breakers that are not marked “Line” and “Load” are identified as suitable for backfeeding.

Substantiation: The inclusion of the word “also” is grammatically incorrect. There is no antecedent.

UL Standard 489 is the reference for testing and marking molded-case circuit breakers suitable for backfeeding. The limited distribution of the standard and the allowance for backfeeding based on the absence of a marking is resulting in many circuit breakers being used improperly for backfeeding. Conversely, the absence of the marking causes many inspectors to not allow backfed circuit breakers. Also see the *UL Marking Guide for Molded Case Circuit Breakers.*

Panel Meeting Action: Accept in Principle

Panel Statement: The intent of this proposal has been met by the changes made in the panel action on Proposal 13-61.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

13-69 Log #2099 NEC-P13 **Final Action: Accept in Principle**
(690.64(B)(6) (New))

TCC Action: The Technical Correlating Committee understands that the Action on this Proposal modifies the Panel Action on Proposal 13-61.

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Add the new section as follows:

690.64(B)(6) The PV supply overcurrent/disconnect device shall be installed in a panel board or connected to a conductor at the location farthest from the feeder or service connection.

Substantiation: The changes proposed for 690.64(B)(2), 690.64(B)(4), and 690.64(B)(6) will clarify the interconnection requirements and make the code requirements for residential (dwelling unit) and commercial installations similar and more easily installed and inspected. Section 690.64(B)(2) establishes the requirement that will limit the PV supply overcurrent device(s) to a value that is not greater than the rating of the busbar or the conductor. This requirement only applies when that busbar or conductor is fed from one end and would not apply to center-fed busbars or busbars or conductors fed from some intermediate point.

When a busbar or conductor is fed from one end and a PV system feeds it from the farthest end (the opposite end) as required by the new proposal for 690.64(B)(6), there is no place on the busbar or conductor where any loads may be connected that can draw current from either source that can overload any portion of the busbar. From any point on the busbar or conductor, currents up to the busbar rating may be supplied from either the utility source or the PV source or both. However, the overcurrent devices for each of these sources are limited to the busbar rating and will prevent the busbar between either source and the load from being overloaded.

This proposal establishes the location of the PV Supply connection or overcurrent device (typically a circuit breaker in a panel board).

Panel Meeting Action: Accept in Principle

Revise last sentence of 690.64(B) to read

“....provided that either condition (1) or all of conditions (2) through (6) are met.”

Add a new number (1) to 690.64(B) to read as follows:

690.64(B)(1) The PV supply overcurrent/disconnect device shall be installed in a panelboard and positioned farthest from the feeder or service connection.

Renumber existing (1) through (5) to (2) through (6).

Panel Statement: The panel agrees with the intent of the proposal but has revised it as a separate list of items to clarify the language.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 14 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

HORNBERGER, B.: Please see my Negative vote comment on 13-61.

STAFFORD, T.: The panel action should have been to include the wording “farthest electrically” from the feeder or service connection. The intent of the panel was to provide the best location to add overcurrent protective devices in a panel board such that the maximum protection would be obtained. This is accomplished by placing the device the furthest electrically from feeder and service connections.

13-70 Log #2062 NEC-P13 **Final Action: Accept in Principle**
(690.74)

Submitter: John C. Wiles, Southwest Technology Development Institute, New Mexico State University / Rep. PV Industry Forum

Recommendation: Add the following second paragraph to the section:

Flexible, fine-stranded cables shall only be used with terminals, lugs, and connectors that are listed and marked for such use.

Substantiation: PV installations with batteries frequently use flexible, fine-stranded cables for ease of installation. These cables are nearly always installed with terminals that are not listed for use with the cable.

UL Standard 486 A and B requires that connectors, lugs, and terminals that are intended for use with flexible, fine-stranded cables be so marked for use with such cables. Very few connectors and terminals have been listed for such use, and few are so marked. The vast majority of connectors, lugs, and terminals are unsuitable for use with flexible, fine-stranded cables. However, the limited distribution and wording of the standard has resulted in flexible, fine-stranded cables being used improperly with these non-marked connectors, lugs, and terminals. Failures in several widely different industries have been reported.

A similar proposal has been submitted for 110.14(A).

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Revise the text by adding the word “devices” after “lugs”

Panel Statement: The panel added the word “devices”, as there may be other devices that are listed for the purpose.

Number Eligible to Vote: 17

Ballot Results: Affirmative: 15 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

NASBY, J.: See my explanation of negative vote on Proposal 13-40.

ARTICLE 692 — FUEL CELL SYSTEMS

13-71 Log #2578 NEC-P13 **Final Action: Accept in Principle**
(692)

Submitter: Timothy M. Croushore, Allegheny Power

Recommendation:

Revise text to read as follows:

ARTICLE 692 Fuel Cell Systems

I. General

692.1 Scope.

This article identifies the requirements for the installation of fuel cell power systems, which ~~may be~~ are either stand-alone or interactive with other electrical power production and distribution network sources ~~and may be~~ with or without electrical energy storage such as batteries. These systems may have ac or dc output for utilization.

692.2 Definitions.

Fuel Cell. An electrochemical system that consumes fuel to produce an electric current. The main chemical reaction used in a fuel cell for producing electric power is not combustion. However, there may be sources of combustion used within the overall fuel cell system such as reformers/fuel processors.

Fuel Cell System. The complete aggregate of equipment used to convert chemical fuel into usable electricity. A fuel cell system typically consists of a reformer, stack, power inverter, and auxiliary equipment.

~~**Interactive System.** A fuel cell system that operates in parallel with and may deliver power to an electrical production and distribution network. For the purpose of this definition, an energy storage subsystem of a fuel cell system, such as a battery, is not another electrical production source.~~

~~**Maximum System Voltage.**~~ The highest fuel cell inverter output voltage between any ungrounded conductors present at accessible output terminals.

Output Circuit. The conductors used to connect the fuel cell system to its electrical point of delivery. In the case of sites that have series- or parallel-connected multiple units, the term *output circuit* also refers to the conductors used to electrically interconnect the fuel cell system(s).

~~**Point of Common Coupling.** The point at which the power production and distribution network and the customer interface occurs in an interactive system. Typically, this is the load side of the power network meter.~~

~~**Stand-Alone System.**~~ A fuel cell system that supplies power independently of an electrical production and distribution network.

692.3 Other Articles.

Wherever the requirements of other articles of this *Code* and Article 692 differ, the requirements of Article 692 shall apply. ~~and, if the system is operated in parallel with a primary source(s) of electricity, the requirements in 705.14, 705.16, 705.32, and 705.43 shall apply~~<u>Fuel Cell systems that are interactive with other electrical power production sources shall follow the requirements of Article 705.</u>

692.4 Installation.

(A) Fuel Cell System. A fuel cell system shall be permitted to supply a building or other structure in addition to any service(s) of another electricity supply system(s).

(B) Identification. A permanent plaque or directory, denoting all electrical power sources on or in the premises, shall be installed at each service equipment location.

692.6 Listing Requirement.

The fuel cell system shall be evaluated and listed for its intended application prior to installation.

II. Circuit Requirements

692.8 Circuit Sizing and Current.

(A) Nameplate Rated Circuit Current. The nameplate(s) rated circuit current shall be the rated current indicated on the fuel cell nameplate(s).

(B) Conductor Ampacity and Overcurrent Device Ratings. The ampacity of the feeder circuit conductors from the fuel cell system(s) to the premises wiring system shall not be less than the greater of (1) nameplate(s) rated circuit current or (2) the rating of the fuel cell system(s) overcurrent protective device(s).

(C) Ampacity of Grounded or Neutral Conductor. If an interactive single-phase, 2-wire fuel cell output(s) is connected to the grounded or neutral conductor and a single ungrounded conductor of a 3-wire system or of a 3-phase, 4-wire wye-connected system, the maximum unbalanced neutral load current plus the fuel cell system(s) output rating shall not exceed the ampacity of the grounded or neutral conductor.

692.9 Overcurrent Protection.

(A) Circuits and Equipment. If the fuel cell system is provided with overcurrent protection sufficient to protect the circuit conductors that supply the load, additional circuit overcurrent devices shall not be required. Equipment and conductors connected to more than one electrical source shall be protected.

(B) Accessibility. Overcurrent devices shall be readily accessible.

692.10 Stand-Alone Systems.

The premises wiring system shall meet the requirements of this *Code* except as modified by 692.10(A), (B), and (C).

(A) Fuel Cell System Output. The fuel cell system output from a stand-alone system shall be permitted to supply ac power to the building or structure disconnecting means at current levels below the rating of that disconnecting means.

(B) Sizing and Protection. The circuit conductors between the fuel cell system(s) output and the building or structure disconnecting means shall be sized based on the output rating of the fuel cell system(s). These conductors shall be protected from overcurrents in accordance with 240.4. The overcurrent protection shall be located at the output of the fuel cell system(s).

(C) Single 120-Volt Nominal Supply. The inverter output of a stand-alone fuel cell system shall be permitted to supply 120 volts, nominal, to single-phase, 3-wire 120/240-volt service equipment or distribution panels where there are no 240-volt loads and where there are no multiwire branch circuits. In all installations, the rating of the overcurrent device connected to the output of the fuel cell system(s) shall be less than the rating of the service equipment. This equipment shall be marked as follows:

WARNING
SINGLE 120-VOLT SUPPLY.
DO NOT CONNECT MULTIWIRE
BRANCH CIRCUITS!

III. Disconnecting Means

692.13 All Conductors.

Means shall be provided to disconnect all current-carrying conductors of a fuel cell system power source from all other conductors in a building or other structure.

692.14 Provisions.

The provisions of 225.31 and 225.33 through 225.40 shall apply to the fuel cell source disconnecting means. The disconnecting means shall not be required to be suitable as service equipment and shall be rated in accordance with 692.17.

692.17 Switch or Circuit Breaker.

The disconnecting means for ungrounded conductors shall consist of readily accessible, manually operable switch(es) or circuit breaker(s).

Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and shall have the following words or equivalent:

DANGER
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS.
TERMINALS ON BOTH THE LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION.

IV. Wiring Methods

692.31 Wiring Systems.

All raceway and cable wiring methods included in Chapter <u>3</u> of this *Code* and other wiring systems and fittings specifically intended and identified for use with fuel cell systems shall be permitted. Where wiring devices with integral enclosures are used, sufficient length of cable shall be provided to facilitate replacement.

V. Grounding

692.41 System Grounding.

For a fuel cell system output circuit, one conductor of a 2-wire system rated over 50 volts and a neutral conductor of a 3-wire system shall be solidly grounded by either 692.41(A) or 692.41(B).

(A) Stand-Alone Systems. Grounding and bonding shall be in accordance with 250.30.

(B) Other Than Stand-Alone Systems.

(1) Two-Wire Systems. One conductor shall be terminated at the grounded circuit conductor terminal of the premises wiring system.

(2) Three-Wire Systems. The neutral conductor shall be terminated at the grounded circuit conductor terminal of the premises wiring system.

692.44 Equipment Grounding Conductor.

A separate equipment grounding conductor shall be installed.

692.45 Size of Equipment Grounding Conductor.

The equipment grounding conductor shall be sized in accordance with 250.122.

692.47 Grounding Electrode System.

Any supplementary grounding electrode(s) required by the manufacturer shall be connected to the equipment grounding conductor specified in 250.118.

VI. Marking

692.53 Fuel Cell Power Sources.

A marking specifying the fuel cell system, output voltage, output power rating, and continuous output current rating shall be provided at the disconnecting means for the fuel cell power source at an accessible location on the site.

692.54 Fuel Shut-Off.

The location of the manual fuel shut-off valve shall be marked at the location of the primary disconnecting means of the building or circuits supplied.

692.56 Stored Energy.

A fuel cell system that stores electrical energy shall require the following warning sign, or equivalent, at the location of the service disconnecting means of the premises:

WARNING
FUEL CELL POWER SYSTEM CONTAINS
ELECTRICAL ENERGY STORAGE DEVICES.

VII. Connection to Other Circuits

692.59 Transfer Switch.

A transfer switch shall be required in non–grid-interactive systems that use utility grid backup. The transfer switch shall maintain isolation between the electrical production and distribution network and the fuel cell system. The transfer switch shall be permitted to be located externally or internally to the fuel cell system unit. When the utility service conductors of the structure are connected to the transfer switch, the switch shall comply with Article 230, Part V.

692.60 Identified Interactive Equipment.

Only fuel cell systems listed and identified as interactive shall be permitted in interactive systems.

692.61 Output Characteristics.

The output of a fuel cell system operating in parallel with an electric supply system shall be compatible with the voltage, wave shape, and frequency of the system to which it is connected.

FPN: The term *compatible* does not necessarily mean matching the primary source wave shape.

~~**692.62 Loss of Interactive System Power.**~~

~~The fuel cell system shall be provided with a means of detecting when the electrical production and distribution network has become de-energized and shall not feed the electrical production and distribution network side of the point of common coupling during this condition. The fuel cell system shall remain in that state until the electrical production and distribution network voltage has been restored.~~

~~A normally interactive fuel cell system shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.~~

~~**692.64 Unbalanced Interconnections.**~~

~~**(A) Single Phase.** Single-phase interactive fuel cell systems shall not be connected to a 3-phase power system unless the interactive system is so designed that significant unbalanced voltages cannot result.~~

~~**(B) Three Phase.** Three-phase interactive fuel cell systems shall have all phases automatically de-energized upon loss of voltage, or upon unbalance of voltage in one or more phases, unless the interactive system is designed so that significant unbalanced voltages will not result.~~

~~**692.65 Point of Connection.**~~

~~The output of a fuel cell system power source shall be connected as specified in 692.65(A) or 692.65(B).~~

~~**(A) Supply Side.** A fuel cell system power source shall be permitted to be connected to the supply side of the service disconnecting means as permitted in 230.82(6).~~

~~**(B) Load Side.** A fuel cell system power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises, provided that all of the following conditions are met:~~

~~(1) Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.~~

~~(2) The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor.~~

~~*Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.*~~

~~(3) The interconnection point shall be on the line side of all ground-fault protection equipment.~~

~~(4) Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.~~

~~(5) Equipment such as circuit breakers, if backfed, shall be identified for such operation.~~

~~(6) The circuit breaker on the dedicated output of a utility-interactive inverter shall be positioned in the distribution equipment at the opposite (load) end from the input feeder connection or main circuit location. A permanent warning label shall be applied to the distribution equipment with the following, or equivalent:~~

~~WARNING~~
~~FUEL CELL POWER SYSTEM OUTPUT.~~
~~DO NOT RELOCATE THIS CIRCUIT BREAKER.~~

VIII. Outputs Over 600 Volts

692.80 General.

Fuel cell systems with a maximum output voltage over 600 volts ac shall comply with the requirements of other articles applicable to such installations.

Substantiation: This proposal is part of 2 other proposals dealing with interconnecting electric power sources in Article 690, Article 692 and Article 705. This proposal is part of 3 other proposals to place common definitions in Article 100. The purpose of this proposal is to revise Article 692. This work incorporates the equipment that would be listed by Underwriters Laboratory Standard 1741 – Inverters, Converters and Controllers for Use in Independent Power Systems.

The figure in the substantiation section of this proposal shows the common wiring in building systems that should be covered by Article 705. It also shows technology specific wiring that would be covered by Articles 690 and 692. The main purpose of this proposal is to put all interconnection requirements in Article 705 and all technology specific issues in their respective articles.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Panel Statement: Refer to panel statement and action on Proposal 13-17.

The panel did not accept the change as recommended in this proposal. The panel concluded that this is a good idea and agreed to some of the recommended duplication of the interconnection issues in Article 705 (Proposal 13-184), but there was insufficient information provided as well as too little industry input to make the proposed change in Article 692. The panel has addressed elements of the issue in Proposal 13-184 (Article 705).

Number Eligible to Vote: 17

Ballot Results: Affirmative: 16

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment because I agree with the panel action to NOT accept the sweeping change as recommended in this proposal on Article 692. Further, I disagree with the recommended duplication of the interconnection issues in Article 705 (Proposal 17-184) as accepted, without a thorough industry-supported substantiation for each change. The impacts for each technology must be assessed. There was insufficient substantiation provided and little industry input to make the proposed change in Article 690, 692 OR in 705. I believe this change, as it was accepted in principle for Article 705, needs careful public and industry scrutiny.

HORNBERGER, B.: I agree with the panel action to accept in principle, however since the interconnection provisions have been incorporated in Article 705, the parallel redundant requirements for Fuel Cell utility interconnected power inverters should be removed from Article 692.

KRASTINS, K.: See my affirmative with comment on Proposal 13-17.

STAFFORD, T.: This Panel Member agrees with the intent of the submitter that all of the interconnection issues should be addressed in a single article of the NEC. The action taken by the panel is welcomed as a first step to determine a uniform acceptance of interconnection issues within the NEC.

13-72 Log #2857 NEC-P13 **Final Action: Accept**
(692.41)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal that the intent is to delete the existing text in 692.41 and 692.41(A) and (B) as it appears in the 2005 NEC and replace it with the text in this proposal.

This action will be considered by the Panel as a Public Comment.

Submitter: Kenneth Krastins, Plug Power, Inc. / Rep. US Fuel Cell Council
Recommendation: Replace all of 692.41 with the following:

692.41 System Grounding.

(A) AC Systems. Grounding of ac systems shall be in accordance with 250.20, and 250.30 for stand-alone systems.

(B) DC Systems. Grounding of dc systems shall be in accordance with 250.160.

Substantiation: The submitter recognizes that a similar proposal during the previous code cycle to add references in the NEC for dc grounding of fuel cell systems was rejected by CMP-13 on the basis that the NEC is not a training manual and that this information does already exist elsewhere in the Code. However, this proposal respectfully requests the panel to reconsider that decision based on the following. The 2005 revision to the Code added language to 692.1 indicating that Article 692 applies for fuel cells with both ac and dc outputs. Currently, however, the language under 692.41 pertains to ac outputs only. The language of 692.3 pertaining to other articles of the Code may cause AHJ's to consider that the grounding requirements and provisions provided in 250.160 may not be applicable because of the specific reference in 692.41 to 250.30 but having no such corresponding reference to 250.160 for dc systems.
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:

SWAYNE, R.: Although this proposal is Accepted, the Section is still incomplete. The Section needs to state that bonding of both ac and dc sides are necessary and that there shall be one grounding electrode for both ac and dc of the premises wiring system.

13-73 Log #3586 NEC-P13 **Final Action: Accept**
(692.41(C) (New))

Submitter: Robert H. Wills, Intergrid, LLC
Recommendation: Add a new section 692.41(C):

<u>(C) Systems with Alternating-Current and Direct Current Grounding Requirements.</u>

<u>When fuel cell power systems have both alternating-current (ac) and direct-current (dc) grounding requirements, the dc grounding system shall be bonded to the ac grounding system. The bonding conductor shall be sized according to 692.45. A single common grounding electrode and grounding bar may be used for both systems in which case the common grounding electrode conductor shall be sized to meet the requirements of both 250.66(ac) and 250.166(dc).</u>

Substantiation: The new section states that bonding between ac and dc grounding systems is required, and that a single grounding electrode and grounding electrode conductor can be used.

The intent of bonding is to hold both ground systems and all equipment, whether ac or dc, at the same potential. As fault current does not run through this bond (the ac and dc grounding systems are separate), a conductor sized the same as an equipment grounding conductor is sufficient to meet this intent. The bonding conductor between the ac and dc grounding systems should not be confused with main or system bonding conductors that are required to carry full fault currents. Both the ac and dc grounding systems will have bonds from the ground system to their respective grounded conductors that are required to be sized according to 250.66(ac) and 250.166(dc).
Panel Meeting Action: Accept
Number Eligible to Vote: 17
Ballot Results: Affirmative: 16
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:

SWAYNE, R.: See Affirmative Comment to Proposal 13-72.

13-74 Log #2855 NEC-P13 **Final Action: Accept in Principle**
(692.65(B)(2))

Submitter: Kenneth Krastins, Plug Power, Inc. / Rep. US Fuel Cell Council
Recommendation: Replace all of 692.65(B)(2), including the exception of that clause, with the following:

The sum of the ampere ratings of overcurrent devices of the utility-interactive inverters supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor.

Substantiation: Interpretations by AHJs of the current wording could lead to needlessly requiring upgrades of the service panel whenever a fuel cell system is installed. This proposed wording, taken in conjunction with the existing requirement of 692.65(B)(6), provides language for safely implementing the requirement without misinterpretation. Because of the greater clarity provided by this language, the need for the exception is obviated, and thus this submittal also recommends removal of the exception.
Panel Meeting Action: Accept in Principle

Revise entire 692.65 to read as follows:

692.65 Utility-Interactive Point of Connection. The output of a utility-interactive inverter shall be connected as specified in 692.65(A) or 692.65(B).

(A) Supply Side. A utility-interactive inverter shall be permitted to be connected to the supply side of the service disconnecting means as permitted in 230.82(6).

(B) Load Side. A utility-interactive inverter shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises, provided that all of the following conditions of 692.65(B)(1) through 692.65(B)(5) are met:

(1) Dedicated Overcurrent and Disconnect. Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.

(2) Ground Fault Protection. The interconnection point shall be on the line side of all ground-fault protection equipment.

(3) Marking. Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.

(4) Suitable for Back Feed. Equipment such as circuit breakers, if backfed, shall be identified for such operation.

(5) Bus or Conductor Rating. The rating of the bus or conductor to which the utility-interactive inverter breaker or fusible disconnect is connected shall meet all of the conditions in 692.65(B)(5)(a) or 692.65(B)(5)(b).

(a) End Feed Connection. Where the utility-interactive inverter breaker or fusible disconnect is connected in the distribution equipment at the opposite (load) end from the input feeder connection or main circuit location, the bus or conductor rating shall be equal to or larger than the sum of the ampere ratings of all overcurrent devices connecting premise electric power production sources to the bus or conductor. A permanent warning label shall be applied to the distribution equipment with the following or equivalent:

WARNING
ELECTRIC POWER PRODUCTION SOURCE OUTPUT
DO NOT RELOCATE THIS OVERCURRENT DEVICE.

(b) General Connection. Where the utility-interactive inverter breaker or fusible disconnect is not end fed, the bus or conductor rating shall be equal to or larger than the sum of the ampere ratings of overcurrent devices in circuits supplying power to the busbar or conductor.

Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.

Panel Statement: The panel action should satisfy the intent of the submitter.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 14 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

HORNBERGER, B.: This rewording of 692.65 will permit the sum of the overcurrent devices supplying current to a bus or conductor to exceed the ampacity rating of the bus or conductor by 200%. If the bus or conductor is not sized for the loads served, in accordance with article 220, an overload condition may exist on the bus or conductor that would not be detected by any of the overcurrent devices supplying current to the system. In addition, this is a "generic" requirement for utility interactive inverters and not specifically a photovoltaic system issue. Please see recommended rewording as part of my comment on 13-184 to incorporate a reference to article 220 and move the text to article 705.

STAFFORD, T.: The action taken by the panel was not consistent with the intent of the submitter. The submitter's intent was to replace all of 692.65(B)(2), including the exception, with the following: The sum of the ampere ratings of overcurrent devices of the utility-interactive inverters supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor. The panel action was to completely rewrite 692.65. The action taken at the Panel level does not reflect accurate intentions of the submitted proposal.
Comment on Affirmative:

BOWER, W.: I vote affirmative with comment to address some concerns that have developed after the CMP meetings. There have been concerns about thermal overloading of a panel board with power being fed from both ends. This does not appear to be a problem that comes out of additional power being available, but by marginal designs of the panel boards, the circuit breakers and the like. Some have argued that panel boards will overheat and cause plastic failures or nuisance trips when loads are increased. It seems the increase in loads will cause nuisance trips regardless if more energy is available. The question in the case of increase loads is will the main breaker trip or will a branch breaker trip from overcurrent or overtemperature. Increasing the loads on panel boards, especially those that are running hot or of marginal design, likely will require new load calculations that will determine if a new panel board is needed. At this point in time, I see no reason why the additional source of power, in itself presents a problem.

13-75 Log #2853 NEC-P13 **Final Action: Accept in Principle**
(692.65(B)(3) Exception (New))

Submitter: Kenneth Krastins, Plug Power, Inc. / Rep. US Fuel Cell Council
Recommendation: Add an exception to read:

Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources. All ground-fault protection devices used with supplies connected to the load-side terminals shall be identified and listed as suitable for backfeeding.

Substantiation: This clause will then be consistent with the rewording of 690.64(B)(3) proposed by the Photovoltaics Industry Forum.
Panel Meeting Action: Accept in Principle

Accept tge exception as proposed but relocate the text to 692.65(B)(2).

Panel Statement: Relocating the text is necessary to make it consistent with the action taken on Proposal 13-74.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 14 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

HORNBERGER, B.: Please see my negative vote comment on 13-74.

STAFFORD, T.: See my explanantion of negative vote on Proposal 13-74.

13-76 Log #2854 NEC-P13 **Final Action: Accept in Principle**
(692.65(B)(6))

Submitter: Kenneth Krastins, Plug Power, Inc. / Rep. US Fuel Cell Council
Recommendation: Pluralize the wording of 692.65(B)(6) to cover multiple fuel cells/inverters to read:

The circuit breaker s on the dedicated output s of ~~a~~ utility-interactive inverter s shall be positioned in the distribution equipment at the opposite (load) end from the input feeder connection or main circuit location. A permanent warning label shall be applied to the distribution equipment with the following, or equivalent: WARNING FUEL CELL POWER SYSTEM OUTPUT. DO NOT RELOCATE THIS BREAKER.

Substantiation: This will appropriately permit the connection of more than a single fuel cell (or other DG) system into a breaker panel while still retaining the safety provided by this clause.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel action on Proposal 13-74 should satisfy the intent of the submitter.
Number Eligible to Vote: 17
Ballot Results: Affirmative: 14 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

HORNBERGER, B.: Please see my negative vote comment on 13-74.

STAFFORD, T.: See my explanantion of negative vote on Proposal 13-74.

ARTICLE 695 — FIRE PUMPS

13-77 Log #2847 NEC-P13 **Final Action: Reject**
(695)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because of the number of technical inconsistencies, style manual issues, and the inclusion of material outside the scope and purpose of Article 695.

It was the action of the Techncial Correlating Committee that this proposal be reconsidered by the panel and that the panel limit the requirements to those within the scope of those necessary for a safe electrical installation. The Techncial Correlating Committee agrees with the negative commenters that much of the material added by the panel is inappropriate for the NEC. The panel should not attempt to recreate NFPA 20 in the NEC. In addition, the panel is directed to address the large number of style manual issues noted in Mr. Nasby's negative comment. This action shall be considered by the panel as a public comment.

Submitter: Dana R. Haagensen, Massachusetts Office of the State Fire Marshal
Recommendation: Revise extracted text from NFPA 20 to reflect 2006 edition revisions. Following is the NFPA 20 - Chapter 9 text as it has been voted on by the NFPA 20 Committee to date.

NFPA 20 - DRAFT

Chapter 9 Electric Drive for Pumps

9.1 General.

9.1.1 This chapter covers the minimum performance and testing requirements of the sources and transmission of electrical power to motors driving fire pumps.

9.1.2 Also covered are the minimum performance requirements of all intermediate equipment between the source(s) and the pump, including the motor(s) but excepting the electric fire pump controller, transfer switch, and accessories (see Chapter 10).

9.1.3 All electrical equipment and installation methods shall comply with NFPA 70, National Electrical Code, Article 695, and other applicable articles.

9.1.4* All power supplies shall be located and arranged to protect against damage by fire from within the premises and exposing hazards.

9.1.5 All power supplies shall have the capacity to run the fire pump on a continuous basis.

9.1.6 All power supplies shall comply with the voltage drop requirements of Section 9.7.

9.2 Normal Power.

9.2.1 An electric motor driven fire pump shall be provided with a normal source of power as a continually available source.

9.2.2 The normal source of power required in 9.2.1 and its routing shall be arranged in accordance with one of the following:

(1) Service connection dedicated to the fire pump installation.

(2) On-site power production facility connection dedicated to the fire pump installation.

(3) A dedicated feeder connection derived directly from the dedicated service to the fire pump installation.

(4) As a feeder connection where all of the following conditions are met:

a. The protected facility is part of a multi-building campus style arrangement.

b. A back-up source of power is provided from a source independent of the normal source of power.

c. It is impractical to supply the normal source of power through arrangement 9.2.2(1), 9.2.2(2), 9.2.2(3) or 9.2.2(5).

d. The arrangement is acceptable to the authority having jurisdiction.

e. The overcurrent protection device(s) in each disconnecting means shall be selectively coordinated with any other supply side overcurrent protective device(s).

(5) A dedicated transformer connection directly from the service meeting the requirements of Article 695 of NFPA 70.

9.2.3 For fire pump installations using the arrangement of 9.2.2(1), 9.2.2(2),9.2.2(3), 9.2.2(5) for the normal source of power, no more than one disconnecting means and associated overcurrent protection device shall be installed in the power supply to the fire pump controller.

9.2.3.1 Where the disconnecting means permitted by 9.2.3 is installed, the disconnecting means shall meet all of the following:

(1) Identified as being suitable for use as service equipment.

(2) Lockable in the closed position.

(3) * Located remote from other building disconnecting means.

(4) * Located remote from other fire pump source disconnecting means.

(5) Marked "Fire Pump Disconnecting Means" in letters that are no less than one inch (25 mm) in height and that can be seen without opening enclosure doors or covers.

9.2.3.2 Where the disconnecting means permitted by 9.2.3 is installed, a placard shall be placed adjacent to the fire pump controller stating the location of this disconnection means and the location of any key needed to unlock the disconnect.

9.2.3.3 Where the disconnecting means permitted by 9.2.3 is installed, the disconnect shall be supervised in the closed position by one of the following methods:

(1) Central station, proprietary or remote station signal device

(2) Local signaling service that will cause the sounding of an audible signal at a constantly attended location

(3) Locking the disconnecting means in the closed position

(4) Sealing of disconnecting means and approved weekly recorded inspections where the disconnecting means are located within fenced enclosures or in buildings under the control of the owner

9.2.3.4 Where the overcurrent protection permitted by 9.2.3 is installed, the overcurrent protection device shall be selected or set to carry indefinitely the sum of the locked-rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment.

9.3 Alternate power.

9.3.1 Except for an arrangement described in 9.3.3, at least one alternate source of power shall be provided when the height of the structure is beyond the pumping capacity of the fire department apparatus.

9.3.2* Except for an arrangement described in 9.3.3, at least one alternate source of power shall be provided where the normal source is not reliable.

9.3.3 An alternate source of power is not required where a back-up engine driven or back-up steam turbine driven fire pump is installed in accordance with this standard.

9.3.4 When provided, the alternate source of power shall be supplied from one of the following sources:

(1) A generator installed in accordance with Section 9.8.

(2) One of the sources identified in 9.2.2(1); 9.2.2(2); 9.2.2(3); or 9.2.2(5) when the power is provided independent of the normal source of power.

9.3.5 When provided, the alternate supply shall be arranged so that the power to the fire pump is not disrupted when overhead lines are de-energized for fire department operations.

9.4 Junction Boxes. Where fire pump wiring to or from a fire pump controller is routed through a junction box, the following requirements shall be met.

9.4.1 The junction box shall be securely mounted.

9.4.2* Mounting and installing of a junction box shall not violate the enclosure Type (NEMA) rating of the fire pump controller(s).

9.4.3* Mounting and installing of a junction box shall not violate the integrity of the fire pump controller(s) and shall not affect the Short Circuit Rating of the controller(s).

9.4.4 As a minimum, a National Electrical Manufacturers Association (NEMA) Type 2, dripproof enclosure (junction box) shall be used. The enclosure shall be listed f or the subject to match the fire pump controller enclosure Type rating.

9.4.5 Terminals, junction blocks, splices, and the like, when used, shall be listed.

9.5* Listed Electrical Circuit Protective System to Controller Wiring.

9.5.1* Where single conductors (individual conductors) are used, they shall be terminated in a separate junction box and in accordance with NFPA 70.

9.5.2 Single (individual conductors) shall not enter the fire pump enclosure separately.

9.5.3* Where required by the manufacturer of a listed Electrical Circuit Protective System or by NFPA 70 or by the Listing agency, the raceway between a junction box and the fire pump controller shall be sealed at the junction box end as required and per the instructions of the manufacturer or listing agency.

9.5.4 Standard wiring between junction box and controller is acceptable.

9.6* Raceway Terminations.

9.6.1 Listed conduit hubs shall be used to terminate raceway (conduit) to the fire pump controller.

9.6.2 The NEMA Type rating of the conduit hub(s) shall be at least equal to that of the fire pump controller.

9.6.3 The installation instructions of the manufacturer of the fire pump controller shall be followed.

9.6.4 No alterations to the fire pump controller, other than conduit entry as allowed by NFPA 70, shall be approved by the authority having jurisdiction.

9.7* Voltage Drop.

9.7.1 Unless the requirements of 9.4.2 are met, the voltage at the controller line terminals shall not drop more than 15 percent below normal (controller-rated voltage) under motor-starting conditions.

9.7.2 The requirements of 9.7.1 shall not apply to emergency run mechanical starting. (See 10.5.3.2.)

9.7.3 The voltage at the motor terminals shall not drop more than 5 percent below the voltage rating of the motor when the motor is operating at 115 percent of the full-load current rating of the motor.

9.8 Motors.

9.8.1 General.

9.8.1.1 All motors shall comply with NEMA MG-1, Motors and Generators, shall be marked as complying with NEMADesign B standards, and shall be specifically listed for fire pump service. (See Table 9.8.1.1.)

Table 9.8.1.1 Horsepower and Locked Rotor Current Motor Designation for NEMA Design B Motors

9.8.1.2 The requirements of 9.8.1.1 shall not apply to direct-current, high-voltage (over 600 V), large-horsepower [over 373 kW (500 hp)], single-phase, universal-type, or wound-rotor motors, which shall be permitted to be used where approved.

9.8.1.3 Motors used with variable speed controllers shall additionally meet the applicable requirements of NEMA MG1, Part 31 and shall be marked for inverter duty.

9.8.1.4* The corresponding values of locked rotor current for motors rated at other voltages shall be determined by multiplying the values shown by the ratio of 460 V to the rated voltage in Table 9.8.1.1.

9.8.1.5 Code letters of motors for all other voltages shall conform with those shown for 460 V in Table 9.8.1.1.

9.8.1.6 All motors shall be rated for continuous duty.

9.8.1.7 Electric motor–induced transients shall be coordinated with the provisions of 10.4.3.3 to prevent nuisance tripping of motor controller protective devices.

9.8.1.8 Motors for Vertical Shaft Turbine–Type Pumps.

9.8.1.8.1 Motors for vertical shaft turbine–type pumps shall be dripproof, squirrel-cage induction type.

9.8.1.8.2 The motor shall be equipped with a nonreverse ratchet.

9.8.2 Current Limits.

9.8.2.1 The motor capacity in horsepower shall be such that the maximum motor current in any phase under any condition of pump load and voltage unbalance shall not exceed the motor-rated full-load current multiplied by the service factor.

9.8.2.2 Where the motor is used with a variable speed pressure limiting controller, the service factor shall not be used.

9.8.2.3 The maximum service factor at which a motor shall be used is 1.15.

9.8.2.4 These service factors shall be in accordance with NEMA MG-1, Motors and Generators.

9.8.2.5 General-purpose (open and dripproof) motors, totally enclosed fan-cooled (TEFC) motors, and totally enclosed nonventilated (TENV) motors shall not have a service factor larger than 1.15.

9.8.2.6 Motors used at altitudes above 1000 m (3300 ft) shall be operated or derated according to NEMA MG-1, Motors and Generators, Part 14.

9.8.3 Marking.

9.8.3.1 Marking of motor terminals shall be in accordance with NEMA MG-1, Motors and Generators, Part 2.

9.8.3.2 A motor terminal connecting diagram for multiple lead motors shall be furnished by the motor manufacturer.

9.9 On-Site Standby Generator Systems.

9.9.1 Capacity.

9.9.1.1 Where on-site generator systems are used to supply power to fire pump motors to meet the requirements of 9.3.2, they shall be of sufficient capacity to allow normal starting and running of the motor(s) driving the fire pump(s) while supplying all other simultaneously operated load(s) while meeting the requirements of Section 9.7.

9.9.1.2 A tap ahead of the on-site generator disconnecting means shall not be required.

9.9.2* Power Sources.

9.9.2.1 These power sources shall comply with Section 9.7 and shall meet the requirements of Level 1, Type 10, Class X systems of NFPA 110, Standard for Emergency and Standby Power Systems.

9.9.2.2 The fuel supply capacity shall be sufficient to provide 8 hours of fire pump operation at 100 percent of the rated pump capacity in addition to the supply required for other demands.

9.9.3 Sequencing. Automatic sequencing of the fire pumps shall be permitted in accordance with 10.5.2.5.

9.9.4 Transfer of Power. Transfer of power to the fire pump controller between the normal supply and one alternate supply shall take place within the pump room.

9.9.5* Protective Devices. Where protective devices are installed in the on-site power source circuits at the generator, such devices shall allow instantaneous pickup of the full pump.

Substantiation: The requirements of NFPA 20 are being revised for the 2006 edition, and involves a reformatting of the NFPA 20, Chapter 9 requirements so that they are easier to understand (and easier to extract). The NFPA revision schedule for NFPA 20 was staggered with respect to NFPA 70 so that timely extracts could take place. The NFPA Standards Council has charged the NFPA 20 Technical Committee on Fire Pumps with developing requirements for the reliability and overall arrangement of power supplies for stationary fire pump installations.

Panel Meeting Action: Accept in Principle in Part

Revise portions of Article 695 to read as follows:

Proposal 13-77 -- Revised Numbering

From NFPA-20-2006 Chapter 9 to NFPA-70-2008 Article 695

695.3 Power Source(s) for Electric Motor-Driven Fire Pumps

FPN [Incorporate panel action text on Proposal 13-83] "NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, covers characteristics of reliable sources. Also see the cross-reference in Annex X."

(A) Scope. This section covers the minimum performance and testing requirements of the sources and transmission of electrical power to motors driving fire pumps.

(B) Equipment. Also covered are the minimum performance requirements of all intermediate equipment between the source(s) and the pump, including the motor(s) but excepting the electric fire pump controller, transfer switch, and accessories.

FPN: (See Chapter 10 of NFPA 20).

(C) General. All electrical equipment and installation methods shall comply with this code, except as modified by Article 695.

(D) Hazards. All power supplies shall be located and arranged to protect against damage by fire from within the premises and exposing hazards.

FPN Where the power supply involves an on-site power production facility, the protection is required for the facility in addition to the wiring and equipment.

(E) Continuous Duty. All power supplies shall have the capacity to run the fire pump on a continuous basis.

(F) Voltage Drops All power supplies shall comply with the voltage drop requirements of Section 695.9 [was 695.7]

(G) Phase Converters. [Incorporate panel action text on Proposal 13-81.] "Phase converters shall not be permitted to be used for fire pump service."

695.4 Normal Power.

(A) Continuously Available. An electric motor driven fire pump shall be provided with a normal source of power as a continually available source.

(B) Arrangement. The normal source of power required in 695.4(A) and its routing shall be arranged in accordance with one of the following:

(1) Service connection dedicated to the fire pump installation.

(2) On-site power production facility connection dedicated to the fire pump installation.

(3) A dedicated feeder connection derived directly from the dedicated service to the fire pump installation.
(4) As a feeder connection where all of the following conditions are met:
a. The protected facility is part of a multi-building campus style arrangement.
b. A back-up source of power is provided from a source independent of the normal source of power.
c. It is impractical to supply the normal source of power through arrangement 695.4(B)(1), 695.4(B)(2), 695.4(B)(3) or 695.4(B)(4).
d. The arrangement is acceptable to the authority having jurisdiction.
e. The overcurrent protection device(s) in each disconnecting means shall be selectively coordinated with any other supply side overcurrent protective device(s).
(5) A dedicated transformer connection directly from the service meeting the requirements of Article 695.6 [was 695.5].
(C) Connections. For fire pump installations using the arrangement of 695.4(B)(1), 695.4(B)(2),, 695.4(B)(3), 695.4(B)(5) for the normal source of power, no more than one disconnecting means and associated overcurrent protection device shall be installed in the power supply to the fire pump controller.
(D) Disconnecting Means. Where the disconnecting means permitted by 695.4(C) is installed, the disconnecting means shall meet all of the following:
(1) Identified as being suitable for use as service equipment.
(2) Lockable in the closed position.
(3) Located remote from other building disconnecting means.
FPN The disconnecting means should be located such that inadvertent simultaneous operation is not likely.
(4) Located remote from other fire pump source disconnecting means.
FPN The disconnecting means should be located such that inadvertent simultaneous operation is not likely.
(5) Marked "Fire Pump Disconnecting Means" in letters that are no less than one inch (25 mm) in height and that can be seen without opening enclosure doors or covers.
(E) Placard. Where the disconnecting means permitted by 695.4(C) is installed, a placard shall be placed adjacent to the fire pump controller stating the location of this disconnection means and the location of any key needed to unlock the disconnect.
(F) Supervision. Where the disconnecting means permitted by 695.4(C) is installed, the disconnect shall be supervised in the closed position by one of the following methods:
(1) Central station, proprietary or remote station signal device
(2) Local signaling service that will cause the sounding of an audible signal at a constantly attended location
(3) Locking the disconnecting means in the closed position
(4) Sealing of disconnecting means and approved weekly recorded inspections where the disconnecting means are located within fenced enclosures or in buildings under the control of the owner
(G) Overcurrent Protection Where the overcurrent protection permitted by 695.4(C) is installed, the overcurrent protection device shall be selected or set to carry indefinitely the sum of the locked-rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment when connected to this power supply. [Incorporate panel action text on Proposal 13-90 which adds a second sentence to existing 695.4(B)(1), Overcurrent Device Selection.] "The next standard overcurrent device shall be used in accordance with 240.6." Existing second sentence becomes third sentence.

695.5 Alternate power.
(A) When Required. Except for an arrangement described in 695.5(c), at least one alternate source of power shall be provided when the height of the structure is beyond the pumping capacity of the fire department apparatus.
(B) Unreliable Source. Except for an arrangement described in 695.5(c), at least one alternate source of power shall be provided where the normal source is not reliable.
FPN [Add entire Annex item from NFPA-20 9.3.2*.] to read as follows: "The conditions identified are conditions that would make the normal source of power be considered not reliable.
(1) NFPA 25 begins to require special undertakings (i.e., fire watches) when a water-based fire protection system is taken out of service for longer than 4 hours. If the normal source power plant has been intentionally shut down for longer than 4 hours in the past, it is reasonable to require a back-up source of power.
(2) The standard does not require that the normal source of power is infallible. NFPA 20 does not intend to require a back-up source of power for every installation using an electric motor driven fire pump. Should the normal source of power fail due to a natural disaster (hurricane) or due to a problem with electric grid management (regional blackout), the fire protection system could be supplied through the fire department connection. However, if the power grid is known to have had problems in the past (i.e., switch failures or animals shorting a substation), it is reasonable to require a back-up source of power.
(3) Fire departments responding to an incident at the protected facility will not operate aerial apparatus near live overhead power lines, without exception. A back-up source of power is required in case this scenario occurs and the normal source of power must be shut off. Additionally, many utility providers will remove power to the protected facility by physically cutting the overhead conductors. If the normal source of power is provided by overhead conductors, which will not be identified, the utility provider could mistakenly cut the overhead conductor supplying the fire pump.
(4) Power disconnection and activated overcurrent protection should only occur in the fire pump controller. The provisions of 9.2.2 for the disconnect switch and overcurrent protection essentially require disconnection and overcurrent protection to occur in the fire pump controller. If unanticipated disconnect switches or overcurrent protection devices are installed in the normal source of power that do not meet the requirements of 9.2.2, the normal source of power must be considered not reliable and a back-up source of power is necessary."
(C) Back-up Pump. An alternate source of power is not required where a back-up engine driven or back-up steam turbine driven fire pump is installed in accordance with this standard.
(D) Alternate Source. When provided, the alternate source of power shall be supplied from one of the following sources:
(1) A generator installed in accordance with Section [695.9]
(2) One of the sources identified in 695.4(B)(1); 695.4(B)(2); 695.4(B)(3); or 695.4(B)(5) when the power is provided independent of the normal source of power.
(E) Overhead Lines. When provided, the alternate supply shall be arranged so that the power to the fire pump is not disrupted when overhead lines are deenergized for fire department operations.

In existing **695.6**, add a new paragraph (I):
(I) Onsite Standby Generator Disconnecting Means. [Incorporate panel action text on Proposal 13-88] "Where the power source is supplied by on-site generator(s), the supply conductors shall connect to a generator disconnecting means dedicated for the purpose of serving the fire pump. The disconnecting means shall be located in a separate enclosure from other generator disconnecting means."

695.7(A)(B) [Note: While this is not extracted material from NFPA 20, it belongs in this section. Therefore, incorporate panel action text on Proposal 13-97 as follows.]
"**Supply Conductors.**
(1) Services and On-Site Power Production Facility. Service conductors and conductors supplied by an on-site power production facility shall be physically routed outside a building(s) and shall be installed as service entrance conductors in accordance with Article 230. Where supply conductors cannot be physically routed outside of buildings, they shall be permitted to be routed through the building(s) where installed in accordance with 230.6(1) or 230.6(2).
(2) Multi-Building Campus Style Complexes. Where a fire pump is wired under the provisions of 695.3(B)(2), all supply conductors on the load side of the service disconnecting means that constitute the normal source of supply to that fire pump shall be physically routed outside a building(s) and shall be installed as outside feeder conductors in accordance with Article 225. Where the feeder conductors cannot be physically routed outside of buildings, they shall be permitted to be routed through the building(s) where installed in accordance with 230.6(1) or 230.6(2).
Exception to (A)(2): Where there are multiple sources of supply with means for automatic connection from one source to the other, the requirement for routing outside of the building(s) shall apply only to those conductors on the load side of that point of automatic connection between sources.
(3) Supervised or On-Site Standby Generator Connections. Fire pump supply conductors on the load side of the final disconnecting means and overcurrent device(s) permitted by 695.4(B) or conductors that connect directly to an on-site generator shall comply with all of the following:
a. Independent Routing. The conductors shall be kept entirely independent of all other wiring.
b. Associated Fire Pump Loads. The conductors shall supply only loads that are directly associated with the fire pump system.
c. Protection from Potential Damage. The conductors shall be protected to resist potential damage by fire, structural failure, or operational accident.
d. Inside a Building. When routed through a building, the conductors shall be installed using one of the following methods:
(1) Be encased in a minimum 50 mm (2 in.) of concrete
(2) Be within an enclosed construction dedicated to the fire pump circuit(s) and having a minimum of a 1-hour fire resistive rating
(3) Be a listed electrical circuit protective system with a minimum 1-hour fire rating
Exception to (3)(d): The supply conductors located in the electrical equipment room where they originate and in the fire pump room shall not be required to have the minimum 1-hour fire separation or fire resistance rating, unless otherwise required by 700.9(D) of this Code.

Delete 695.6(B)
Renumber existing (C) through (H) to become (B) through (G)."

695.8 Voltage Drop. [Was 695.7]
(A) Starting Volgate Drop. [Exemption for Mechanical Operator. See below.] The voltage at the controller line terminals shall not drop more than 15 percent below normal (controller-rated voltage) under motor-starting conditions.

(B) Mechanical Operator. The requirements of 695.8(A) shall not apply to emergency run mechanical starting. [Note: Parenthetical note in NFPA 20 (9.4.2) 2003 Edition is not applicable.]

(C) Running Voltage Drop. The voltage at the motor terminals shall not drop more than 5 percent below the voltage rating of the motor when the motor is operating at 115 percent of the full-load current rating of the motor.

[Note: Motor Requirements not part of 695.]

695.9 On-Site Standby Generator Systems.

(A) Capacity.

(1) Where on-site generator systems are used to supply power to fire pump motors to meet the requirements of 695.5(B), they shall be of sufficient capacity to allow normal starting and running of the motor(s) driving the fire pump(s) while supplying all other simultaneously operated load(s) while meeting the requirements of Section 695.8.

(2) A tap ahead of the on-site generator disconnecting means shall not be required.

(B) Power Sources.

(1) These power sources shall comply with Section 695.8 and shall meet the requirements of Level 1, Type 10, Class X systems of NFPA 110, *Standard for Emergency and Standby Power Systems*.

(2) The fuel supply capacity shall be sufficient to provide 8 hours of fire pump operation at 100 percent of the rated pump capacity in addition to the supply required for other demands.

(C) Sequencing. Automatic sequencing of the fire pumps shall be permitted as a means of meeting the voltage drop requirements of 695.8.

(D) Transfer of Power. Transfer of power to the fire pump controller between the normal supply and one alternate supply shall take place within the pump room.

(E) Protective Devices. Where protective devices are installed in the on-site power source circuits at the generator, such devices shall allow instantaneous pickup of the full pump room load [See NFPA-20-9.6.5] [Note: Same wording as 13-107]

FPN Generator Protective Devices. The subject protective device(s), where used, need to be sized to allow the generator to allow instantaneous pickup of the full pump room load. This includes starting any and all connected fire pumps in the across-the-line (direct on line) full voltage starting mode. This is always the case when the fire pump(s) is running by use of the Emergency Mechanical Operator of [Not applicable here.] (Emergency-Run Mechanical Control at Controller).

Note: (F), (G), and (H) remain unchanged.

695.10 Junction Boxes. Where fire pump wiring to or from a fire pump controller is routed through a junction box, the following requirements shall be met.

(A) Mounting. The junction box shall be securely mounted.

(B) Controller Enclosure Integrity. Mounting and installing of a junction box shall not violate the enclosure Type (NEMA) rating of the fire pump controller(s).

[Note Appendix item from NFPA 20 is not applicable.]

(C) Controller Short Circuit Rating Integrity. Mounting and installing of a junction box shall not violate the integrity of the fire pump controller(s) and shall not affect the Short Circuit Rating of the controller(s).

[Note Appendix item from NFPA 20 is not applicable.]

(D) Type Rating. As a minimum, a National Electrical Manufacturers Association (NEMA) Type 2, dripproof enclosure (junction box) shall be used. The enclosure shall be listed f or the subject to match the fire pump controller enclosure Type rating.

(E) Terminals. Terminals, junction blocks, splices, and the like, when used, shall be listed.

695.11 Listed Electrical Circuit Protective System to Controller Wiring.

(A) Single Conductors. Where single conductors (individual conductors) are used, they shall be terminated in a separate junction box and in accordance with this code.

FPN Cutting slots or rectangular cutouts in a fire pump controller will violate the manufacturer's Enclosure Type rating, and the controller's Short Circuit (Withstand) rating and will void the manufacturer's warrantee. See also 300.20 and Article 322.

(B) Single (individual conductors) shall not enter the fire pump enclosure separately.

(C) Smoke Seal. Where required by the listing of the Electrical Circuit Protective System, the raceway between a junction box and the fire pump controller shall be sealed at the junction box end as required and per the instructions of the manufacturer or listing agency.

FPN When so required, this seal is to prevent flammable gases from entering into the fire pump controller.

(D) Standard wiring between junction box and controller is acceptable.

695.12 Raceway Terminations.

(A) Hubs. Listed conduit hubs shall be used to terminate raceway (conduit) to the fire pump controller.

(B) Type Rating. The NEMA Type rating of the conduit hub(s) shall be at least equal to that of the fire pump controller.

(C) Installation. The installation instructions of the manufacturer of the fire pump controller shall be followed.

(D) Controller Alterations. No alterations to the fire pump controller, other than conduit entry as allowed by this code, shall be approved by the authority having jurisdiction.

Note: The following sections are revised:

Extant 695.6 moves to 695.7	[No change.].
New 695.8 moves to 695.9	[No change.]
New 695.13 moves to 695.10	[Above]
New 695.14 moves to 695.12	[Above]
New 695.15 moves to 695.11	[Above]

Panel Statement: Renumbered to correlate text of NFPA 20 to comply with the NEC Style Manual. The revised text in this proposal incorporates the panel's actions on Proposals 13-81; 13-83; 13-88; 13-90; and 13-97.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

NASBY, J.: NEMA disagrees with the rewrite outlined in this proposal. The arrangement of the material introduces new confusion to an Article that was already not clear in its intent. In addition, the revision adds material that is in NFPA 20 and should remain in NFPA 20. The responsibility of the NEC is for the installation requirements for the fire pump. Design requirements related to performance should not be moved to the NEC. An example of this problem is in proposed 695.5(A) to require an alternate source when the pumping capacity is beyond that of fire department apparatus. This is not an installation requirement, but is information that should remain in NFPA 20 only.

In addition, the revisions add a number of Fine Print Notes that are unacceptable and in violation of the NEC Style Manual. Examples of these notes include:

1. 695.4(D)(3) FPN – Contains a recommendation
2. 695.4(D)(4) FPN – Contains a recommendation
3. 695.5(B) FPN – Contains recommendations as well as an attempted interpretation of the requirement
4. 695.9(E) FPN – contains recommendations
5. 695.11(E) FPN – deals with warranty issues and is inappropriate in the NEC and in a FPN

Other technical issues include (but are not limited to):

1. 695.6(I) – does not recognize installations where large generator sets are paralleled and supply switchboards or switchgear that then serves the various connected loads.
2. 695.4(C) – limits the installation to one disconnect between the source and the controller. Should a transfer switch be installed ahead of the controller, another disconnect would not be permitted. This is contrary to typical installation where a remote disconnect is applied at the normal source of supply and then supplies the transfer switch.
3. 695.4(D) – it would appear that the requirement to not locate the disconnecting means in with other equipment has been lost in the revision without any substantiation.
4. 695.4(B)(4)(e) – the requirement for selective coordination creates significant technical concern. It may be impossible to design a system where the overcurrent protection for the fire pump circuit (size very large to carry locked rotor current) could be selectively coordinated with an upstream device that is part of the normal distribution system protection. It may also end up causing the other parts of the distribution system equipment to be oversized to simply accomplish the selectivity requirement. This is not justified or substantiated and decreases safety because of the increase in arc flash hazard.

Other requirements that are inappropriate for the NEC include:

1. 695.9(A)(1) – a direct mandatory reference to NFPA 110, which is prohibited by the NEC Style Manual
2. 695.9(B)(2) – requirements for fuel supply capacity for a generator which is not an NEC installation issue
3. 695.10(D) – A mandatory reference to NEMA Type 2 – which is reference to another standard that is prohibited by the NEC Style Manual.
4. 695.12(D) – is in conflict with the provisions of 90.4
5. 695.3(C) – this material is redundant with 90.3

The complete concept of this revision needs to be addressed in the comment phase with the objective of keeping Article 695 limited to installation requirements necessary for the application of the NEC.

SWAYNE, R.: This proposal should be rejected for many reasons. NFPA 20 has its place and Article 695 has its place, the two should not become one. The Scope of Article 695 covers the installation of power sources and interconnecting units and the installation of switching and control equipment dedicated to fire pump drives. It does not cover performance, maintenance, and testing of the fire pump system. The Scope of NFPA 20 covers minimum performance and testing requirements of the sources and transmission of electric power to motors driving fire pumps. The two scopes are not the same and each is necessary.

The wholesale replacement of one standard by another will leave electricians and Authorities Having Jurisdiction without the guidance necessary to provide safe installations of fire pumps. If it is felt that Article 695 is lacking in some of the requirements that NFPA 20 indicates as being important, then a paragraph by paragraph review should be performed. In this way, there will not be any danger in deleting any of the safe practices that exist today.

As examples of where the proposed action is deficient:

1) Section 695.3(G) prohibits phase converters which was not accepted by NFPA 20 as documented in the substantiation to Proposal 13-81. See Negative Comment on Proposal 13-81.

2) Section 695.4(B)(4)(c) refers to itself as being impractical.

3) Section 695.4(B)(5) refers to "service" whereas the facility does not have to be a campus to have a primary service with a low voltage supply feeding the building or structure.

4) Section 695.4(F)(4) refers to weekly recorded inspections which are proper for NFPA 20, but not for NFPA 70 which is an installation code.

5) Section 695.5(A) is a new requirement that may be enforced by the Fire Marshal, but not by the electrical AHJ.

6) Section 695.5(B) requires an alternate source when the normal source is not reliable without defining "reliable". "Reliable" is not defined in Article 100 and the attempt to define it by the unenforceable FPN is confusing.

7) Section 695.5(B), FPN No. 4 refers to conditions that are not permitted. This may signal the installer that it may not be permitted, but you can do it anyway if you provide an alternate source. This sends the wrong signal.

8) Editorially, "when" should be replaced by "where" in several locations to meet the Style Manual.

9) It is not apparent what is included in Section 695.7(A) and what is in Section 695.7(B).

10) Section 695.7(A)(B)(3) refers to load side of the "service" disconnecting means. A multi-building campus or a facility with a primary service generally does not have a "service" to each of its buildings.

11) Section 695.7(A)(B)(3) refers to disconnecting means and overcurrent devices permitted by Section 695.4(B). Section 695.4(B) does not cover these items.

This proposal is premature and should be rejected. The Proposer should come back with a detailed comparison for consideration.

13-78 Log #2864 NEC-P13 **Final Action: Reject**
(Table 695 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject". The Technical Correlating Committee does not agree with the placement of a cross-reference in the Annex. The objective of the extract identification requirements of the Style Manual make a cross-reference unnecessary.

See the Technical Correlating Committee Note on Proposal 13-77.

Submitter: James S. Nasby, Master Control Systems, Inc.

Recommendation: Consider incorporating new extract Text Cross Reference between NFPA 20 and NFPA 70 Article 695 Extract Text.

Substantiation: This was NFPA-20-2006 Proposal 20-179 Log #98; which had final action Accept in Principle with Substantiation:

Clarify which clauses in NFPA 70-695 are extract text from NFPA 20. Present format of NFPA 70 makes it difficult to know which sections and sentences are extract text. Some proposals and comments have been misdirected. This would also help the NFPA 20 Technical Committee to know which clauses have been extracted into NFPA 70.

With Committee Action:

Change title to read as follows: NFPA 20 Material Extracted by 70 Article 695.

and with COMMITTEE STATEMENT:

Clarifies that the information in NFPA 70 is extracted from NFPA 20.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Place text cross reference between NFPA 20 and NFPA 70 Article 695 extract text in an annex.

(cross reference table shown on following pages)

Panel Statement: The panel agrees with the intent of the proposal and will place text cross-reference between NFPA 20 and NFPA 70 Article 695 extract text in an annex.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: Although the concept is commendable, the recommendation is not in a form that can be accepted. The substantiation indicates that the purpose is to show which sections of Article 695 are extracted from NFPA 20. The table provided shows extraneous information. In addition, it indicates that the 2006 edition of NFPA 20 has deleted information that was in Chapter 10 that presently exists in Article 695. The Proposer should come back with a detailed comparison for consideration.

13-79 Log #1774 NEC-P13 **Final Action: Accept in Principle in Part**
(695.1(A) & (B))

TCC Action: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action until the Panel Action has been clarified regarding the deletion of (B)(2) and acceptance of the underlined (4).

The Technical Correlating Committee directs the Panel to clarify the Panel Action relative to the addition of Item 4, associated fire pump accessory equipment, since that equipment appears to be related to mechanical equipment rather than the electrical installation.

This action will be considered by the panel as a public comment.

Submitter: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services

Recommendation: Revise text to read as follows:

695.1 Scope.

(A) Covered. This article covers the installation of the following:

(1) Electric power sources and interconnecting circuits

(2) Switching and control equipment dedicated to fire pump drivers

<u>(3) Pressure maintenance (jockey or makeup) pumps</u>

<u>(4) Associated fire pump accessory equipment</u>

(B) Not Covered. This article does not cover the following:

(1) The performance, maintenance, and acceptance testing of the fire pump system, and the internal wiring of the components of the system

~~(2) Pressure maintenance (Jockey or makeup) pumps~~

Substantiation: We need to state that jockey or makeup pump motors and accessory equipment are covered in Article 695 because it is included in 695.5(A) and (B) and (C)(2) for load calculations, and the very fact that they do exist in job installations.

Panel Meeting Action: Accept in Principle in Part

Delete Item Number 3 of the proposal.

Panel Statement: Jockey pumps are covered by Article 430.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-80 Log #2856 NEC-P13 **Final Action: Accept**
(695.2)

TCC Action: The Technical Correlating Committee understands that the Panel Action is to only delete the word "either" and change "and/or" to "or" and the remainder of the definition is unchanged.

Submitter: James S. Nasby, Master Control Systems, Inc.

Recommendation: Revise text to read as follows:

~~3.3.10~~ **Fault Tolerant External Control Circuit.** Those control circuits ~~either~~ entering ~~and~~ /or leaving the fire pump controller enclosure, which if broken, disconnected, or shorted will not prevent the controller from starting the fire pump <u>from all other internal or external means</u> and may cause the controller to start the pump under these conditions.

Note: Text Strikeouts (~~Text Strikeouts~~) and <u>Text Underlines</u> are FIM-AAA Committee ROP Actions.

Substantiation: This was NFPA -20-2006 Proposal 20-6 Log #16; Which had final action Accept with Substantiation:

Substantiation: The ungrounding of the CPT secondary has, historically, been the controller manufacturer's predominant practice to comply with NFPA 20 - 10.5.2.6 and NFPA 20-3.3.10.

-and modified by-

NFPA -20-2-2006 Committee Comment 20-?? Log #CC1; which had **Final Action**. Accept with Substantiation:

Substantiation: Coordinates definitions with Article 695 of the NEC.

Note: This same Committee Comment also revised the definitions in NFPA-20 of "On-Site Power Production Facility" and "On-Site Standby Generator" to agree with those already in NFPA -70-2005 695.2

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

SWAYNE, R.: This action is not consistent with the action on Proposal 13-1 which has a different wording for Article 100. This is the action that should be Accepted because the term being defined is used only as Article 695.

NFPA-70 Section 695 (Fire Pumps) Extract Material from NFPA-20

NFPA-20 2006 Edition	NFPA-70 2005 Edition	NFPA-70 2008 Pro forma	Section 695 (2005 Edition) Titles -or- Text
	695.2	695.2	Definitions.
3.3.10	(ditto)	(ditto)	Fault Tolerant External Control Circuits.
			Title: "Circuits" was "Conductors".
			Add "either" -- "or" was "and/or".
3.3.27	(ditto)	(ditto)	On-Site Power Production Facility.
3.3.28	(ditto)	(ditto)	On-Site Standby Generator.
9.1	695.3	695.3	Power Source(s) for Electric Motor-Driven Fire Pump
9.1.1	N/A	695.3(A)	Scope
9.1.2	N/A	695.3(B)	Equipment
9.1.3	N/A	695.3(C)	General
9.1.4*	N/A	695.3(D)	Hazards
A.9.1.4		FPN	Annex / Fine Print Note
9.1.5		695.3(E)	Continuous
9.1.6		695.3(F)	Voltage Drops
9.2	N/A	695.4	Normal Power
9.2.1	N/A	695.4(A)	Continuously Available
9.2.2	N/A	695.4(B)	Arrangement
9.2.3	N/A	695.4(C)	Connections
9.2.3.1*	N/A	695.4(D)	Disconnecting Means
A.9.2.3.1	N/A	FPN	Annex / Fine Print Note
9.2.3.2*	N/A	695.4(E)	Placard
A.9.2.3.2	N/A	FPN	Annex / Fine Print Note
9.2.3.3	N/A	695.4(F)	Supervision
9.2.3.4	N/A	695.4(G)	Overcurrent Protection
9.3	N/A	695.5	Emergency Power (not Alternate Power)
9.3.1	N/A	695.5(A)	When Required
9.3.2	N/A	695.5(B)	Unreliable Source
9.3.3	N/A	695.5(C)	Back-up Pump
9.3.4	N/A	695.5(D)	Alternate Source
9.3.5	N/A	695.5(E)	Overhead Lines
9.4	N/A	695.10	Junction Boxes
9.4.1	N/A	695.10(A)	Mounting
9.4.2	N/A	695.10(B)	Controller Enclosure Integrity
9.4.3	N/A	695.10(C)	Controller Short Circuit Rating Integrity
9.4.4	N/A	695.10(D)	Type Rating
9.4.4	N/A	695.10(E)	Terminals
9.5	N/A	695.10	Listed Electrical Circuit Protective System to Controll
9.5.1*	N/A	695.10(A)	Single Conductors
A.9.5.1	N/A	FPN	Annex / Fine Print Note
9.5.2	N/A	695.10(B)	[Title Missing]
9.5.3*	N/A	695.10(C)	Smoke Seal
A.9.5.3	N/A	FPN	Annex / Fine Print Note
9.5.4	N/A	695.10(D)	[Title Missing] - Reword ??
9.6	N/A	695.12	Raceway Terminations
9.6.1	N/A	695.12(A)	Hubs
9.6.2	N/A	695.12(B)	Type Rating
9.6.3	N/A	695.12(C)	Installation
9.6.4	N/A	695.12(D)	Controller Alterations
??	695.5	695.6	Transformers.
??	695.5(B)	695.6(B)	Overcurrent Protection.
??			New 2nd Sentence Re 600% -vs.- 125% conductors & c
??			"Devices other than overcurrent devices" was "any oth
??	695.5(C)	695.6(C)	Feeder Source.
??	695.5(C)(1)	695.6(C)(1)	Size.
??	695.5(C)(2)	695.6(C)(2)	Overcurrent Protection.
??			New 2nd Sentence Re 600% -vs.- 125% conductors & c
??			"Devices other than overcurrent devices" was "any oth
N/A	695.6	695.7	Power Wiring.
10.3.4.6,	695.6(F)	- same-	Junction Points.
10.3.4.7	(ditto)	- same-	(ditto)

NFPA-70 Section 695 (Fire Pumps) Extract Material from NFPA-20

9.7	695.7	695.8	Voltage Drop.
9.5.1.1,	695.10	695.12	Listed Equipment.
10.1.2.1,	(ditto)	(ditto)	(ditto)
10.8.3.1,	(ditto)	(ditto)	(ditto)
12.1.3.1	(ditto)	(ditto)	(ditto)
N/A	695.12	695.13	Equipment Location.
10.2.1,	695.12(A)	695.13(A)	Controllers and Transfer Switches.
12.2.1	695.12(B)	695.13(B)	Engine-Drive Controllers. "diesel engine drives" changed to "engine-generator drives" "engine-generator drives" changed to "fire pump engines"
11.2.5.2.5	695.12(C)	695.13(C)	Storage Batteries.
11.2.5.2.6	695.12(D)	695.13(D)	Energized Equipment.
10.2.2,	695.12(E)	695.13(E)	Protection Against Pump Water.
12.2.2	(ditto)	(ditto)	(ditto)
10.3.2,	695.12(F)	695.13(F)	Mounting.
12.3.2	(ditto)	(ditto)	(ditto)
10.5.2.6,	695.14(A)	(Same)	Control Circuit Failures.
12.5.2.5,	(ditto)	(ditto)	(ditto)
12.6.12	(ditto)	(ditto)	(ditto)
10.4.5.6	695.14(B)	(Same)	Sensor Functioning.
10.8.1.3	695.14(C)	(Same)	Remote Device(s).
12.3.5.1,	695.14(D)	(Same)	Engine-Drive Control Wiring.
12.6.4.1	(ditto)	(ditto)	(ditto)
	695.14(E)	(Same)	Electric Fire Pump Control Wiring Methods.
Additional References - Informational Only			
9.9.4	695.12(A)	695.13(A)	Controllers and Transfer Switches.
A.9.2.4(3)	695.14(F)	(Same)	Generator Control Wiring Methods.

13-81 Log #2860 NEC-P13 **Final Action: Accept**
(695.3)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting.
This action will be considered by the Panel as a Public Comment.
Submitter: James S. Nasby, Master Control Systems, Inc.
Recommendation: ~~9.2.1.x~~ **Phase Converters.** Phase converters shall not be permitted to be used for fire pump service.
Substantiation: This was NFPA-20-2006 Proposal 20-71 Log #59; which raised the question and had **Final Action**: Reject with Substantiation:
The users of NFPA 20 need guidance on whether or not the use of phase converters constitutes a reliable source of power. The situation occurs frequently where three-phase power is not available. How is this problem intended to be addressed? Is there a need to list phase converters for fire pump service? Is there a need to regulate how phase reversal will be monitored and annunciated? Users of the standard need answers to these questions.
-and- was modified by Comment 20-?? Log #38 (**Final Action**: APR?) with Substantiation:
Based on the committee statement to the proposal and the negative comment of Mr. Haagensen, we have submitted a comment to include the prohibition of the converters to clarify the issue.
Panel Meeting Action: Accept
Panel Statement: The action correlates and is incorporated into Proposal 13-77.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: Although the recommendation may appear reasonable, the substantiation does not match the recommendation. This proposal was a NFPA-20-2006 proposal and was REJECTED per the substantiation. The substantiation asks the Panel to determine the requirements and/or limitations on the use of phase converters without providing any substantiation to prohibit their use. I do not believe that the Panel has sufficient information to either permit or prohibit the use of phase converters and NFPA 20 has not done it either.

13-82 Log #2858 NEC-P13 **Final Action: Reject**
(695.3 and possibly 695.4 and 695.5)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" since the Proposal does not comply with 4.3.3 of the NFPA Regulations Governing Committee Projects.
Submitter: James S. Nasby, Master Control Systems, Inc.
Recommendation: Revise 695.3, 695.4, 695.5, as required to match corresponding text from NFPA-20 Clauses 9.2 and etc.
Substantiation: This was NFPA-20-2006 Proposal 20-69 Log #97; which had **Final Action**: Accept in Principle in Part with Substantiation:
Jurisdictions have a difficult time enforcing the power supply requirements because it is difficult to point to particular provision(s) within the existing Chapter 9 that clearly specifies the intent. For example, there is no link from existing 9.2.1.1 to 9.2.2, 9.2.3, or 9.2.4. There are designers out there that interpret Chapter 9 to permit the use of a reliable standby generator as the normal power source. The rewrite being proposed makes it much clearer what are acceptable power supply arrangements. Secondly, Article 695 of NFPA 70 extracts the effected power supply provisions of NFPA 20. This extract has become less direct over the years as the provisions of NFPA 20 are modified during the various revision cycles. The existing text of NFPA 20 for power supply requirements needs to be made clearer so that no editorial changes are needed by the NEC to extract the material.
In addition to the example concern above, the proposed rewrite clears up some of the following concerns with the existing provisions:
1. Definition of a "reliable" power supply.
2. Which portion of the power supply must be dedicated to the fire pump installation.
3. Confusion on whether the normal supply arrangement is allowed to change based on provisions for back-up power.
4. Confusion with the requirements for using the "campus style" arrangement.
5. Whether more than one back-up source of power is permitted.
6. Lack of direct guidance for over 600 volt services (privately owned transformers), which was the subject of the NFPA Standards Council decision the last revision cycle of NFPA 70.
This were seven Comments which modified the above with **Final Action** of Accept, AAP, APR, or APP.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 13-77, which meets the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: The submitter has not been specific in how the text is to be added, revised, or deleted. This proposal does not meet the requirements of Section 4-3.3 Regulations Governing Committee Projects.

13-83 Log #3366 NEC-P13 **Final Action: Accept in Principle**
(695.3, FPN (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77. This action will be considered by the Panel as a Public Comment.
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Insert a fine print note ahead of 695.3(A) as follows:
FPN: NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, provides information on the characteristics of reliable power sources in Annex A, item A.9.2.4.
Substantiation: The topic of reliability in the context of the allowable power supplies to fire pumps has become one of the most controversial from the standpoint of NEC enforcement, largely because of the expense of providing standby power for this equipment. This is a particularly contentious issue in occupancies that otherwise would not require an on-site generator. Since many rules in Article 695 hinge on the concept of reliability, placing this information in the NEC will provide much needed guidance on this topic.
Panel Meeting Action: Accept in Principle
Revise the proposed FPN in 695.3 as follows:
FPN: NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, covers characteristics of reliable sources. Also see the cross-reference in Annex X.
Panel Statement: This action correlates and is incorporated into the panel action on Proposal 13-77.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: The Proposal is redundant. NFPA 20 is already referenced at the beginning of Article 695 and does not need to be repeated.

13-84 Log #2716 NEC-P13 **Final Action: Reject**
(695.3(A)(3) (New))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text to read:
695.3(A)(3) In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, a fire pump shall be permitted to be supplied by a single feeder from a site-wide power distribution system.
Substantiation: Problem: 695.3(A)(1) permits a fire pump to be supplied from a separate service. NFPA commentary in 2005-NEC Handbook to 695.3 states power may be supplied by "A separate utility service or connection ahead of the main disconnecting means". *NFPA commentary in 2005-NEC-Article 100, definition for "Service" states, "a service can only be supplied by the serving utility. If the electric energy is supplied by other than the serving utility, the supplied conductors and equipment are considered feeders, not a service".* Article 695 does not recognize "feeder" as a reliable power source and requires more than one power source for a fire pump.
Substantiation: Many industrial power systems are similar in size and complexity to municipal or co-operative power companies that do not have power generation capability but are considered the serving utility. These industrial power systems typically include multiple sources of power that can cover large areas and include selective switching arrangements to provide highly reliable power sources that meet or exceed the reliability of the traditional "serving utility". The proposed change recognizes the reliability of the industrial power system for the purpose of fire pump installations.
The approval of this change will provide needed guidance to support the AHJ in approving electric driven fire pump installations in industrial applications.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: A single feeder is not considered a reliable source of power. This is extract material from NFPA 20.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
ELKINS, D.: This proposal should be accepted. This proposal corrects code language which ignores the requirements of large industrial concerns which purchase power at a high voltage such as 69kV. This proposal permits these large industrial concerns to provide service to fire water pumps which is

identical physically to that used by smaller concerns which purchase power at a medium voltage such as 12.47kV. Article 695 permits a fire water pump to be served by a separate utility service or connection ahead of the main service disconnecting means which is not practical for large industrial concerns which purchase power at a high voltage. This proposal adds an exception for these industrial establishments to use facilities identical to those used by smaller facilities which purchase power at a lower voltage. Since power purchased at higher voltage is generally more reliable, this installation is actually more reliable than what is permitted.

Comment on Affirmative:

SWAYNE, R.: This proposal has merit, but lacks conditions for the supply to the feeder. If the feeder is supplied from a double ended substation fed from two separate primary feeders, then the permission for campus-style complexes, as in 695.3(B)(2) should apply.

13-85 Log #3579 NEC-P13 **Final Action: Reject**
(695.3(A)(3) (New))

Submitter: Richard A. Holub, Middletown, DE
Recommendation: Add new text to read:

695.(A)(3): Where redundant fire pumps are installed to protect a facility, and where the power source to each fire pump is independent (or where a diesel fire pump serves as the redundant pump for an electric pump), a single feeder shall be permitted as a reliable source.

Substantiation: Problem: As currently written, the code requires a direct utility connection or on-site production to be considered reliable. Without either of these, multiple power sources are required per Article 695.3(B) for the fire pump to be considered reliable. These multiple sources may improve the reliability of a single fire pump depending on the reliability of the automatic transfer switch and other components used to derive the second source, but another method to reliably supply fire water would be to provide a redundant pump with a single, diverse power source. This would improve reliability beyond what is offered in the current code language. While the Authority Having Jurisdiction may permit this method, specific language should be included in the code to permit such installations as an alternative to the currently mandated methods.

Panel Meeting Action: Reject

Panel Statement: A single feeder is not considered a reliable source of power. Refer to the panel statement on Proposal 13-84. The power supply for a fire pump is within the scope of NFPA 20.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

ELKINS, D.: This proposal should be accepted. This proposal corrects code language which does not recognize the increased reliability provided by two fire water pumps fed by independent sources or by an installation with both an electric and a diesel engine driven fire water pump. The proposal with its redundant pumps provides for a much more reliable fire water supply than existing code language which only requires a single pump. The panel statement justifying the rejection ignored this redundant feature of the proposal. The panel statement also stated that "The power supply for a fire pump is within the scope of NFPA 20" which is not consistent with 90.2 "Scope" which does not exclude the power supply to fire water pumps. This panel statement is also not consistent with 695.1(A) which states "This article covers the installation of the following: (1) Electric power sources and interconnecting circuits. (2) Switching and control equipment dedicated to fire pump drivers.

SWAYNE, R.: This proposal has merit. Section 695.3(B) permits two individual sources without reference to whether they are "reliable" or not. The point where these two sources come together would be at an automatic transfer switch. In this proposal, the two sources come together at the redundant pumps output. It should also be noted that in Proposal 13-77 to insert NFPA 20 into section 695, Section 695.5(C) does not require an alternate source when there is an engine driven or steam turbine driven back-up pump.

13-86 Log #2750 NEC-P13 **Final Action: Reject**
(695.3(B)(1))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" since the Proposal does not comply with 4.3.3 of the NFPA Regulations Governing Committee Projects.

Submitter: David Sroka, Turner Falls, MA
Recommendation: Add a second paragraph "Power Sources."

This would be paragraph 9.6.2 from NFPA 20.

Substantiation: This "Power Source" information is just as important as "Capacity" which is from paragraph 9.6.1 of NFPA 20.

Panel Meeting Action: Accept in Principle

Panel Statement: See Panel action on Proposal 13-77, which should satisfy the intent of the submitter.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: This proposal should be evaluated on its own rather than depending upon the acceptance of Proposal 13-77. This proposal should be Rejected for two reasons. First, Power Sources is the topic of the entire Section 695.3 and should not be a subsection further down in the section. Second, the paragraph reference in NFPA 20 is not related to "Power Source".

13-87 Log #2865 NEC-P13 **Final Action: Reject**
(695.3(B)(1))

Submitter: James S. Nasby, Master Control Systems, Inc.
Recommendation: Revise text to read as follows:

695.3(B)

(1) Generator Capacity. An on-site generator(s) used to comply with this section shall be of sufficient capacity to allow normal starting and running of the motor(s) driving the fire pump(s) while supplying all other simultaneously operated ~~load~~ <u>load(s) while meeting the voltage drop requirements of 695.7.</u> Automatic shedding of one or more optional standby loads in order to comply with this capacity requirement shall be permitted. A tap ahead of the on-site generator disconnecting means shall not be required. The requirements of 430.113 shall not apply.

Note: Text Strikeouts (~~Text Strikeouts~~) and <u>Text Underlines</u> indicate revisions to existing text.

Substantiation: There are frequent and serious field problems under sized gen-sets. Ditto when there are long cable runs from the gen-set. Most gen-set sizing soft ware applications programs do NOT take this requirement into account. In other words, most of these programs are not designed for fire pump applications.

There were no Comments on this Proposal.

Panel Meeting Action: Reject

Panel Statement: The material is already covered in the existing 695.7.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-88 Log #3617 NEC-P13 **Final Action: Accept in Part**
(695.4(A))

Submitter: John Gill, CRS Engineering
Recommendation: [Add to paragraph]When the power source is supplied by on-site generator(s), the supply conductors shall connect to a generator disconnecting means dedicated for the purpose of serving the fire pump. The disconnecting means shall be located in a separate enclosure from other generator disconnecting means, or in a switchboard or switchgear assembly.

Substantiation: Articles 445 and 700 recognize that a single generator(or mutliple generators operating in parallel) often serve multiple standby systems: emergency, legally-required, or optional. Currently, the language of article 695 is vague as to what point is the "source" when using a generator. The proposed language clarifies the requirements for connection to generators and coordinates them with above-mentioned articles as well as with paragraph 695.3(B)(1). Switchboards and switchgear provide reliable protection and separation of the conductors and overcurrent device from damage when it is not practical to install disconnecting means in a separate switch/breaker enclosure.

Panel Meeting Action: Accept in Part

Change the first word from "When" to "Where", and delete "or in a switchboard or switchgear assembly" at the end of the second sentence.

Panel Statement: This proposal (with the panel's revisions) clarifies Section 695.4 (A) & (B). It would be incorrect to include the proposed revisions as submitted in the proposal because the disconnecting means for the fire pump iis required to be isolated.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

SWAYNE, R.: The wording is not clear and there could be a misinterpretation of the direction of power flow. An alternative wording, such as "...the supply conductors shall be fed from a generator disconnecting...", would be clearer.

13-89 Log #2739 NEC-P13 **Final Action: Accept in Principle**
(695.4(B))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77.

This action will be considered by the Panel as a Public Comment.

Submitter: Jim Pauley, Square D Company
Recommendation: Revise 695.4(B) as shown below to read as follows:

(B) Supervised Connection.

(1) <u>Number of Disconnecting Means.</u>

<u>a. General.</u> A single disconnecting means and associated overcurrent protective device(s) shall be permitted to be installed between ~~a remote~~ <u>the fire pump</u> power source <u>(s)</u> and one of the following:

(1) A listed fire pump controller
(2) A listed fire pump power transfer switch
(3) A listed combination fire pump controller and power transfer switch

b. Feeder Sources. For systems installed under the provisions of 695.3(B)(2) only, ~~such~~ additional disconnecting means and associated overcurrent protective device(s) shall be permitted as required to comply with other provisions of this Code.

c. On-Site Standby Generator. Where an on-site generator is used to supply a fire pump, an additional disconnecting means and associated overcurrent protective device(s) shall be permitted to be located on or at the generator.

(2) Overcurrent Device Selection.

a. General. ~~The overcurrent~~ Overcurrent protective device(s) , other than those installed between the on-site generator and the fire pump controller or fire pump transfer switch, that are unique to the fire pump loads shall be selected or set to carry indefinitely the sum of the locked-rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment when connected to this power supply. The requirement to carry the locked-rotor currents indefinitely shall not apply to conductors or devices other than overcurrent devices in the fire pump motor circuit(s).

b. On-Site Standby Generators. Overcurrent protective devices between an on-site standby generator and a fire pump controller shall be selected and sized to allow for instantaneous pickup of the full pump room load, but shall not be larger than the value selected to comply with ~~according to~~ 430.62 to provide short-circuit protection only.

(3) Disconnecting Means. All disconnecting devices ~~and overcurrent protective devices~~ that are unique to the fire pump loads shall comply with items a through d. ~~695.4(B)(1) through (B)(5).~~

a. ~~(2)~~ **Features and Location .** [keep existing 2005 text]

b. ~~(3)~~ **Disconnect Marking.** [keep existing 2005 text]

c. ~~(4)~~ **Controller Marking.** [keep existing 2005 text]

d. ~~(5)~~ **Supervision.** [keep existing 2005 text]

Substantiation: The objective of this proposal is to provide the user with an easier means to find the rules applicable to a supervised disconnect and overcurrent device. The current language of 695.4(B) mixes the following elements in an unclear manner:

1) Number of disconnecting means allowed (B – main paragraph)
2) Overcurrent protection for generator supplied circuits (B – last paragraph)
3) Feeder requirements (B – last paragraph)
4) Overcurrent protection (again) – (B)(1)
5) Disconnecting means features and markings (B)(2), (3), (4) and (5)

The user is left with a few potential conflicts and some gaps to fill. For example, the requirement for generator OCP sizing is in conflict with (B)(1) – which applies. It is unclear whether the "single disconnecting means" requirement includes or excludes a disconnect that may be on the generator itself.

The proposal is an effort to rearrange the material to make it more usable and remove the perceived conflicts. Titles have been provided to better direct the user to the specific rule they are looking for. In the existing text, it is very difficult to even find the requirement for sizing the overcurrent devices between the stand-by gen set and the FP controller because it is buried in a paragraph at the end of 695.4(B) main text, even though the issue deals with OCP sizing which is covered in (B)(1).

Here is a synopsis of the changes:

1) The requirements are split into three basic sets of rules. Those for the number of disconnecting means, those for the overcurrent protection and those for the disconnecting means itself. They are split in this manner to avoid having more than three levels of subdivision which is prohibited in the style manual.

2) Number of disconnecting means is split into the General Requirements and uses the existing text from 695.4 (B). The words "remote" were deleted from the source because it is redundant. All sources are remote unless the electric fire pump generates its own power.

3) The "Feeder Source" provisions that were in the last paragraph of 695.4(B) are now their own sublevel and the text from the existing code is used. The word "such" is deleted because it is no longer needed since the text is in its own identified rule.

4) A new item "c" is added to clarify that the "single disconnecting means" is not intended to prohibit the on-site generator from having its own disconnect. This is a point of confusion today. If you interpret the current language literally, a disconnect would not be permitted downstream of the generator supplied disconnect. The general interpretation today is that the "single disconnecting means" referred to in the main rule is in addition to a disconnect at the generator.

5) Proposed (B)(2) is intended to cover the rules applicable to overcurrent protective devices. The main rule in item "a" is the existing rule requiring that the OCP be sized to carry locked rotor current. The additional underlined wording in this rule is to eliminate the conflict between locked rotor sizing and 430.62 sizing for the generator circuit OCP. In addition the words "that are unique to the fire pump loads" come from the last sentence of 695.4(B) last sentence.

6) New item (B)(2)b is a relocation of the text from the second sentence of existing 695.4(B) last paragraph regarding the sizing of the OCP in the generator circuits. A revision has been made to this text to pick up the requirement in NFPA 20 [9.6.5] that the OCP in the generator circuit be sized to pick up the instantaneous pump room load. However, the maximum sizing of the OCP should still be directed by the reference to 430.62 as in the present code.

7) New item (B)(3) is to pick up all of the rules associated with the Disconnecting Means itself. The main paragraph is the text from the last sentence of the last paragraph of 695.4(B). The text has been modified to remove the reference to overcurrent protection since it is now covered in (B)(2).

8) The existing 695.4(B) (2), (3), (4) and (5) now become items a, b, c and d under new item (3). Since all of these rules deal with the disconnecting means in some manner, this relocation is appropriate. The text from the 2005 NEC remains in all of these sections. The title "Features and Location" was chosen for item "a" because the list of items apply to the features expected of the disconnect and the location of the disconnect.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel action and statement on Proposal 13-77 should satisfy the intent of the submitter.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: This proposal should be evaluated on its own merits rather than depending upon the acceptance of Proposal 13-77. The proposal should be Accepted because the recommendations provide a more logical arrangement of requirements.

13-90 Log #1836 NEC-P13 **Final Action: Accept**
(695.4(B)(1))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77.

Technical Correlating Committee understands that the Panel Action was to add a new second sentence in 695.4(B)(1) and the existing second sentence now becomes the third sentence.

This action will be considered by the panel as a public comment.

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician

Recommendation: Revise as follows:

Overcurrent Device Selection. The overcurrent protective device shall be selected or set to carry indefinitely the sum of the locked rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment when connected to this power supply. The next standard overcurrent device shall be used in accordance with 240.6.

Substantiation: Limitations need to be put in place that any overcurrent device in the access of locked rotor should not be used.

Panel Meeting Action: Accept

Panel Statement: This action correlates and is incorporated into Proposal 13-77.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: The purpose of this section is to set a lower limit on the overcurrent device. As written, the overcurrent device is always required to be larger than the locked rotor currents. This proposal should be Accept in Principle by inserting "permitted to" so that the wording would read "...device shall be permitted to be used...".

ZGONENA, T.: I am not certain 1) what is the intent of the added text and 2) if it accomplishes what the submitter intended.

1) 240.4(B) and (C) already cover the selection of the overcurrent device rating. As such, I am not certain what the added text accomplishes. 240.4(C) permits the overcurrent device rating to be the next higher standard rating per 240.6 provided it does not exceed 800 amperes. The added text seems to amend the 800 ampere limitation in 240.4(C) and allow the higher standard rating in all cases. We do not believe this was the intent of the panel.

2) The submitter's substantiation states: "Limitations need to be put in place that any overcurrent device in the access (we believe he meant "excess") of locked rotor should not be used." This does not correlate with his proposal as allowing the next standard overcurrent device will result in the overcurrent device being rated in excess of the locked rotor current. The proposal accomplishes the opposite of what the substantiation requests.

13-91 Log #3618 NEC-P13 **Final Action: Reject**
(695.4(B)(2)3.)

Submitter: John Gill, CRS Engineering

Recommendation: [Add an exception to item (3)] Supervised disconnecting means may be installed in a separate, dedicated vertical section of a switchboard or switchgear.

Substantiation: The commentary in the 2005 NEC Handbook for Article 700.9(B) recognizes that switchboards provide substantial physical protection and separation of conductors and devices for emergency circuits. Particularly in the case with multiple generators operating in parallel to supply the emergency loads and a fire pump, it is infeasible to have the fire pump disconnecting means in a totally separate enclosure. To do so would actually reduce the

reliability of the supply to the pump since it would remove the pump supply from the common bus array and not take advantage of the redundancy provided by multiple generators. Another example is where multiple or network utility service is provided to a facility with a "main-tie-main" or "primary-alternate source" switchgear configuration. Forcing the pump disconnecting means out of the switchgear reduces the reliability by eliminating the redundancy of the multiple sources.
Panel Meeting Action: Reject
Panel Statement: The present wording is clear. Also, in violation of Section 695.4(B)(2)(3)
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
ELKINS, D.: This proposal should be accepted in principle using the wording in the recommendation provided by the submitter of Proposal 13-93. See comment on Proposal 13-93.
SWAYNE, R.: This proposal should be Accept in Principle with the words "switchboard or" deleted from the proposed wording. Switchgear construction, as contrasted with switchboard construction per UL Standards, provides for complete physical isolation between vertical sections and is the equivalent of a separate enclosure.

13-92 Log #2347 NEC-P13 **Final Action: Accept**
(695.4(B)(2)(4))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.
Recommendation: Delete "contemporaneous" and replace with "inadvertent operation at the same time would be unlikely".
Substantiation: Use Webster's definition of "contemporaneous". We shouldn't have to take Webster with us to understand the NEC.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-93 Log #3279 NEC-P13 **Final Action: Reject**
(695.4(B)(2)3. Exception)

Submitter: Richard A. Holub, Middletown, DE
Recommendation: Add text to read as follows:
695.4(B)(2)(3) Exception: In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified persons service the installation, disconnecting means may be located within equipment that feeds loads other than the fire pump as long as the other 3 provisions of 695.4(B)(2) are met.
Substantiation: As currently written, the code prevents the feeder from originating in a switchgear lineup with other disconnects, even when multiple feeders are used as allowed in 695.3(B). This practice has been done within industrial establishments for many years, without incident. Correct labeling, and locking of the disconnect as required in this section prevent s inadvertent opening of the disconnect. As long as the switch gear is protected from damage resulting from a fire or operational incident, and the other requirements are followed, the switchgear should be permitted to feed the fire pump controller as has been done in the past.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Plant equipment should not interfere with fire pump installation.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
ELKINS, D.: This proposal should be accepted. This proposed exception recognizes a method of supplying firewater pumps in industrial concerns which was widely used prior to the 2005 code. The addition of the separate switchgear, cable/bus, six cable terminators and bus connections to meet the "not located within equipment that feeds other loads..." requirement added in 2005 actually lowers the installation's reliability in these industrial installations since additional equipment must be connected to the bus.
SWAYNE, R.: See Negative Comment to Proposal 13-91.

13-94 Log #2749 NEC-P13 **Final Action: Reject**
(695.4(C) (New))

Submitter: David Sroka, Turner Falls, MA
Recommendation: Revise text to read:
"Disconnecting Switch Fuses. A spare set of fuses of the correct rating shall be stored near the switch. A placard indicating the proper type of fuses shall be required."
Substantiation: Reduces downtime. Also, should reduce chance of improper replacement fuses being installed.
Panel Meeting Action: Reject
Panel Statement: Whereas fire pump supply overcurrent devices are only providing short-circuit protection, a blown fuse is an indication of a major electrical failure. Refusing and reclosing onto the fault may cause more damage and will not reduce the "downtime". Replacement fuses can be obtained with the other material needed to repair the electrical damage that caused the fuse to blow.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-95 Log #3551 NEC-P13 **Final Action: Reject**
(695.5(B)(3))

Submitter: Patrick Gaffney, Ronk Electrical Industries, Inc.
Recommendation: Add new text to read:
695(B)(3) Phase Converters. Where the only source of utility power is a single-power source, a phase converter may be utilized as one of the multiple sources of supply to a three-phase fire pump motor. [Note: Change current B(3) to B(4).]
Substantiation: In many instances, fire pumps are being installed where three-phase utility service is not available. Phase converters offer the ability to connect to a utility source as either a primary or back-up source, in addition to a generator (or other source, to provide three-phase power to three-phase fire pump motors.)
Panel Meeting Action: Reject
Panel Statement: Phase converters are not considered reliable sources.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
SWAYNE, R.: It is not apparent that the Panel Statement is technically correct. The Affirmative vote is made to Reject the Proposal because there was insufficient substantiation to determine if a phase converter is or is not reliable. What are the alternatives if three phase power is not available? See Negative Comment to Proposal 13-81.

13-96 Log #988 NEC-P13 **Final Action: Accept**
(695.6(A))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise first sentence:
Supply conductors shall be physically routed outside a building or structure and shall be installed as service ~~entrance~~ conductors in accordance with Part III and Part IV of Article 230.
Substantiation: Edit. Per the FPN to the definition of Service-Entrance Conductors, Underground System, there may be no service-entrance conductors. The Style Manual indicates references should not be made to entire articles.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: The indicated limitation on which Parts of Article 230 are to be considered is not inclusive of all sections that need to be complied with. Section 230.6 (Conductors Considered Outside the Building) and Section 230.9 (Clearances) are sections that should also apply and they are not in part III or Part IV.

13-97 Log #2740 NEC-P13 **Final Action: Accept in Principle**
(695.6(A) and (B))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77.
This action will be considered by the Panel as a Public Comment.
Submitter: Jim Pauley, Square D Company
Recommendation: Revise 695.6(A) as shown below:
~~(A) Service~~ Supply Conductors.
(1) Services and On-Site Power Production Facility. Service conductors and s ~~upply~~ conductors supplied by an on-site power production facility shall be physically routed outside a building(s) and shall be installed as service entrance conductors in accordance with Article 230. Where supply conductors cannot be physically routed outside of buildings, they shall be permitted to be routed through the building (s) where installed in accordance with 230.6(1) or 230.6(2).
(2) Multi-Building Campus Style Complexes. Where a fire pump is wired under the provisions of 695.3(B)(2), ~~this requirement shall apply to~~ all supply conductors on the load side of the service disconnecting means that constitute the normal source of supply to that fire pump shall be physically routed outside a building(s) and shall be installed as outside feeder conductors in accordance

with Article 225. Where the feeder conductors cannot be physically routed outside of buildings, they shall be permitted to be routed through the building(s) where installed in accordance with 230.6(1) or 230.6(2).

Exception to (A)(2) : Where there are multiple sources of supply with means for automatic connection from one source to the other, the requirement for routing outside of the building(s) shall apply only to those conductors on the load side of that point of automatic connection between sources.

(3) Supervised or On-Site Standby Generator Connections. ~~**(B) Circuit Conductors.**~~ Fire pump supply conductors on the load side of the final disconnecting means and overcurrent device(s) permitted by 695.4(B) or conductors that connect directly to an on-site generator shall comply with all of the following:

(1) a. Independent Routing. The conductors shall be kept entirely independent of all other wiring.

(2) b. Associated Fire Pump Loads. ~~They~~ The conductors shall supply only loads that are directly associated with the fire pump system.

(3) c. Protection from Potential Damage. ~~, and they~~ The conductors shall be protected to resist potential damage by fire, structural failure, or operational accident.

(4) d. Inside a Building. When routed through a building, ~~they~~ the conductors shall be installed ~~be permitted to be routed through a building(s)~~ using one of the following methods:

(1) Be encased in a minimum 50 mm (2 in.) of concrete

(2) Be within an enclosed construction dedicated to the fire pump circuit(s) and having a minimum of a 1-hour fire resistive rating

(3) Be a listed electrical circuit protective system with a minimum 1-hour fire rating

Exception to (3)(d) : The supply conductors located in the electrical equipment room where they originate and in the fire pump room shall not be required to have the minimum 1-hour fire separation or fire resistance rating, unless otherwise required by 700.9(D) of this Code.

In addition,

Delete 695.6(B)

Renumber the existing (C) through (H) to become (B) through (G).

Substantiation: The objective of this proposal is intended to rearrange the material in 695.6(A) and (B) to make it clear to the user how the rules apply. The present text mixes rules for service conductors (the first two sentences of 695.5(A)) with feeder rules (last sentence of 695.6(A)) and then has “other conductors” in item (B). This creates confusion because the exception in (A) deals with feeders only (because it applies on the load side of the automatic connection), but is located in a manner that is being interpreted to apply to service conductors.

The rearrangement breaks the paragraph into services, multi-building campus applications and finally supervised connections. The following is a summary of the changes:

1) The wording has been revised to specifically apply (1) to both service conductors and the conductors from an on-site power production facility. This clears up the confusion in the present text where the title says “service conductors”, but the text starts out with “supply conductors”. It would appear that the conductors in question are either service conductors, supply conductors from an on-site supply (which are not service conductors by definition).

2) The campus distribution provision is broken out into its own section and given a title. feeders which are covered in (A)(2) for the campus style distribution permission in 695.3(B)(2) or feeders covered by 695.6(B) which are on the load side of the supervised disconnect. In addition, since these are by definition feeder conductors so a reference has been added to Article 225 to ensure ensure that the wiring methods and installation are covered. Finally, a sentence has been added to allow routing through the building in accordance with 230.6(1) or (2) to parallel the provision for services.

3) The exception is now placed under (A)(2) and is modified to specifically note what it applies to. The wording “for routing outside of the building” has been added to make it clear what is being “excepted” by the exception.

4) The old 695.6(B) now becomes 695.6(A)(3) so that all of the conductor routing rules appear in a single subsection. Text has been added to the main paragraph to make it clear that the provisions not only apply on the load side of the final disconnecting means, but also to the conductors that connect directly to a gen set that has no overcurrent protection. Article 445 would allow a direct connection to the generator if the conductors are sized at 115% of the full load current. Presently it is not clear what should be done with the conductors from a generator. In addition, the revision applies to “direct connection” since the assumption would be that a gen set that has OCP and a disconnect would already be covered by the language “on the load side of the final disconnecting means”.

5) The main paragraph presently contains four separate provisions (independent routing, associated loads, protection from damage and rounting inside a building) that are applicable to these conductors. The revision breaks these elements out into separately numbered items so that they are clearly identified.

6) The exception modified to make it clear that it applies to (3)(d) which covers the 1 hour fire rating issue.

7) 695.6(B) is deleted because it is now part of (A)(3) and the remaining sections are renumbered.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel action incorporated the recommended text into Proposal 13-77. This action correlates with Proposals 13-77, 13-82, and 13-89, which should meet the intent of the submitter.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: The Panel Statement is faulty in that it refers to two proposals for which no action was taken, but action is referred to Proposal 13-77. See Negative Comments on Proposals 13-77 and 13-89.

13-98 Log #2546 NEC-P13 **Final Action: Accept in Principle**
(695.6(B)(2))

Submitter: Kenneth W. Birringer, University of Michigan

Recommendation: Revise text to read as follows:

Be within an enclosed construction dedicated to the fire pump circuit(s) and assembled according to listed details having a minimum of a 1-hour fire resistive rating.

Substantiation: (1) As a reviewer of over two billion dollars worth of new buildings and building renovations in the past three years, I have repeatedly seen installations that indicate a misunderstanding of how to obtain a minimum 1 hour fire resistive rating. Haphazardly slapping two layers of gypsum wallboard over fire pump circuits does not necessarily provide the required fire resistive rating. Requiring the construction to be assembled according to listed details should result in installations that actually have the required rating.

(2) To coordinate better with 700.9(D)(1)(4).

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 13-99 which should satisfy the intent of the submitter.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-99 Log #3018 NEC-P13 **Final Action: Accept**
(695.6(B)(2))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal is modified by the Panel action on Proposal 13-100.

Submitter: James Conrad, Tyco Thermal Control

Recommendation: Revise 695(B)(2) as follows:

Be ~~within an enclosed construction~~ protected by a fire-rated assembly listed to achieve a minimum fire rating of 1-hour and dedicated to the fire pump circuit(s). ~~and having a minimum of a 1-hour fire resistive rating.~~

Substantiation: This proposal is to harmonize 695.6(B)(2) with 700.9(D)(4) that requires the enclosure or assembly to be listed. Listed fire-rated assemblies have been tested and are described in the UL Fire Resistance Directory or other Listing Directories.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

ZGONENA, T.: The TCC needs to be advised that the action on this proposal needs to be correlated with the action on 13-100.

13-100 Log #3017 NEC-P13 **Final Action: Accept**
(695.6(B)(2) & (3))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 13-99.

This action will be considered by the Panel as a Public Comment.

Submitter: James Conrad, Tyco Thermal Control

Recommendation: Revise 695.6(B)(2) & (3) as follows:

(2) Be within an enclosed construction dedicated to the fire pump circuit(s) and having a minimum of a 2 ~~1~~ hour fire resistive rating

(3) Be a listed electrical circuit protective system with a minimum 2 ~~1~~ hour fire rating.

Substantiation: NFPA 72 requires 2-hour survivability of the notification circuits and the interconnecting wiring of the fire command center. To achieve this 2-hour rating you can use 2-hour rated cables, a 2-hour fire-rated enclosure or if permitted by the AHJ the automatic sprinkler system of the building. If an electric driven fire pump is supplying the sprinkler system, then the fire pump circuits should be protected for 2-hours ensuring the operation of the sprinkler system for 2-hours.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: The criteria for notification is not the same as the criteria for operation of a fire pump. Within the one hour time window, the fire department has time to connect to their equipment and then the fire pump operation is not critical. Notification is necessary for a longer time to insure that personnel evacuate the facility. There is insufficient justification to increase the rating from one hour to two hours. If NFPA 20, which is technically qualified to make that judgment, has not required the additional time, then this Panel has no justification for the change.

Comment on Affirmative:

ZGONENA, T.: The TCC needs to be advised that the action on this proposal needs to be correlated with the action on 13-99.

13-101 Log #2986 NEC-P13 **Final Action: Accept in Principle**
(695.6(B)(3))

TCC Action: The Technical Correlating Committee understands that the Panel Action on this Proposal modifies 695.6(B)(3) and the FPN is to be located before the Exception.

Submitter: Robert Konnik, Rockbestos-Suprenant

Recommendation: Add an FPN to 695.6(B)(3) to clarify that the installation of an electrical circuit protective system requires special precautions as follows:

<u>FPN: Electrical circuit protective systems for fire rated cables, require special precautions for installation to maintain circuit integrity ratings, UL Guide information for category FHIT contains information on proper installation requirements to maintain the fire rating, including raceway support, vertical support, testing of boxes, compatibility of pulling lubricants and ground wires, and whether splices are allowable.</u>

Substantiation: There has been some confusion on installation of electrical circuit protective system fire rated cables to maintain fire ratings, UL Guide information was updated to provide useful information to clarify installation requirements.

Panel Meeting Action: Accept in Principle

Revise the proposed fine print note to read as follows:

FPN: UL guide information for electrical circuit protective systems (FHIT) contains information on proper installation requirements to maintain the fire rating.

Panel Statement: The panel revised the proposed FPN so as not to limit to these requirements.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

HORNBERGER, B.: The FPN text is non mandatory. By providing the reference to this UL Guide, confusion will be created concerning whether the requirements in the UL Guide are mandatory or not." Manufacturers should provide adequate instructions on the proper installation of the product and installers should not have to refer to the UL Guide card for proper installations. See 110.3

13-102 Log #2593 NEC-P13 **Final Action: Reject**
(695.6(D))

Submitter: Jebediah Novak, Cedar Rapids Electrical JATC

Recommendation: Revise text to read as follows:

"...short circuit only. Where a tap is made to supply a fire pump, the wiring shall be treated as service conductors. ~~in accordance with 230.6.~~

Substantiation: With the change made to this section in the 2005 NEC, the reference to 230.6 is no longer necessary.

Panel Meeting Action: Reject

Panel Statement: The requirements in Section 230.6 shall be complied with. The phrase must not be deleted.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

STAFFORD, T.: It is recognized that the submitter is trying to prevent repetitious code. It is felt that the duplication in this instance allows for a better understanding of 695.6(D).

13-103 Log #3427 NEC-P13 **Final Action: Accept**
(695.6(D))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Insert the words "Except for protection of transformer primaries provided in 695.5(C)(2)" at the beginning of the second sentence.

Substantiation: This proposal reverses the panel action that accepted Comment 13-64 in the last cycle. A motion was supposed to have been made at the Annual Meeting to set this action aside, but the previous question was ordered before that motion could be made. The text in question was part of this submitters original rewrite of Article 695 that was accepted almost in its entirety for the 1999 NEC, as Proposal 15-98. The substantiation for that text pointed to required correlation with 695.5(C)(2). The submitter of Comment 13-64 clearly did not understand the context for 695.5(C).

A 695.5(C) transformer is one that is typically rated in megavolt amperes, and used in conjunction with a campus-type distribution for which the fire pump load is a negligible portion of its capacity. This is why 695.5(C) allows these transformers to supply other loads, and why these transformers are protected under the customary rules in 450.3, and the feeders protected per 215.3 [all as covered in 695.5(C)(2)]. To do otherwise is to impair the safety of the entire electrical system during all times when the fire pump is not operating, by over sizing the protection settings. In fact, with respect to feeders the panel action on Comment 13-64 creates a direct conflict between 695.6(D) and 695.5(C)(2). The overcurrent protection rules in 695.5(C)(2) require feeder protection per 215.3; and now 695.6(D) requires feeder conductors to be protected against short circuits only. For a transformer feeder that supplies a multiplicity of non-fire pump loads, that creates the preconditions for fire that the pumps will then have to extinguish.

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

STAFFORD, T.: It is not believed that the NEC is in error as according to the submitter's substantiation. It is desired that transformer primaries remain covered as specified by 695.5(C)(2).

13-104 Log #1196 NEC-P13 **Final Action: Accept in Part**
(695.6(D) Exception No. 2)

Submitter: Lanny G. McMahill, Phoenix, AZ

Recommendation: Delete Exception No. 2.

Substantiation: The exception makes no sense and conflicts with 695.5(B). Fire pump circuit conductors, service or feeder, are either a direct or supervised connection. A direct connection must comply with 695.6(A) and a supervised connection must comply with 695.6(B). 430.52 is not equivalent protection.

Panel Meeting Action: Accept in Part

Retain Exception No. 2, but at the end of the first paragraph of the exception, delete "or protected in accordance with 430.52."

Panel Statement: The panel agrees with the submitter that 430.52 is not equivalent protection but retained the remainder of the exception.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-105 Log #2344 NEC-P13 **Final Action: Reject**
(695.6(E))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Add "flexible metal conduit".

Substantiation: Flexible metal conduit is commonly installed as a raceway for motor supply conductor and it should be permitted for a fire pump motor. The only flexible raceways presently recognized are the two types of liquidtight flexible conduit.

Panel Meeting Action: Reject

Panel Statement: Pump rooms may have an accumulation of water or have a sprinkler system installed; therefore protection against water intrusion into a raceway is required. Flexible metal conduit is not listed for a wet environment.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-106 Log #2345 NEC-P13 **Final Action: Reject**
(695.6(E))

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Recommendation: Add "electrical metallic tubing"

Substantiation: EMT would be permitted to supply the controller, the present restriction on the use of EMT to supply the pump should be removed.

Panel Meeting Action: Reject

Panel Statement: Raceways from the controller to the motor are exposed in the pump room. EMT does not have sufficient mechanical strength to prevent damage to conductors.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-107 Log #1949 NEC-P13 **Final Action: Accept in Principle**
(695.8 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77.

This action will be considered by the Panel as a Public Comment.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Recommendation: Add text to read as follows:

<u>695.8 Protective Devices. Where protective devices are installed in the onsite power source circuits at the generator, such devices shall allow instantaneous pickup of the full pump room load.</u>

Substantiation: This information is extracted from NFPA 20-2003, paragraph 9.6.5 and should be included in NFPA 70-2008.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel believes that the committee action on Proposal 13-77 accomplishes the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This proposal should be evaluated on its own merits rather than depending upon the acceptance of Proposal 13-77 and should be Rejected. The requirements of Section 695.4 already require the overcurrent protection to carry the locked rotor currents indefinitely. Carrying locked rotor current is a more severe requirement than "pump room load". Load current is considerably less than locked rotor current.

13-108 Log #2866 NEC-P13 **Final Action: Reject**
(695.8 (New) or new text to 695.6(F))

Submitter: James S. Nasby, Master Control Systems, Inc.
Recommendation: Add a new 695.8 to read as follows:
695.8 Field Connections. No undervoltage, phase loss, frequency sensitive, or other sensor(s) shall be installed that automatically or manually prohibit electrical actuation of the motor contractor.
Or add above new text to 695.6(F).
Substantiation: This was NFPA-20-2006 Proposal 20-94 Log #117; which adds new 10.3.4.6 and which had **Final Action**: Accept in Part and with Substantiation:
Field problems with modifications to controllers. Clearer direction.
This was also NFPA-20-2006 Proposal 20-138 Log #106; which adds new 12.3.5.3.2 and which had **Final Action**: Accept in Principle and with Substantiation:
Field problems with modifications to controllers. Clearer direction.
There were no Comments on these Proposals.
Panel Meeting Action: Reject
Panel Statement: Section 695.14(B) prohibits these devices in the control wiring to the pump. Field connections should be subject to this section.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-109 Log #2848 NEC-P13 **Final Action: Accept in Principle**
(695.13 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77.
This action will be considered by the Panel as a Public Comment.
Submitter: James S. Nasby, Master Control Systems, Inc.
Recommendation: Revise text to read as follows:
~~9.3.2.2.6~~ **695.13 Junction Boxes** . Where fire pump wiring to or from a fire pump controller is routed through a junction box, the following requirements shall be met.
~~9.3.2.2.6.1~~ **695.13(A)** The junction box shall be securely mounted. [Note: This clause deleted by FIM-AAA]
~~9.3.2.2.6.2*~~ **695.13(B)** Mounting and installing of a junction box shall not violate the enclosure Type ~~(NEMA~~) rating of the fire pump controller(s).
~~A.9.3.2.2.6.2 See also clause 10.3.3 (Enclosures for Electric Drive Controllers).~~
~~9.3.2.2.6.3*~~ **695.13(C)** Mounting and installing of a junction box shall not violate the integrity of the fire pump controller(s) and shall not affect the Short Circuit Rating of the controller(s).
~~A.9.3.2.2.6.3 See 10.1.2.1, controller short circuit (withstand) rating.~~
~~9.3.2.2.6.4~~ **695.13(C)** As a minimum, a ~~National Electrical Manufacturers Association (NEMA)~~ Type 2, dripproof enclosure (junction box) shall be used. The enclosure shall be listed ~~for the subject~~ <u>to match the fire pump controller enclosure</u> Type rating.
~~9.3.2.2.6.5~~ **695.13(D)** Terminals, junction blocks, splices, ~~and the like~~ , when used, shall be listed.
Or renumber as appropriate.
Note: Text Strikeouts ~~(Text Strikeouts~~) and <u>Text Underlines</u> are FIM-AAA Committee ROP Actions.
Note: There was **<u>no</u>** Public Comments on this Proposal.
Substantiation: A number of fire pump controllers have had very large rectangular cut outs made to them and fitted with flimsy unrated junction boxes for the purposes of terminating cables. This violates both the enclosure Type (NEMA) rating and the controller's withstand (short circuit) rating. This makes the reliability of the controller an unknown factor and also leads to dangerous installations
This was NFPA -20-2006 Proposal 20-76 Log #111 which was final action: Accept in Principle in Part.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel action and statement on Proposal 13-77 should satisfy the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This proposal should be evaluated on its own merits rather than depending upon the acceptance of Proposal 13-77 and should be Rejected. None of the proposed subsections provide any significant change to what presently exists. Proposed subsection 695.13(A) is already a requirement of this Code in Section 314.23 and does not need to be repeated. Proposed subsections 695.13(B) and 695.13 (C) are unnecessary because doing so, as in the substantiation, would make the installation unacceptable. The second proposed subsection 695.13(C) is problematic. If the controller is required to be NEMA 2, then all of the equipment and wiring should be required to be drip proof, not just junction boxes.

13-110 Log #2852 NEC-P13 **Final Action: Accept in Principle**
(695.14 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77.
This action will be considered by the Panel as a Public Comment.
Submitter: James S. Nasby, Master Control Systems, Inc.
Recommendation: Revise text to read as follows:
~~9.3.2.2.8*~~ **695.14 Raceway Terminations.**
~~9.3.2.2.8.1~~ **695.14(A)** Listed conduit hubs shall be used to terminate raceway (conduit) to the fire pump controller.
~~9.3.2.2.8.2~~ **695.14(B)** The ~~NEMA~~ Type rating of the conduit hub(s) shall be at least equal to that of the fire pump controller.
~~9.3.2.2.8.3~~ **695.14(C)** The installation instructions of the manufacturer of the fire pump controller shall be followed.
~~9.3.2.2.8.4~~ **695.14(D)** ~~No alterations~~ <u>Alterations</u> to the fire pump controller <u>shall be approved by the authority having jurisdiction.</u> ~~without the express specific approval of the manufacturer of the controller.~~
~~A.9.3.2.2.8~~ FPN: All fire pump controllers are required to be rated as NEMA (UL) Type 2 as a minimum. Conduit hobs must be also. Controllers rated at higher levels, such as Type 12, Type 4, Type 4X and etc., require correspondingly rated hubs in order for the controller Type rating to be valid. Failing to do so ~~will void the controller's warranty and~~ may cause controller damage or destruction by entry of water into the controller.
Note: Text Strikeouts (~~Text Strikeouts~~) and <u>Text Underlines</u> are FIM-AAA Committee ROP Actions.
Note: There were Comments Logs #19 & #21 on this proposal, both APA, APR or APP. Wording above needs to be verified against to the ROC. The FPN wording was struck.
Substantiation: Field problems, damage and confusion. Many controllers have been ruined by not following the above either at time of installation or after water damage due to not following the above requirements. The resulting loss of fire protection is often lengthy due to having to replace the entire controller or having to rebuild same in the field. The water damage situation is compounded by the fact that more and more pump rooms are sprinklered. Note that clause numbering is based on another submitted proposal. Also, if adopted, this text should also become extract text material for NFPA 70 Article 695.
This was NFPA-20-2006 Proposal 20-78 Log #100; which had **Final Action**: Accept in Principle.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel action and statement on Proposal 13-77 should satisfy the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This proposal should be evaluated on its own merits rather than depending upon the acceptance of Proposal 13-77 and should be Rejected. The proposed Section 695.14(D) would given an unqualified Authority Having Jurisdiction (AHJ) the authority to accept an installation that neither the manufacturer or the testing agency would do without the appropriate testing. The proposed text in Proposal 13-77, Section 695.12(D) specifically prohibits the AHJ from approving alterations to the fire pump controller. See also Negative Comment on Proposal 13-109.

13-111 Log #2849 NEC-P13 **Final Action: Accept in Principle**
(695.15 (New))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the Technical Correlating Committee action on Proposal 13-77.
This action will be considered by the Panel as a Public Comment.
Submitter: James S. Nasby, Master Control Systems, Inc.
Recommendation: Revise text to read as follows:
~~9.3.2.2.7*~~ **695.15 Listed Electrical Circuit Protective System to Controller Wiring.**

~~9.3.2.2.7.1*~~ **695.15(A)** ~~When used, Type MI (Mineral Insulated) cable~~ Where single conductors (individual conductors) are used, they shall be terminated in a separate junction box and in accordance with NFPA 70. Single (Individual) conductors shall not enter the fire pump enclosure separately.

~~A.9.3.2.2.7.1~~ FPN Cutting slots or rectangular cutouts in a fire pump controller will violate the ~~NEMA~~ Enclosure Type rating, and the controller's Short Circuit (Withstand) rating and will void the manufacturer's warrantee. See also NFPA 70 Articles 300.20 and 322, for example, for further information.

~~9.3.2.2.7.2*~~ **695.15(B)** Where required by the manufacturer of a ~~Listed~~ listed Electrical Circuit Protective System or by NFPA 70 or by the Listing ~~agency~~ , the raceway between a junction box and the fire pump controller shall be sealed at the junction box end as required and per the instructions of the manufacturer ~~or listing agency.~~

~~A.9.3.2.2.7.2~~ FPN When so required, this seal is to prevent flammable gases from entering into the fire pump controller.

Note: Text Strikeouts (~~Text Strikeouts~~) and Text Underlines are FIM-AAA Committee ROP or ROC Actions.

Note: There were Comments Logs #17, #18 & #20 on this proposal, both APA, APR, or APP. Wording above needs to be verified against to the ROC. The FPN wording was struck.

Substantiation: Clarification of field confusion and questions. Except for conductors smaller than #8 AWG, most or all electric drive fire pump controllers inlet terminals are rated and Listed for use with stranded wire and not solid wire. Some Listed Electrical Circuit Protective Systems make use of solid wire and require splicing to regular stranded cables for proper termination in the controller. Note that clause numbering is based on another submitted proposal. Also, if adopted, this text should also become extract text material for NFPA 70 Article 695.

This was NFPA-20-2006 Proposal 20-77 Log #99; which had **Final Action**: Accept in Principle.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel action and statement on Proposal 13-77 should satisfy the intent of the submitter.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: This proposal should be evaluated on its own merits rather than depending upon the acceptance of Proposal 13-77 and should be Rejected. This proposal would prohibit the use of conduit and wire to a controller and only permit cable. The substantiation does not address any problem with conduit and wire but only discusses problems with terminating solid conductors. If the terminations are not listed for use with solid conductors, then doing so would be a violation of this Code by not complying with the listing instructions as required in Section 110.3(B).

ARTICLE 700 — EMERGENCY SYSTEMS

13-112 Log #1450 NEC-P13 **Final Action: Reject**
(700.1, FPN 3)

Submitter: Ryan Jackson, West Valley City, UT

Recommendation: Revise as follows:

700.1 Scope. Remain unchanged.

FPN No. 1: Remain unchanged.

FPN No. 2: Remain unchanged.

FPN No. 3: Emergency systems are ~~generally~~ often installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters, sports arenas, health care facilities, and similar institutions. ~~Emergency system may also provide power for such functions as ventilation where essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communications systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions~~ .

FPN No. 4: Remain unchanged.

FPN No. 5: Remain unchanged.

Substantiation: This fine print note in many instances creates havoc. The word "may" that is used seems to give permission to the designer to include any of the equipment listed in the FPN. This is inaccurate, because only equipment that is required to be an emergency load is permitted to be an emergency load. While I find the fine print notes in Articles 700 and 701 quite valuable, this particular fine print note goes a little bit too far.

A companion proposal to delete the FPN in 701.2 is being made to help correlate.

Panel Meeting Action: Reject

Panel Statement: The existing FPN is not mandatory text. The text proposed to be deleted simply points out that loads other than lighting may be "required" to be supplied by such systems.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

(Note: Sequence 13-113 was not used)

13-114 Log #688 NEC-P13 **Final Action: Reject**
(700.4(B))

Submitter: James Filippone, Port Authority of NY & NJ

Recommendation: Revise 700.4(B) to read as follows:

Tested Periodically. Systems shall be tested periodically on a schedule acceptable to the authority having jurisdiction to ensure the systems are maintained in operating condition. Systems shall be tested by the building owner at least every five years under maximum load conditions to verify that they still have sufficient capacity and rating.

FPN: Passenger electric elevators and freight electric elevators permitted to carry passengers must be tested in the down direction with 125 percent of their rated load inside the car and freight elevators must be tested with rated load inside the car. See ASME A17.1 Safety Code for Elevators and Escalators for information on which elevators must be capable of operating in the down direction with 125 percent of rated load.

Substantiation: Requiring testing on a 5-year basis under maximum load conditions is reasonable to ensure that these critical systems still have sufficient capacity and rating and are available to emergency responders. Over time the loads that the system must supply can change significantly. Experience indicates that systems that were once sufficient can be no longer sufficient due to added loads. The system is tested under maximum capacity upon installation and the means to test it periodically must be provided. However, testing periodically under maximum load conditions is not specifically required. Information on the required load for elevators is provided for testing purposes.

Panel Meeting Action: Reject

Panel Statement: Testing frequency is not the responsibility of an installation code. The existing text directs the reader to other references or requires an adequate installation to permit testing.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-115 Log #1630 NEC-P13 **Final Action: Reject**
(700.6)

Submitter: Peter Ramus, Town of Hanover

Recommendation: Add the following text:

Where an outdoor housed generator set is equipped with a readily accessible disconnecting means individually capable of being locked in the open position and the generator set is located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.

Substantiation: Some AHJs view the generator enclosure as an outer enclosure of the generator disconnect while others require the disconnect handle to be visible from the building. Where gen set enclosures "within sight" of the building are approved, a more practical and efficient layout of equipment can be achieved with no degradation of safety.

In either case, the outdoor gen set is usually not visible from the ATS or generator distribution located within the building. Requiring provisions for lockout at the generator disconnect will provide a higher degree of safety in situations where the only disconnect for an alternate source service is remote and not visible from the equipment served.

Panel Meeting Action: Reject

Panel Statement: Section 700.6 deals with transfer equipment, not disconnecting devices. This is already covered in 700.12(B)(6), 701.11(B)(5), and 702.11.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

STAFFORD, T.: See my comment to the affirmative on 13-9.

13-116 Log #88 NEC-P13 **Final Action: Reject**
(700.6(A))

Submitter: Paul Hamann, Lake Forest, IL

Recommendation: Delete from 700.6(A) the following text:

" ~~Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment.~~ "

Revise 700.6(D) as follows:

(D) Use. ~~Transfer equipment shall supply only emergency loads~~ . If transfer equipment is installed then all emergency loads shall be fed through the transfer equipment.

Substantiation: I have seen designs where the whole building is fed through the transfer equipment. The generator was feeding emergency circuits, standby circuits, optional standby circuits and normal circuits.

Panel Meeting Action: Reject

Panel Statement: The recommended deleted text prohibits "inadvertent interconnection of the normal and emergency sources of supply," not the "loads" as referenced to in the submitter's substantiation. The transfer equipment shall supply only emergency loads in order to maintain emergency system reliability.

In addition, the revision to 700.6(D) may not meet requirements of the Local authority having jurisdiction in all locations.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-117 Log #2369 NEC-P13 **Final Action: Accept**

(700.6(C)(1) (New))

Submitter: Lawrence A. Bey, Cummins Power Generation

Recommendation: Add a new 700.6(C)(1) as follows:

(1) Automatic transfer switches, rated 600 VAC and below, shall be listed for emergency system use.

Substantiation: A problem can exist under normal operation of the transfer switch where the two power sources are both energized and out-of-phase relative to each other, as is often the case with one utility source and an on-site generator set(s). Typically, both power sources are energized during exercise and test of the generator. When the two power sources are not synchronized, as much as twice rated voltage may be seen across the transfer switch contacts. At twice rated voltage, sustained arcing across the contact air gap may cause a source-to-source short circuit during transfer operation. This potential problem exists unless the transfer switch equipment has been designed and tested to be suitable for switching between out-of-phase power sources (three phase systems displaced by 120 electrical degrees and single phase systems displaced by 180 degrees), or has otherwise been examined and determined to be suitable for switching between out-of-phase power sources.

Unless listed, a problem of uncoordinated overcurrent protection may exist should the transfer switch close into a short circuit. The short circuit fault that cleared the upstream overcurrent device may still be present when the transfer switch operates and closes on the alternate source. A listed transfer switch has been tested to 1) safely withstand a short circuit with contacts closed until the upstream overcurrent clears; and 2) close into short circuit with contacts open. Closing into a short circuit is typically a more severe test than withstand due to arcing and out gassing of contact material as the contacts move together. Transfer switch equipment that has not been tested for closing into a fault may not be adequately protected by the alternate source upstream overcurrent device. Generally this is transfer switch performance that must be established by high current laboratory testing on a complete as-built assembly. The recognized national standard for testing Automatic Transfer Switch Equipment is ANSI/UL 1008.

This proposed requirement as placed under 700.6(C) would specifically apply only to automatic transfer switches. The intent is to not rule out other types of transfer system transfer equipment identified for emergency system use and acceptable to the AHJ under 700.6(A). The proposed requirement would not apply to systems rated above 600 volts, but would apply 600 volts and below where UL Safety Standard 1008 provides ANSI testing specifications.

Panel Meeting Action: Accept

Add as a last sentence to existing 700.6(C) instead of a new (C)(1)

Panel Statement: This places the text in a better position.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

ELKINS, D.: This proposal should be rejected. The substantiation describes an engineering error which can occur in misapplication of a transfer switch. As the NEC says in 90.1(C) "This code is not intended as a design specification or an instruction manual for untrained persons." Listing a transfer switch as required in this proposal will not prevent misapplication.

13-118 Log #833 NEC-P13 **Final Action: Accept in Principle**

(700.9)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal so that the text is in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

Submitter: Thomas H. Wood, Cecil B. Wood Inc.

Recommendation: Revise Section 700.9 to read as follows:

II. Circuit Wiring.

700.9 Wiring, Emergency System.

(A) Identification. All boxes and enclosures (including transfer switches, generators, and power panels) for emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system.

(B) Distribution. Wiring from an emergency source that supplies a vertical switchboard or individual disconnects with overcurrent protection grouped at one location shall be permitted to serve a combination of emergency, legally required and optional standby systems in accordance with (1) through (3).

(1) Switchboards or individual enclosures shall be permitted to be supplied by a single feeder.

(2) Legally required and optional standby circuits shall not originate from vertical sections or enclosures that supply emergency circuits.

(3) Separate switchboard sections shall be provided for each emergency, legally required, or optional standby system.

(C) ~~(B)~~ Wiring. Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in (1) through (4):

(1) Wiring from the normal power source located in transfer equipment enclosures

(2) Wiring supplied from two sources in exit or emergency luminaires (lighting fixtures)

(3) Wiring from two sources in a common junction box, attached to exit or emergency luminaires (lighting fixtures)

(4) Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the emergency circuit supplied by the unit equipment.

Substantiation: The separation of emergency system wiring from all other wiring is required by NEC 700.9, and is clearly understood. Just where the separate emergency, legally required standby, or optional standby systems feeders originate at or near the generator is less well defined. The supply tap box on generators equipped with disconnects with or without overcurrent protection is not generally designed or manufactured for installation of multiple devices to serve separate circuits for emergency loads, fire pumps, legally required standby loads, and optional standby loads, although AHJs have interpreted the mandated separation of wiring to require just that. In addition, such an interpretation does not consider parallel operation of multiple generators, which require some type of distribution to separate the systems downstream of the paralleling bus. The recommended revisions clarify that, for both single generator and parallel generator installations, separation of the circuits served by an emergency generator(s) source may be accomplished using a single feeder from the generator to separately mounted enclosed overcurrent devices or a distribution switchboard that separates emergency circuits in different vertical sections from other loads.

Separately enclosed overcurrent devices or overcurrent devices mounted in separate vertical sections of a distribution switchboard will provide physical separation of the different systems or branches and define that the origin of the emergency, legally required standby, and optional standby systems is at the feeder overcurrent protection device, not the generator terminals.

This proposal was developed by the Task Group directed by the TCC to consider comments 13-6 and 13-71 and if appropriate to develop proposals for the 2008 NEC. The task group consisted of the following: Thomas H. Wood; Chair (Chair NFPA-70, panel 13), Hugh O. Nash; (Chair NFPA 99), Douglas S. Erickson; (Chair NFPA 110), James Costley; and Herb Whittall.

Panel Meeting Action: Accept in Principle

Revise existing section 700.9(B) by adding a new Number (5) to (B) to read as follows:

(5) Wiring from an emergency source shall be permitted to supply any combination of emergency, legally required, or optional loads in accordance with (a), (b) and (c).

(a)From separate sections of a vertical switchboard, with or without a common bus, or from individual disconnects mounted in separate enclosures.

(b)The common bus or separate sections of the switchboard or the individual enclosures shall be permitted to be supplied by single or multiple feeders without overcurrent protection at the source.

(c)Legally required and optional standby circuits shall not originate from the same vertical switchboard section, panelboard enclosure or individual disconnect enclosure as emergency circuits.

Exception to (5) (b). Overcurrent protection shall be permitted at the source or for the equipment, provided the overcurrent protection is selectively coordinated with the down stream overcurrent protection.

Panel Statement: The panel has placed revised text in a new list Item (5) in Section 700.9 (B) to clearly identify that the original separation requirements from the source to the loads or from the source distribution overcurrent protection to the loads is to remain unless modified by (1) – (5).

The revised text will further clarify that it is permitted to supply any combination of emergency, legally required or optional loads from a single feeder or from multiple feeders or from separate vertical sections of a switchboard that are supplied by either a common bus or individually.

The use of an overcurrent protective device at the source or for the equipment is a matter of reliability and design. While the requirements in (5) (b) maintain the highest degree of reliability, the exception to (5) (b) will permit the use of an overcurrent device at the source or for the equipment. The coordination of the overcurrent protection at the source or for the equipment with the downstream overcurrent protection requirement in the exception will maintain the highest degree of reliability possible while allowing protection for conductors and equipment. The revised text in the main paragraph should also make it clear that circuits supplying emergency loads are not to be combined in panelboard enclosures with circuits supplying other loads.

Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

NASBY, J.: NEMA is voting negative on the panel action because the new text creates additional confusion. This issue stemmed from a misinterpretation made by CMP 13 during the 2005 NEC cycle that implied you could not have a switchboard supplied from a generator that would then supply transfer switches for emergency, legally required and optional systems even though this type of installation was common. The panel is now left trying to resolve that confusion. The panel action does attempts to address part of the issue, but does so in a manner that is confusing. Here are a few of the issues that must be dealt with in order to arrive at an acceptable solution:

1) What is a "vertical switchboard" as stated in (5)(a)? Does that panel mean vertical sections of a switchboard?

2) The text discussing "separate sections" will be easily misinterpreted. The implication to some AHJ's is that there must be physical barriers between sections. Standard switchboards are open between sections. The wording could be improved by stating "From different vertical sections of a switchboard, …"

3) It's unclear what the text is saying in (5)(b). Is the implication that I cannot have a main overcurrent device in the switchboard or at the generator? The text implies that it is simply acceptable to omit overcurrent protection that may be necessary for proper protection.

4) The proposed exception is not suitable for this section of Article 700. 700.9 deals with separation of circuits with the objective of keeping non-emergency circuits from having a physical impact on emergency circuits. The exception related to selective coordination has nothing to do with this objective.

Comment on Affirmative:

SWAYNE, R.: Section 700.9(C)(5)(a) is not a complete sentence as are (b) and (c). A possible addition of "Wiring" at the beginning and "shall be permitted" at the end would correct the English. Also, in the Exception, the word "for" should be replaced with "at" to have the sentence make sense.

13-119 Log #1306 NEC-P13 **Final Action: Reject**
(700.9(B))

Submitter: Barbara Cooper, Peerless Lighting
Recommendation: Revise text to read:

700.9(B) Wiring. Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box or cabinet. Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in (1) through (4):

(2) Wiring supplied from two sources in <u>single unit</u> exit or emergency luminaires (lighting fixtures), <u>or a linear run of luminaires containing exit or emergency luminaires.</u>

Substantiation: Linear runs of fluorescent luminaires containing emergency sections are common in many installations. Physical separation of the normal and emergency wiring is not always possible due to size of the luminaire and real estate available for wiring; therefore, the only option for feeding emergency sections in a run is to provide separate drops for each emergency section. Adding a drop for each emergency fixture increases the chance of failed connection, it increases the risk of error in field wiring and it increases the possibility of damaging wire insulation. Allowing the emergency wiring harness to be run through non-emergency luminaires in the same raceway does not inherently increase the risk to normal feed circuits. This has been standard practice in this (linear fluorescent lighting) Industry for over thirty years and should be allowed in the revised edition of the NEC.
Panel Meeting Action: Reject
Panel Statement: Mixing of emergency and nonemergency wiring is prohibited except at the emergency luminaire.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-120 Log #2941 NEC-P13 **Final Action: Accept in Principle**
(700.9(B) (New))

Submitter: Rand Veerman, Town of Normal
Recommendation: Add new text as follows:

700.9(B) Distribution. An emergency distribution switchboard supplied by a single feeder or feeders in parallel from alternate power source(s) shall be permitted to supply legally required and optional standby systems from separate sections. The wiring in each section shall only be comprised of those conductors serving that system.

Substantiation: Generators operating in parallel must supply a switchboard containing individual closing breakers for each generator. Individual feeders in accordance with Article 445 supply each closing breaker. Each closing breaker supplies the internal buss array and are operated by sophisticated electronic synchronizing controls.

The overcurrent protection device supplying a transfer switch with a feeder is the source distribution point for determining system class e.g...emergency, legally required, optional standby, not the bushings on the generator. This new additional section should clarify long-standing issues for generator installations from both designers and the inspection community.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel action on Proposal 13-118 should satisfy the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-121 Log #3024 NEC-P13 **Final Action: Accept in Principle**
(700.9(D))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for comment.
Submitter: Barry F. O'Connell, Tyco Thermal Controls
Recommendation: Revise 700.9(D) as follows:

(D) Fire protection emergency systems shall meet the additional requirements in 700.9(D)(1) and (D)(2) in assembly occupancies for not less than 1000 persons or in buildings above 23 m (75 ft) in height with any of the following occupancy classes; assembly, educational, residential, detention and correctional, business, and mercantile, <u>and the essential electrical system for hospitals as described in 517.30.</u>

Substantiation: The Code should specifically call for fire protection of the emergency system wiring in hospitals. It is common practice in hospital design. The intent is expressed in 700.1 FPN No. 3:

FPN No. 3: Emergency systems are generally installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters, sports arenas, health care facilities, and similar institutions.
Panel Meeting Action: Accept in Principle

<u>Revise proposed revision to 700.9(D) as follows:</u>

"... ~~and~~ mercantile <u>, and feeders for essential electrical systems for hospitals and health care facilities.</u>

Panel Statement: The proposal was accepted by adding "health care facilities" and deleting the reference to be consistent with the Code format.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 10 Negative: 3
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

ELKINS, D.: This proposal should be rejected. The proposal in affect adds requirements for Article 517 Health Care Facilities which is handled by Panel 15. This addition creates a correlation problem with the requirements generated by this other panel. It is suggested that this proposal be forwarded to Panel 15 for action within the wording of Article 517.

HORNBERGER, B.: Essential Electrical system requirements for the Health Care industry are the responsibility of Panel 15. The TCC should instruct Panel 15 to reference 700.9(D) in 517.

SWAYNE, R.: Article 517 has requirements for Essential Electrical Systems which are not exactly the same as Emergency Systems. The requirements for hospitals and health care facilities should be confined to Article 517 unless it references other Articles.

13-122 Log #3437 NEC-P13 **Final Action: Accept in Principle**
(700.9(D))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for information.

Submitter: Edward Walton, Draka Cableteq
Recommendation: Add Health Care Facilities to the list of occupancy classes covered by this section.
Substantiation: Omission may lead some to believe it is not required for Health Care.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel action and statement on Proposal 13-121 should satisfy the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 10 Negative: 3
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

ELKINS, D.: See explanation of negative vote on Proposal 13-121.

HORNBERGER, B.: Please see my Negative Vote comment on 13-121.

SWAYNE, R.: See Negative Comment to Proposal 13-121.

13-123 Log #3436 NEC-P13 **Final Action: Reject**
(700.9(D)(1))

Submitter: Edward Walton, Draka Cableteq
Recommendation: Revise Feeder-Circuit Wiring to Emergency Circuit Wiring. Emergency circuit wiring shall meet one of the following conditions.
Substantiation: Currently, the first hazard that might cause emergency wiring circuit failure is only minimized in the area of the feeder circuit and the feeder circuit may be located very close to the generator which leaves a large amount of the emergency wiring unprotected [reference 700.9(C)]. Because this protection applies to large assembly occupancies and buildings with critical egress requirements, it is the responsibility of this code section to adapt this proposal or except wiring other than feeder circuits from the requirements of 700.9(C) Wiring Design and Location.

The stated objection has been potential problems that may be associated with incorporating this requirement beyond feeder circuits. Presently, any one of six different methods may be used to provide this protection. Included are simple routing techniques or the substitution of plastic building wire with circuit integrity building wire (available from several nationally recognized sources). Given these options, I do not know of any branch circuit application that cannot be satisfied with one of the six allowable options.
Panel Meeting Action: Reject
Panel Statement: The level of protection required is warranted of a feeder supplying many emergency circuits. Section IV covers circuits, and does not require such protection. The submitter has not offered technical substantiation to warrant the text revision.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-124 Log #3022 NEC-P13 **Final Action: Accept in Principle**
(700.9(D)(1)(4))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal so that the text is in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
Submitter: James Conrad, Tyco Thermal Control
Recommendation: Revise 700.9(D)(1)(4) as follows:
4) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 1 hour <u>and dedicated to the emergency wiring circuits.</u>
Substantiation: Although it is already stated in 700.9(B) that the wiring of the emergency system shall be "kept entirely independent" it is a common practice to put the normal and emergency circuits in a fire rated shaft or assembly running through the building. By adding the word "dedicated" to option (4) will make it clear that the fire-rated assembly can only contain the emergency circuits.
Panel Meeting Action: Accept in Principle
Revise proposed wording to read as follows:
<u>...which is dedicated to the emergency wiring circuits.</u>
Panel Statement: Editorial clarification.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: The Proposal mixes the need to maintain electrical separation with the need for separation. There is no substantiation that a one hour rated enclosure containing both normal and emergency systems is more susceptible to fire. The one hour rating should also be adequate to permit wiring under Article 695 also.

13-125 Log #2985 NEC-P13 **Final Action: Accept in Principle**
(700.9(D)(1)(2), FPN (New))

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add an FPN to 700.9(D)(1)(2) to clarify that the installation of an electrical circuit protective system requires special precautions as follows:
<u>FPN: Electrical circuit protective systems for fire rated cables, require special precautions for installation to maintain circuits integrity ratings. IL Guide information for category FHIT contains information on proper installation requirements to maintain the fire rating, including raceway support, vertical support, testing of boxes, compatibility of pulling lubricants and ground wires, and whether splices are allowable.</u>
Substantiation: There has been some confusion on the installation of electrical circuit protective system for fire rated cables to maintain fire ratings. UL Guide information was updated to provide useful information to clarify installation requirements.
Panel Meeting Action: Accept in Principle
See panel action on Proposal 13-101.
Panel Statement: The panel action and statement on Proposal 13-101 should satisfy the intent of the submitter.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This proposal should be Accepted in Principle in the same manner that Proposal 13-101 was Accepted in Principle. Proposal 13-101 was for Article 695. This proposal is for Article 700 which covers different wiring.

13-126 Log #3015 NEC-P13 **Final Action: Accept in Principle**
(700.9(D)(3) (New))

Submitter: James Conrad, Tyco Thermal Control
Recommendation: Add new 700.9(D)(3) as follows:
<u>(3) Generator Control Wiring Methods. Control conductors installed between the transfer switch and the emergency generator shall be kept entirely independent of all other wiring and shall meet one of the following conditions:</u>
<u>(1) Be encased in a minimum 50 mm (2 in.) of concrete</u>
<u>(2) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 1 hour and dedicated to the emergency wiring circuits</u>
<u>(3) Be a listed electrical circuit protective system with a minimum 1-hour fire rating.</u>
Substantiation: The generator start circuit is a critical component of the emergency system and should have the same protection as the feeder-circuit wiring. This same requirement is currently in 695.14(F) to ensure the starting of the generator when used for an alternate source of power.
Panel Meeting Action: Accept in Principle
Accept the proposal in principle but revise proposed new 700.9(D)(3), to read as follows:
<u>(3) Generator Control Wiring. Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.9(D)(1).</u>
Panel Statement: The panel action should meet the intent of the submitter and does not repeat requirements. It also maintains existing approved methods for this protection.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-127 Log #581 NEC-P13 **Final Action: Reject**
(700.12)

Submitter: Richard Pokorny, City of Marshfield, WI / Rep. Wisconsin Chapterof IAEI
Recommendation: Add text to read as follows:
The enclosure of the alternate source of power located outdoors for emergency systems shall be located at least 10 ft from a combustible wall and at least 20 ft from an outdoor electrical transformer or normal power distribution equipment. These dimensions may be reduced by one-half where a noncombustible barrier is installed that extends at least 3 ft beyond each side of the transformer. The height of the barrier shall be at least one foot above the top of the transformer or alternate power source, whichever is higher.
Substantiation: This is a proposal to add wording into the NEC dealing with distance between alternate sources of emergency power and outdoor transformers or distribution equipment. At the present time, there is not any guidance as to an enforceable distance between these units needed to keep portions of building premises wiring systems operational. Under a scenario where either one of these items are having a problem, components of emergency systems needs to be operational. There appears to be a need to keep a safe distance away so that one disaster does not take out the other unit. With real estate prices being so high, areas utilized for transformers and alternate power systems are shrinking to the point that designers are placing these items as close as possible. In many cases, installers are barely meeting safe working clearances required by Article 110 much less looking at how fragile this spacing "safety net" is. An emergency source of power should not be compromised because a portion of a building, an electrical distribution system or a transformer is burning or has another severe problem.

700.12 is vague as it merely states that the "Equipment shall be designed and located to minimize the hazards...". This does not give the AHJ any dimensions to enforce this section of a critical code article.

A good starting point for looking at existing rules would bring ten feet (10 ft or 3.05 meters) to the forefront, as a number of large transformer installation codes require this distance from a combustible building. A fire in the building, exterior distribution equipment or a transformer fire would be less likely to affect a generator or other alternate power source. With this in mind, a legally required standby source of power should also be located at least 3.05 m (10 ft) from a combustible wall. At this point, the logic would be that two components, such as a generator and transformer shall have a 3.05 m (10 ft) safety zone from each other, that does not overlap the other component's zone. Therefore, 6.1 m (20 ft) would be the acceptable distance between the two units. If one is on fire, there would still be a 3.05 m (10 ft) safe zone beyond the conflagration at the other unit that would permit personnel to work on problems with the particular unit that is needed at that time. As designers still want to minimize any spacing requirement, this dimension should be able to be reduced if the design of the area includes a noncombustible assembly. The dimensions and composition of this barrier listed in the proposal are the same as the ones stated in the State of Wisconsin's Public Service Commission - PSC

114 and have proved to be an acceptable standard for transformer placement for many years. I have provided copies of the applicable portion of this document. PSC 114.317 C 2. states this distance requirement from combustible walls. PSC 114.317 D 2. indicates the dimensions for a noncombustible barrier that will allow a reduction to this dimension for cramped building sites.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: Separation requirements may vary from jurisdiction to jurisdiction. The NEC is not intended to be a design manual. No substantiation was provided for the 10 foot distance.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-128 Log #3079 NEC-P13 **Final Action: Reject**

(700.12)

Submitter: Joseph A. Hertel, Safety and Buildings

Recommendation: In addition to the requirements in 700.12 (intro):

The enclosure of the alternate source of power located outdoors for emergency systems shall be located at least 10 ft from a combustible wall and at least 20 ft from an outdoor electrical transformer or normal power distribution equipment. These dimensions may be reduced by one-half where a noncombustible barrier is installed that extends at least 3 ft beyond each side of the transformer The height of the barrier shall be at least one foot above the top of the transformer or alternate power source, whichever is higher.

Substantiation: NFPA 110 provides specific requirements where a generator used for emergency standby power is located indoors. If it is located outdoors, there is a very general statement in 700.12 to consider the hazards involved. Is there hazard if the emergency generator is located immediately adjacent to the service gear or the utility transformer? This language would provide some degree of reliability to the installation in the event of a catastrophic failure of the normal power supply.

Panel Meeting Action: Reject

Panel Statement: Separation requirements may vary from jurisdiction to jurisdiction. The NEC is not intended to be a design manual. No substantiation was provided for the separation distance. See also panel action and statement on Proposal 13-127.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-129 Log #539 NEC-P13 **Final Action: Reject**

(700.12(B)(6))

Submitter: Joel A. Rencsok, Electrical Designs Inc.

Recommendation: Delete the words "or pass through" to read as follows:

(6) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve ~~or pass through~~ the building or structure.

Substantiation: See225.31. When this section was added, emergency systems feeder were passing through building to building where the feeder could be taken out of service by a fire in the first building. Indoor generator sets still have to comply with 225.31.

Panel Meeting Action: Reject

Panel Statement: Emergency system feeders passing through another building must meet the requirements of 700.9. Installations meeting this requirement may pass through another building.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-130 Log #547 NEC-P13 **Final Action: Reject**

(700.12(B)(6), FPN (New))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Add a new FPN as follows:

(6) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.

<u>FPN: 250.32(D) provides grounding and bonding requirements for building or structure disconnecting means that are remote from the building or structure.</u>

Substantiation: This proposal is an effort to provide some correlation between the rules in 250.32(D) which provides requirements for grounding and bonding where the building or structure disconnecting means is mounted remote from the building or structure as it would be if it were located on the generator assembly in accordance with this section. A companion proposal is being submitted to 250.32(D) to correlate with the provisions of 700.12(B)(6).

Panel Meeting Action: Reject

Panel Statement: Section 250.32(D) applies and should not have to be referenced. This section of Article 700 is concerned with the need for a disconnect, not grounding.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 12 Negative: 1

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

SWAYNE, R.: This proposal should be Accepted. The purpose of FPNs is to direct the reader to Articles or Sections of this Code that may not be obvious. The grounding and bonding requirements for equipment in separate buildings or structures is not well understood and many questions arise as to correct action. This is a desirable place for this FPN.

13-131 Log #1283 NEC-P13 **Final Action: Reject**

(700.12(B)(6), FPN (New))

Submitter: Mark R. Hilbert, State of New Hampshire

Recommendation: Revise text to read:

(6) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.

Add a new fine print note to read as follows:

<u>FPN: Section 225.36 provides additional requirements for the suitability of the disconnecting means.</u>

Substantiation: The recommendation for this fine print note is an attempt to identify the requirements of 225.36 for the building disconnecting means, which in this case will be located at the generator, to be "suitable for use as service equipment." Additionally, this FPN will help identify an often overlooked requirement, clarify that even though it is remote to the building, the disconnecting means must be suitable for use as service equipment and that the requirement in 225.36 is not amended by 700.12(B)(6).

Panel Meeting Action: Reject

Panel Statement: The disconnect required in 700.12(B)(6) is not intended to be a service disconnect.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-131a Log #CP1303 NEC-P13 **Final Action: Accept**

(700.12(D))

Submitter: Code-Making Panel 13,

Recommendation: In 700.12(D), first sentence, change "Where acceptable to the authority having jurisdiction", to "Where approved".

Substantiation: To comply with NEC Manual of Style. The definition of "approved" is defined in Article 100 as "acceptable to the authority having jurisdiction".

Panel Meeting Action: Accept

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-132 Log #430 NEC-P13 **Final Action: Reject**

(700.12(F) Exception No. 2 (New))

Submitter: Robert Sogla, Mayer Electric, Local 292 JATC

Recommendation: Add new text as follows:

<u>Exception No. 2: If appropriate lighting in an area is provided from an optional standby system, and all means of egress from that area, then the unit equipment shall be connected to the optional standby system circuit that is providing lighting in those areas. And it shall be provided with a lock-on feature.</u>

Substantiation: When the local utility goes out, many companies have provided power to keep their employees working. Should that source fail, they are without egress lighting if the batteries have since drained. If they were connected to the optional standby system, they would work upon "its" failure, giving them a way out.

Panel Meeting Action: Reject

Panel Statement: This can be an option for the building owner and should not be required.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-133 Log #2183 NEC-P13 **Final Action: Accept**
(700.16)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal so that the text is in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
Submitter: Dann Strube, Strube Consulting
Recommendation: Revise text to read as follows:
"...failure of any individual lighting element such as ~~the burning out of a light bulb~~ a lamp, cannot...".
Substantiation: Article 410 covers lamps but does not cover light bulbs.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-134 Log #3321 NEC-P13 **Final Action: Accept in Principle**
(700.23 (New))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal so that the text is in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
Submitter: Steven R. Terry, ETC
Recommendation: Add a new section to read:
700.23 Dimmer Systems. A dimmer system containing more than one dimmer and Listed for use in emergency systems may be used as a control device for energizing emergency lighting circuits. Providing that all branch circuits fed from the dimmer system cabinet comply with the wiring methods of Article 700, it shall be permissible, upon failure of normal power, for the dimmer system to selectively energize only those branch circuits required to provide a required minimum required emergency illumination.
Substantiation: Dimmer systems Listed for emergency use under UL 924 and containing more than one dimmer are now common. These systems include a method to sense failure of normal power and selectively energize branch circuits fed from the dimmer cabinet using a reliable method, regardless of the setting of control switches or panels normally used to control the dimmer system. This is generically known as "Bypass Mode". Such systems are typically supplied by a feeder that is transferred from normal to emergency power by an upstream UL 1008 Transfer Switch.
These dimmer systems often contain a greater number of branch circuits than those required to maintain minimum emergency illumination levels.
The design and construction of modern dimming systems listed under UL 924 allows a reliable method of selectively energizing branch circuits upon loss of normal power. Clarification is needed to allow such dimming systems to energize only those circuits required for minimum emergency illumination levels, rather than all circuits in the dimmer cabinet.
Panel Meeting Action: Accept in Principle
Revised the submitter's proposed new section to read as follows:
700.23 Dimmer Systems. A dimmer system containing more than one dimmer and listed for use in emergency systems may be used as a control device for energizing emergency lighting circuits. Providing that all branch circuits fed from the dimmer system cabinet comply with the wiring methods of Article 700, it shall be permissible, upon failure of normal power, for the dimmer system to selectively energize only those branch circuits ~~required~~ necessary to provide the ~~a~~ ~~required~~ minimum required emergency illumination.
Panel Statement: The editorial revision clarifies the new text.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-135 Log #3428 NEC-P13 **Final Action: Reject**
(700.25 and 700.27)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: I. 700.25 Add a fine print note as follows:
FPN: Fuses and circuit breakers for emergency circuit overcurrent protection, where coordinated to ensure selective clearing of fault currents, increase overall reliability of the system.
II. 700.27 Delete this section.
Substantiation: This proposal restores the status of selective coordination coverage in Article 700 to that which existed in the 2002 NEC. The 2005 NEC changes are tantamount to a mandate to use fused protection at all levels of emergency systems and legally required standby systems, including branch circuits. Any doubt as to the intention of this action was surely erased in the March/April issue of *IAEI News* . With the ink barely dry on the 2005 NEC, a major fuse manufacturer announces full distribution of a fusible branch circuit panelboard. When is the last time anyone ever heard of fusible branch-circuit panelboards for sale? The article goes on to explain that of course you could use circuit breakers, but only if the available fault current during the normal connection did not exceed the instantaneous pick-up values for the upstream protective devices. This is one more battle in the probably endless attempts by the branches of the overcurrent device manufacturing segment to manipulate the code making process to influence market share.
The simple fact is there will always be systems that can't be coordinated for both emergency and normal operation. Most engineers agree that coordination under "normal" power is likely more important than coordination under emergency conditions simply because of the amount of loading/circuits involved. One major NEC expert representing a leading circuit breaker manufacturer even noted in this regard that perhaps the only way this could be done with certainty would be with electronic trip CBs and zone selective interlocking (that is, where the upstream protective device response is restrained by the downstream device.) He was prophetic indeed. The September/October issue of *IAEI News* , in an article written by the same fuse manufacturer, in fact by the very submitter of the NEC proposal in 700.27, mentioned this approach as the way to make circuit breakers coordinate for elevators, which labor under a similarly ill advised ukase on selective coordination, also placed in the NEC with no history of loss experience.
There is a more interesting dimension to this problem, however. When you consider ground faults, even when the system is running on the generator it will frequently be impossible to coordinate the levels of protection. This is critical because ground faults are a far more likely source of failures than short circuits. Take a large, heavily loaded feeder, say, 1200A loaded to 1000A, with three 400A subfeeders and a 600A subfeeder originating at a distribution panel. If the 600A subfeeder sees a 800A ground fault, it will likely take out the 1200A main because the other loads that are making it heavily loaded will continue, and the ground fault will push it over the edge. All things being equal, a 600A circuit breaker loaded to 800A (+133%) during the ground fault event will take much longer to trip than a 1200A circuit breaker loaded to 1800A (+150%).
Remember that it is simply not possible to predict how much current will flow during a ground fault, although the worst case can be easily calculated. For many such coordination studies, the worst case for fault duty is the best case for coordination; the best case for fault duty is the worst case for coordination; and coordination for various fault conditions must therefore result in different protective devices under different fault scenarios on the same feeder. The same NEC expert referred to earlier noted that, for these reasons, there may be instances where the only way to coordinate a ground fault is to add ground fault protection, and he correctly noted the confounding fact that 700.26 tries to avoid this outcome.
Panel members should carefully review the substantiation and the comments in the voting on 2005 NEC Comment 13-88, where both NEMA and UL voted against the NEC change that this proposal unwinds. They did not do so lightly. UL lists both fuses and circuit breakers and has no axe to grind, and correctly pointed out that the new language "would most likely exclude the application of circuit breakers in emergency systems." Do we seriously want to continue this burden on the design community? Not one single instance of loss experience was cited to support the changes in Article 700.
Panel Meeting Action: Reject
Panel Statement: This proposal removes the selective coordination requirement from the mandatory text and places it in a nonmandatory FPN. The requirement for selective coordination for emergency system overcurrent devices should remain in the mandatory text. Selective coordination increases the reliability of the emergency system. The current wording of the NEC is adequate. The instantaneous portion of the time current curve is no less important than the long time portion. Selective coordination is achievable with the equipment available now.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 9 Negative: 4
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
ELKINS, D.: This proposal should be accepted in principle. Instead of the FPN proposed by the submitter, it is suggested 700.27 be reworded as follows: "Overcurrent protection system design. Emergency system(s) overcurrent devices shall be applied according to the safety requirements of the specific installation. Issues such as coordination with supply overcurrent devices, reliable availability of spares, varying levels of normal or standby ground-fault levels, and overcurrent device resetting capability should be evaluated to achieve the optimal safe design."
The language adopted in 2005 presupposes safety in all installations is better served by coordination than rapid recovery of power after an outage. The 2005 code language has the effect of requiring the use of fuses in many installations involving retrofits or expansions of existing installations. Fuses cannot be reset after the cause of an outage has been determined and cleared. A spare matching fuse must be available. The 2005 code language ignores services where rapid restoration of power may be more critical to safety than short outages. This requirement limits engineering solutions and goes counter to the stated intention of the code in 90.1(C) that it "is not a design specification."
NASBY, J.: See my explanation of negative vote on Proposal 13-137.
WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: Selective coordination is a design issue, and not a code issue. There is a question of the enforceability of selective coordination. In many cases, selective coordination may exclude the application of circuit breakers in emergency systems.

13-136 Log #3501 NEC-P13 **Final Action: Reject**
(700.26)

Submitter: Jim Pauley, Square D Company
Recommendation: Revise 700.26 as shown:
700.26 Ground Fault Protection of Equipment.
(A) Not Required. ~~The~~ Alternate source s of supply f or emergency systems not covered by (B) shall not be required to have ground-fault protection of equipment with automatic disconnecting means. ~~Ground-fault~~ Indication ~~of the emergency source~~ of a ground-fault shall be provided in accordance ~~per~~ with 700.7(D).
(B) Large Systems. Where the alternate source of supply is 1500kVA or larger and is a solidly grounded wye system with more than 150V to ground, but not exceeding 600 volts phase-to-phase, ground-fault protection of equipment shall be provided in accordance with 230.95 or 215.10 for each disconnect rated 1000 amperes or more.
Substantiation: This proposal has two objectives:
1) Editorially revise the existing 700.26 requirements to make it clear that any alternate source of supply (other than those for large systems as discussed below) is not required to have GFPE with automatic disconnect.
2) The technical change in this proposal is the addition of item (B). This new provision would require GFPE to be installed on large alternate source systems. It is realized that this is different from the conventional wisdom of the past, but the panel likely recognizes that the alternate system of yesterday are not the same of today. There are very large systems being installed for alternate standby. We have recently seen systems that range from 2MW to 8MW in size. These systems not only supply emergency power, but they may also operate in parallel with the utility to provide cogeneration.

Previous thinking was that alternate systems should be exempt from GFPE because the generators would not supply enough current to be of concern relative to equipment burn-down. The view was that it created a more reliable system by deciding to withstand some level of damage of the ground-fault and provide some alarm. With the larger systems, not having GFPE not only creates a significant safety hazard, it also decreases the reliability of the system by using multiple levels of coordinated ground-fault protection.

Large standby generators being employed today typically have zero sequence reactance that is less than that of an equivalent power class transformer. For a minimum of two cycles, the generator will provide more short circuit current than an equivalent transformer. As such, the initial available fault current flow from a phase-to-ground fault can be significant. These two cycles of increased fault can have enough energy to initiate the damage sequence in the faulted equipment. Although the current levels will decrease, the damage escalates because the generator continues to supply significant amounts of current.

At the same time, the generators stator and winding will be subjected to significant thermal stresses and mechanical forces. These can partially damage or permanently damage the generators causing them to shutdown and alternate power is lost completely. Alarm indication of ground-fault is insignificant because there is generally nobody to react to the alarm and even if there is, the damage has already occurred.

The wording of the proposal is to apply the requirements for GFPE from 230.95 and/or 215.10 to an alternate source of supply that is 1500kVA or larger. These systems can deliver current levels that are of a magnitude where equipment damage can continue after the initial fault. GFPE would be applied on disconnecting means rated 1000A or greater on systems 150V to ground or greater. References to 215.10 and 230.95 would pick up the settings and testing requirements as already outlined in those sections.

In summary, it is critical to both safety and reliability of the systems that GFPE be required on these larger systems. Although the previous rule made sense with smaller alternate source systems, it no longer makes technical sense with the increase in the size of these systems.
Panel Meeting Action: Reject
Panel Statement: The submitter has not offered adequate substantiation to require GFPE on emergency systems. The existing text requires indication only but not automatic disconnecting. Automatic disconnecting may be provided but it is not required.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This proposal has merit for Accept in Principle by its more than adequate substantiation. A ground fault on a 480Y/277 volt, whether Normal or Emergency power supplied, can result in destructive damage and initiate a fire on its own. I would modify the Proposal by relating it to disconnects rated 1000 amperes or more instead of 1500 KVA. In addition, since a generator would not be classified as "service", "Section 240.13" should replace the proposed reference to "Section 230.95".

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

13-137 Log #1950 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Delete 700.27.
~~700.27 Coordination.~~
~~Emergency system(s) overcurrent devices shall be selectivity coordinated with all supply side overcurrent protective devices.~~
Substantiation: Selective coordination is recognized as a prudent design consideration for emergency and legally required circuits to maximize the reliability of a power system, however it is not practical, necessary, or even desired to require the selectivity of all overcurrent devices in the system to achieve maximum reliability. This is recognized in NFPA 110. Electrical system designs and demands differ based on the size and occupancy needs. Ensuring the maximum reliabiliy of the electrical system must be determined by the engineering professional for each facility. Although selective coordination sounds like a reasonable requirement on the surface, it can and will drive system design parameters that may make the system less reliable. It will also place restrictions on the design unnecessarily with no added benefit as discussed in IEEE Standard 242. This proposal seeks to delete the requirement for selective coordination in order to ensure that maximum reliability can be designed into the electrical system.

Conflict between NFPA Documents

The International Building Code is adopted across the vast majority of the country. Chapter 27 in IBC specifically requires compliance to NFPA 110 for emergency systems.

The electrical industry has recognized that selective coordination is not always practical or even necessary. The NFPA 110 Technical Committee for Emergency and Standby Power Systems has recognized these limitations as found in paragraph 6.5.1 by requiring the selectivity to be optimized.

"6.5.1 General. The overcurrent protective devices in the EPSS shall be coordinated to optimize selective tripping of the circuit overcurrent protective devices when a short circuit occurs."

The NFPA 110 technical committee further explains why they use the term "optimize" in Annex A.

A.6.5.1 It is important that the various overcurrent devices be coordinated, as far as practicable, to isolate faulted circuits and to protect against cascading operation on short circuit faults. In many systems, however, full coordination is not practicable without using equipment that could be undesirable for other reasons or prohibitively costly. Primary consideration also should be given to prevent overloading of equipment by limiting the possibilities of large current inrushes due to instantaneous reestablishment of connections to heavy loads.

Do I optimize the selectivity or do I coordinate all supply side devices? The NEC and NFPA 110 do not coordinate on this specific topic and industry design documents such as IEEE Standard 242 would support the position of the NFPA 110 technical committee.

Simply not "Practicable"

The implementation of selective coordination is simply not practicable in many instances. The inrush currents for a transformer or the starting current of a motor may drive a large overcurrent device that is not practicable to coordinate with the line side device. IEEE standards also note that in order to obtain a selective coordinated system, the back-up power source which is generally a generator, will be driven closer to the load in the design. Once again, the selectivity requirement is driving a design requirement that may reduce the reliability of the system. NFPA 70B recently published statistics in the annex in support of a new section entitled Reliability-Centered Maintenance. The statistics demonstrate that a major system reliability issue is with the generator starting. Selectivity drives a large single generator rather than distributed smaller generators in the system, such design is directly in opposition of the NFPA 70B statistics when evaluating the entire system for reliability. One design consideration to resolve this reliability issue is to parallel smaller generators. Paralleling multiple generators ensures that I have a power source even if one of the generator sets does not start or is undergoing maintenance. If a generator does not start, the electrical system is not paralyzed due to no power source. Selective coordination is of no use if there is no power for the electrical distribution system to deliver. The requirement for selective coordination, as presently found in the NEC, prohibits solid design consideration that would enhance the reliability of the system.

Selectivity will not enhance performance of the system in specific instances

A review of IEEE documents such as the Buff book or IEEE Standard 242 recognizes that loss of selectivity between two overcurrent devices may have no impact on the system performance. Page 565 in IEEE Standard 242-1986 notes two examples: The first is the primary and secondary protection of a transformer. Requiring selective coordination of the secondary overcurrent is unnecessary where a single main exists on the secondary of the transformer. No reliability is gained by the present restriction in the NEC while placing a design and financial burden on the designer and owner. Another simple example is a load protective device and the next upstream device. Specifically, consider a feeder breaker or fused switch supplying a motor control center. NEC 430.94 requires protection of a motor control center bus by either an integral main or overcurrent device located ahead of the MCC. Based on the size of the motor loads, selectivity will drive the size of the MCC to be larger than necessary where large motors may have been designed into the system to enhance electrical maintenance safety practices. Once again, selective coordination of the feeder and the MCC main overcurrent devices provides no enhancement to the electrical system reliability, but impacts the electrical system design with no added benefit.

Selective coordination of overcurrent protection devices in the system must be addressed by the electrical system design engineer in order to ensure the most reliable electrical system. No data has been presented in the past NEC development cycles that supports selective coordination as a safety or reliability issue existing in the industry. Attempting to govern this performance parameter in the NEC is unnecessary and may reduce the reliability of critical electrical systems as recognized in other industry standards.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-135.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 9 Negative: 4
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

ELKINS, D.: This proposal should have been accepted in principle as noted in my explanation of negative vote on Proposal 13-135.

NASBY, J.: The panel failed to address the substantive points of the proposal. A number of issues have been established that must be addressed:

1) There is a material conflict between NFPA 110 and the NEC that creates a dilemma for the system designer. This design conflict within two NFPA documents is not acceptable.

2) A conflict between the text of 700.27 and the definition of selective coordination in Article 100.

3) Numerous industry standards that point to selectivity impacting reliability negatively or without benefit.

4) Unnecessary selective coordination increases overcurrent device size and can unnecessarily increase the arc-flash hazard on the electrical system.

NFPA 110 is a long standing document which recognizes the importance of selective coordination by requiring selective coordination of overcurrent devices to be “optimized”. The International Building Code, adopted by many states, points to NFPA 110 for installing emergency system installations. The NFPA 110 technical committee recognizes selective coordination is prudent to enhance the performance of the electrical system, however, by adding the word “optimized” the committee permits the engineering community to provide the most reliable electrical system.

There is clearly a technical correlation issue between NFPA 110 and the NEC on selective coordination. Furthermore, the definition of selective coordination in article 100 of the NEC requires the “localization of an overcurrent condition to restrict outages to the circuit or equipment affected.” The proposal substantiates that the present rule goes well beyond the definition of localizing an overcurrent condition, by requiring “all” overcurrent devices to be selectively coordinated. No other industry document supports all overcurrent devices being selectively coordinated.

The wording in 700.27 must be revised to align with NFPA 110, the definition of selective coordination, and IEEE standards which recognize selective coordination as not being necessary for “all” overcurrent device as follows:

700.27 Coordination. Selective Coordination of overcurrent protective devices shall be optimized.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-138 Log #2168 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:

700.27 Coordination. Emergency system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices. <u>Series rated combinations as covered in 110.22 and 240.86 shall not be permitted where selective coordination of emergency system overcurrent protective devices is required.</u>

Substantiation: Based on the concept of series rated combinations of overcurrent devices and how they are required to operate, be tested and evaluated, it would seem to be rather difficult to comply with the requirements of this section.

Panel Meeting Action: Reject
Panel Statement: Selective coordination can be achieved with series rated combinations
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

13-139 Log #2514 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Revise text to read as follows:

700.27 Coordination. Emergency system(s) overcurrent devices shall be selectively coordinated <u>in the long-time portion of the time-current curves</u> with all supply side overcurrent protective devices. <u>Coordination shall not be required in the current-limiting or instantaneous portions of the time-current curves.</u>

Substantiation: (1) Molded case circuit breakers with instantaneous trips are unable to provide selectively in the instantaneous range of the breaker trip curve. Thus, fuses would be required for all emergency system circuits - including lighting branch circuits. (2) The substantiation provided for this change is insufficient to demonstrate that non-selective tripping of emergency circuits has been problematic.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on 13-135.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-140 Log #2515 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Delete 700.27 in its entirety. ~~Coordination. Emergency system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices in the long time portion of the time current curve. Circuit breakers and fuses shall be permitted where it is not possible to provide selectivity in the current limiting or instantaneous portion of the time current.~~

Substantiation: (1) Molded case circuit breakers with instantaneous trips are unable to provide selectively in the instantaneous range of the breaker trip curve. Thus, fuses would be required for all emergency system circuits - including lighting branch circuits. (2) The substantiation provided for this change is insufficient to demonstrate that non-selective tripping of emergency circuits has been problematic. (3) The wording of this section is ambiguous. What are supply side overcurrent protective devices?

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-135.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 9 Negative: 4
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

ELKINS, D.: This proposal should have been accepted in principle as noted in my explanation of negative vote on Proposal 13-135.

NASBY, J.: See my explanation of negative vote on Proposal 13-137.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-141 Log #3302 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Darrel Miller, LSW Engineers Arizona, Inc.
Recommendation: Delete the following text:
~~700.27 Coordination. Emergency system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.~~
Substantiation: The code paragraph statement "…shall be selectively coordinated with all supply side overcurrent protective devices." is where the problem lies. The inclusion of the word "all" takes issue with the use of circuit breakers (circuit breakers). The majority of the circuit breakers that are used throughout an emergency distribution system are of the molded case type. The main devices are most often the insulated case type.

To anyone performing a coordination study, it is evident the initial two-cycles of a molded case circuit breakers tripping band appears as a "foot" and, where adjustable, only for initial activation amperes.

Circuit breakers utilize a thermal-magnetic or electronic trip devices for operation. The thermal magnetic have limited or no adjustment. The instantaneous band adjustment is all that is offered, moving to a higher initiation level. Circuit breakers that utilize an electronic trip unit can have multiple bands of adjustment, instantaneous, short time pickup and delay, short time I2T in/ out, long time pickup and delay. These features make these breakers much more flexible for coordination, and naturally more expensive. All breaker types, molded or insulated case, and power circuit breakers utilize one of the above trip devices. In some cases, the instantaneous band can be eliminated (turned off) but only when the circuit breakers mechanical strength is great enough to withstand the initial short circuit magnetic forces imposed on it. Only power circuit breakers offer this feature. This is helpful in coordination of larger ampere rated breakers with those downstream. Coordination then becomes a function of trip band adjustments and mechanical strength to withstand short circuit forces.

Coordination occurs at each level (band) of the breaker operation. In reviewing the time current curves you will see that each circuit breaker has a max and a min operational value, an operational band. These values are determined from repeated testing of a particular breaker model, and its response to overcurrent conditions. The result establishes that particular breakers operational range throughout the entire response curve.

To obtain coordination at the initial two-cycle level is to have the ability to turn off the instantaneous trip function of the upstream circuit breaker and even at that, there will be problems coordinating devices of the same frame size. The instantaneous "off" feature is not available in a molded case circuit breaker. The next step up from the molded case circuit breaker is an insulated case design. These models do not generally offer an "instantaneous off" feature. Yet another step up is the power circuit breaker. These are the large units with high interrupting capacities and withstand ratings. A few of these models offer "instantaneous off" features. This type of breaker is not the style commonly used in distributions systems rated 3,000amps or less and almost never on systems rated 120/208volts.

The instantaneous "band of a molded case circuit breaker is less than two-cycles tall and becomes active at a point (fixed or adjustable). This band continues increasing in amps until it hits the maximum short circuit current rating of the breaker. See examples below and attached time current curves.

The instantaneous "band of a molded case circuit breaker is less than two-cycles tall and becomes active at a point (fixed or adjustable). This band continues increasing in amps until it hits the maximum short circuit current rating of the breaker. See examples below and attached time current curves.

Examples:

A. GE model 'THED', 20amp, 480vac:	225amps to 25,000amps
B. GE model 'SFHA', 225amp, 480vac:	550amps to 35,000amps
C. GE model 'SGHA', 400amp, 480vac:	1,000amps to 35,000amps
D. GE model 'SKHA', 800amp, 480vac:	2,000amps to 50,000amps
E. GE model 'SS', 1600amp, 480vac:	2,200amps to 150,000amps
F. GE model 'SS', 2500amp, 480vac:	3,500amps to 100,000amps
G. GE model 'AKR', 3000amp, 480vac:	None. Fault must be over 0.125s in duration.

The present requirement is restrictive in the application of circuit breakers. 100% coordination of circuit breakers can't be achieved. This code section will have to be more specific as to the end result in order to be applied.

Presently fuses are the only overcurrent protective devices that can achieve 100% coordination. Unfortunately, this presents a reduction in reliability. Fuse switches do not simultaneously open all phases in an overcurrent condition. A faulted fuse requires a physical change to restore the faulted condition. In a life safety application a quick reset is important.

This article is not yet ready to be applied. I suggest a phase-in as is being done with other restrictive requirements (unit switches on lighting fixtures) to allow manufactures to provide effective solutions.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-135.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 9 Negative: 4
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

ELKINS, D.: This proposal should have been accepted in principle as noted in my explanation of negative vote on Proposal 13-135.

NASBY, J.: See my explanation of negative vote on Proposal 13-137.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-142 Log #3494 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Alan Manche, Square D Co.
Recommendation: Delete NEC **700.27 Coordination.**
~~**700.27 Coordination.** Emergency system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.~~
Substantiation: The application of selective coordination is often misunderstood in that it is perceived as being independent of all other electrical design parameters. The seemingly simple misperception is that you just have to pick the correct fuses or circuit breakers to ensure this particular requirement is met. What has not been considered, at least in the NEC, is the impact placed upon the design and reliability of the entire electrical system. My discussion with engineers and our company involvement with coordination studies indicates they do a comprehensive coordination evaluation of emergency systems and maximize the selectivity, unfortunately the requirement placed in the 2005 NEC for requiring full selectivity is driving system design parameters that can impact the reliability in a negative manner by possibly reducing that reliability. The requirement also places a requirement on the system that is unnecessary in various areas of the electrical system.

Other industry standards, such as NFPA 110 and IEEE Standard 242, recognize the need for this latitude in maximizing system reliability and permitting the engineer to selectively coordinate devices that support the isolation of the system as necessary. Electrical system designs and demands differ based on the size and occupancy needs. Ensuring the maximum reliability of the electrical system must be determined by the engineering professional for each facility.

A brief review of other technical committees guidance that have addressed this issue will support the need to delete this requirement. The NFPA 110 committee recognizes the limitations of selective coordination by requiring the selective coordination of the emergency system to be "optimized." They further provide an explanation in the annex of NFPA 110 regarding this subject:

A.6.5.1 It is important that the various overcurrent devices be coordinated, as far as
practicable, to isolate faulted circuits and to protect against cascading operation on short circuit faults. In many systems, however, full coordination is not practicable without using equipment that could be undesirable for other reasons or prohibitively costly. Primary consideration also should be given to prevent overloading of equipment by limiting the possibilities of large current inrushes due to instantaneous reestablishment of connections to heavy loads.

A review of IEEE Standard 242 also provides further explanation that selectivity of overcurrent devices may not provide any further enhancement to reliability, but this requirement in the NEC simply drives an unnecessary burden for these particular areas of the electrical system. An example is where primary and secondary protection is necessary for a transformer. Selectively coordinating the primary and secondary may or may not have any impact on isolating the fault.
The NEC places an unnecessary burden on the electrical system design without any benefit.

The only reason for requiring selective coordination in the NEC is to drive a performance parameter for enhanced reliability of power for the system. Based on this premise, that goal is not accomplished in many instances. Our company supports the design and installation of many critical electrical infrastructures and this requirement can drive a compromise in electrical reliability. The easiest system to recognize this issue is when an alternate power source is utilized. The system design must take into consideration of whether to have a generator located near the point of use or decide that a more reliable power source is paralleling a number of generators in the event one of the independent generators do not start. NFPA 70B does recognize that the reliability of the generator starting is an issue, likely based on poor maintenance practices, but that is the reality of our electrical infrastructure. If the power source does not exist then having a selectivity coordinated system serves no purpose. Selective coordination will drive large single generators and in effect prohibit the paralleling of small generators to establish a more reliable power source. Once again, an example that selective coordination is not independent from the rest of the electrical system design.

The present NEC requirement for selective coordination prohibits solid design considerations that would enhance the reliability of the system. I urge the committee to accept this proposal and delete the requirement for selective coordination on emergency systems. Deleting this requirement will permit the electrical system design engineer to maximize the reliability of the system and remove a restriction placed on the designer that may reduce the reliability of the system.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 13-135.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 9 Negative: 4

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

ELKINS, D.: This proposal should have been accepted in principle as noted in my explanation of negative vote on Proposal 13-135.

NASBY, J.: See my explanation of negative vote on Proposal 13-137.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-143 Log #3525 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Darrel Miller, LSW Engineers Arizona, Inc.

Recommendation: Add:

Coordination shall be defined as three-cycle minimum separation between tripping bands and shall not apply during the first 3 cycles.

Substantiation: The code paragraph statement "...shall be selectively coordinated with all supply side overcurrent protective devices." is where the problem lies. The inclusion of the word "all" takes issue with the use of circuit breakers (circuit breakers). The majority of the circuit breakers that are used throughout an emergency distribution system are of the molded case type. The main devices and most often the insulated case type.

To anyone performing a coordination study, it is evident the initial three-cycles of a molded case circuit breakers tripping band appears as a "foot" and, where adjustable, only for initial activation amperes.

Circuit breakers utilize a thermal-magnetic or electronic trip devices for operation. The thermal magnetic have limited or no adjustment. The instantaneous band adjustment is all that is offered, moving to a higher initiation level. Circuit breakers that utilize an electronic trip unit can have multiple bands of adjustment, instantaneous, short time pickup and delay, sort time I2T in/out, long time pickup and delay. These features make these breakers much more flexible for coordination, and naturally more expensive. All breaker types, molded or insulated case, and power circuit breaker utilize one of the above trip devices. In some cases, the instantaneous band can be eliminated (turned off) but only when the circuit breakers mechanical strength is great enough to withstand the initial short circuit magnetic forces imposed on it. Only power circuit breakers offer this feature. This is helpful in coordination of larger ampere rated breakers with those downstream. Coordination then becomes function of trip band adjustments and mechanical strength to withstand short circuit forces.

Coordination occurs at each level (band) of the breaker operation. In reviewing the time current curves you will see that each circuit breaker has a max and a min operational value, an operational band. These values are determined from repeated testing of a particular breaker model, and its response to overcurrent conditions. The results establish that particular breakers operational range throughout the entire response curve.

To obtain coordination at the initial three-cycle level is to have the ability to turn off the instantaneous trip function of the upstream circuit breaker and even at that, there will be problems coordinating devices of the same frame size. The instantaneous "off" feature is not available in a molded case circuit breaker. The next step up from the molded case circuit breaker is an insulated case design. These models do not generally offer an "instantaneous off" feature. Yet another step up is the power circuit breaker. These are the large units with high interrupting capacities and withstand ratings. A few of these models offer "instantaneous off" features. This type of breaker is not the style commonly used in distributions systems rated 3,000 amps or less and almost never on systems rated 120/208 volts.

The instantaneous band of a molded circuit breaker is less than three-cycles tall and becomes active at a point (fixed or adjustable). This band continues increasing in amps until it hits the maximum short circuit current rating of the breaker. See examples below and time current curves.

Examples:

A. GE model "THED", 20 amp, 480vac: 225 amps to 25,000 amps
B. GE model "SFHA", 225 amp, 480vac: 550 amps to 35,000 amps
C. GE model "SGHA", 400 amp, 480vac: 1,000 amps to 35,000 amps
D. GE model "SKHA", 800 amp, 480vac 2,000 amps to 50,000 amps
E. GE model "SS", 1600 amp, 480vac: 2,200 amps to 150,000 amps
F. GE model "SS", 2500 amp, 480vac: 3,500 amps to 100,000 amps
G. GE model "AKR", 3000 amp, 480vac: None. Fault must be over 0.125s in duration

The present requirement is restrictive in the application of circuit breakers. 100% coordination of circuit breakers can't be achieved. This code section will have to be more specific as to the end result in order to be applied.

Presently, fuses are the only overcurrent protective devices that can achieve 100% coordination. Unfortunately, this presents a reduction in reliability. Fuse switches do not simultaneously open all phases in an overcurrent condition. A faulted fuse requires a physical change to restore the faulted condition. In a life safety application, a quick reset is important. Using fuses at all levels throughout the distribution system is impractical. I5 could be equated to a return to an archaic design. Certainly you can recollect your father fumbling around in the dark to replace the screw in "Buss" fuse at the power panel of your home in the 1960's. This is what we would be retuning to at the branch circuit level if fuses are required to coordinate down to that level.

This article is not yet ready to be applied. I suggest modifying the text to further define the term coordination or using a "phase-in" approach as is being done with other restrictive requirements (unit switches on lighting fixtures) thus allowing manufactures to provide effective solutions that work.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 13-135.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-144 Log #3624 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Jon Ross, Smith Seckman Reid, Inc.

Recommendation: Emergency system(s) overcurrent protective devices shall be coordinated to optimize selective tripping of the circuit overcurrent protective devices and minimize the extent of interruption to the electrical system due to abnormal current caused by overload and/or short circuits.

Substantiation: The current wording of 701.18 implies complete and absolute coordination of devices. To achieve this, many upstream overcurrent devices will have to be selected to permit higher let-thru energy which will compromise efforts in certain situations to limit the arc-flash potential and equipment damage. In addition it will limit the use of several circuit breaker products currently in use on the market today. This will reduce the ability to achieve the recommendation in NFPA 99.4.4.1.1.2(2) "achieving the fastest possible restoration of any given circuit(s) after clearing a fault". The proposed wording would also bring the requirement for coordination in NFPA 70, 110 & 99 into agreement.

Panel Meeting Action: Reject

Panel Statement: Selective coordination is currently required, and the panel disagrees with the word "optimized".

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 3

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

NASBY, J.: See my explanation of negative vote on Proposal 13-137.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-145 Log #3667 NEC-P13 **Final Action: Reject**
(700.27)

Submitter: Douglas Humme, CHPA Consulting Engineers

Recommendation: Replace all text of the paragraph 700.27 after the title Coordination with the following:

The overcurrent protective devices in the emergency system shall be coordinated to optimize selective tripping of the circuit overcurrent protective devices when a short circuit occurs.

Substantiation: NFPA 110-2002 is cited in Fine Print Note 5 of Rule 700.1 in the NEC. The 2005 NEC Rule 700.27 conflicts with NFPA 110. My proposal uses the language of NFPA 110 Rule 6.5.1 to harmonize the NEC with NFPA 110.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 13-144.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 9 Negative: 4

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

ELKINS, D.: This proposal should have been accepted in principle as noted in my explanation of negative vote on Proposal 13-135.

NASBY, J.: See my explanation of negative vote on Proposal 13-137.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-146 Log #2560 NEC-P13 **Final Action: Reject**
(700.27, FPN (New))

Submitter: Greg Batie, Sparling / Rep. Electric League of the Pacific Northwest-Code Committee
Recommendation: Add a FPN as follows:

FPN: This requirement can be accomplished by choice of overcurrent protective devices and their ratings or settings at 0.1 seconds and longer.
Substantiation: The requirement for selective coordination in new articles 700.27 and 701.18 will result in more reliable emergency systems but selective coordination is not always possible for all fault current levels when protection is provided by molded case circuit breakers. As seen in the examples provided of typical circuit breaker curves, there is typically some overlap between curves in the instantaneous region below 0.1 seconds.

As documented in the provided references, the majority of faults are not bolted three phase faults. The typical fault involves a lower level line-to-ground fault. This
line -to-ground fault can escalate to a three phase arcing fault, however, this arcing fault is lower than the three phase bolted fault. Therefore, the lower level fault is often low enough to allow selective coordination in the instantaneous region between the upstream and downstream breakers. Therefore, selective coordination in the instantaneous region should not be of a concern. Establishing 0.1 seconds and longer as the level for evaluating selective coordination will ignore the overlap of the instantaneous region. This represents the real world. The addition of this FPN will also eliminate confusion about these new articles prohibiting the use of standard molded case circuit breakers for Emergency and Legally Required Standby Systems. The addition of this FPN will also eliminate confusion on how to apply this requirements to existing installations without having to replace existing switchboards and breakers that are not presently fully coordinated. Note that the Florida Agency for Healthcare Administration (ACHA) has settled at the 0.1 second coordination requiremetrns since about 2002.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The instantaneous portion of the time current curve is no less important than the long time portion.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-147 Log #3668 NEC-P13 **Final Action: Reject**
(700.27 Exception (New))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Add an exception to read as follows:

Exception: the use of molded case circuit breakers which coordinate in the non-instantaneous trip range shall be permitted where restoration of power is as important or more important than the risk of loss of power due to miscoordination.
Substantiation: Problem: The emergency system overcurrent device coordination requirement added during the last code cycle will force the use of fuses in installations where manufacturer tested coordinating circuit breakers are not available or are no longer available to match upstream/downstream devices due to obsolescence. Application of fuses may lower the needed availability of emergency power in installation where rapid restoration of power is as important or more important than a brief outage.

Substantiation: The ability to retrofit manufacture tested coordinating circuit breakers will often not be possible when modifying existing systems forcing the use of fuses which may not be available when needed to restore emergency power. The code change made requiring coordination without regard to other risks may force installations which increase the risk of more extended outages which may have higher consequence than shorter outages, or may result in unsafe practices such as using incorrectly sized available fuses in place of the needed fuse to quickly restore power to emergency systems when the correct fuse is not available. The user should be able to use engineering judgment to decide whether coordination or rapid restoration of power is more critical in a specific installation. This change to the code has the effect of eliminating the use of normal molded case circuit breakers in these systems.
Panel Meeting Action: Reject
Panel Statement: Selective coordination increases the reliability of the emergency system. When quick restoration of power is important, it is the responsibility of the system designer to meet the Code.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 10 Negative: 3
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:

ELKINS, D.: This proposal should have been accepted in principle as noted in my explanation of negative vote on Proposal 13-135.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

ARTICLE 701 — LEGALLY REQUIRED STANDBY SYSTEMS

13-148 Log #1451 NEC-P13 **Final Action: Reject**
(701.2, FPN)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:

701.2 Definition.

Legally Required Standby Systems. Those systems required and so classed as legally required standby by municipal, state, federal, or other codes or by any governmental agency having jurisdiction. These systems are intended to automatically supply power to selected loads (other than those classed as emergency systems) in the event of failure of the normal source

~~FPN: Legally required standby systems are typically installed to serve loads, such as heating and refrigeration systems, communications systems, ventilation and smoke removal systems, sewage disposal, lighting systems, and industrial processes, that when stopped during any interruption of the normal electrical supply could create hazards of hamper rescue or fire fighting operations.~~
Substantiation: This proposal is being made in an effort to correlate my proposal to edit FPN No. 3 in 700.1.
Panel Meeting Action: Reject
Panel Statement: The existing FPN helps the reader understand the loads typically connected to legally required systems.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-149 Log #687 NEC-P13 **Final Action: Reject**
(701.5(B))

Submitter: James Filippone, Port Authority of NY & NJ
Recommendation: Revise 701.5(B) to read:

Systems shall be tested periodically on a schedule and in a manner acceptable to the authority having jurisdiction to ensure the systems are maintained in operating condition. <u>Systems shall be tested by the building owner at least every five years under maximum load conditions to verify that they still have sufficient capacity and rating.</u>

<u>FPN: Passenger electric elevators and freight electric elevators permitted to carry passengers must be tested in the down direction with 125 percent of their rated load inside the car and freight elevators must be tested with rated load inside the car. See ASME A17.1 Safety Code for Elevators and Escalators for information on which elevators must be capable of operating in the down direction with 125 percent of rated load.</u>
Substantiation: Requiring testing on a 5-year basis under maximum load conditions is reasonable to ensure that these critical systems shall have sufficient capacity and rating and are available to emergency responders. Over time the loads that the system must supply can change significantly. Experience indicates that systems that were once sufficient are no longer sufficient due to added loads. The system is tested under maximum capacity upon installation and the means to test it periodically must be provided. However, testing periodically under maximum load conditions is not specifically required. Information on the required load for elevators is provided for testing purposes.
Panel Meeting Action: Reject
Panel Statement: Testing frequency is not the responsibility of an installation code. Section 701.5 defers this responsibility to the authority having jurisdiction (AHJ).
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-150 Log #2368 NEC-P13 **Final Action: Accept in Principle**
(701.7(C)(1) (New))

Submitter: Lawrence A. Bey, Cummins Power Generation
Recommendation: Add a new 701.7(C)(1) as follows:
(1) Automatic transfer switches, rated 600 VAC and below, shall be listed for legally required standby system use.
Substantiation: A problem can exist under normal operation of the transfer switch where the two power sources are both energized and out-of-phase relative to each other, as is often the case with one utility source and an on-site generator set(s). Typically, both power sources are energized during exercise and test of the generator. When the two power sources are not synchronized, as much as twice rated voltage may be seen across the transfer switch contacts. At twice rated voltage, sustained arcing across the contact air gap may cause a source-to-source short circuit during transfer operation. This potential problem exists unless the transfer switch equipment has been designed and tested to be suitable for switching between out-of-phase sources (three phase systems displaced by 120 electrical degrees and single phase systems displaced by 180 degrees), or has otherwise been examined and determined to be suitable for switching between out-of-phase power sources.

Unless listed, a problem of uncoordinated overcurrent protection may exist should the transfer switch close into a short circuit. The short circuit fault that cleared the upstream overcurrent device may still be present when the transfer switch operates and closes on the alternate source. A listed transfer switch has been tested to 1) safely withstand a short circuit with contacts closed until the upstream overcurrent clears; and 2) close into short circuit with contacts open. Closing into a short circuit is typically a more severe test than withstand due to arcing and out gassing of contact material as the contacts move together. Transfer switch equipment that has not been tested for closing into a fault may not be adequately protected by the alternate source upstream overcurrent device. Generally this is transfer switch performance that must be established by high current laboratory testing on a complete as-built assembly. The recognized national standard for testing Automatic Transfer Switch Equipment is ANSI/UL 1008.

This proposed requirement as placed under 701.7(C) would specifically apply only to automatic transfer switches. The intent is to not rule out other types of transfer system transfer equipment identified for standby system use and acceptable to the AHJ under 701.7(A). The proposed requirement would not apply to systems rated above 600 volts, but would apply 600 volts and below where UL Safety Standard 1008 provides ANSI testing specifications.
Panel Meeting Action: Accept in Principle
Revise proposal to add text to existing 701.7(C) as follows:
Automatic transfer switches, rated 600 VAC and below, shall be listed for legally required standby system use.
Panel Statement: The panel's revision is editorial in nature.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-151 Log #582 NEC-P13 **Final Action: Reject**
(701.11)

Submitter: Richard Pokorny, City of Marshfield, WI / Rep. Wisconsin Chapterof IAEI
Recommendation: Add text to read as follows:
The enclosure of the alternate source of power located outdoors for legally required standby systems shall be located at least 10 ft from a combustible wall and at least 20 ft from an outdoor electrical transformer or normal power distribution equipment. These dimensions may be reduced by one-half where a noncombustible barrier is installed that extends at least 3 ft beyond each side of the transformer. The height of the barrier shall be at least one foot above the top of the transformer or alternate power source, whichever is higher.
Substantiation: This is a proposal to add wording to the NEC dealing with distance between alternate sources of legally required standby power and outdoor transformers or distribution equipment. At the present time, there is not any guidance as to an enforceable distance between these units needed to keep portions of building premises wiring systems operational. Under a scenario where either one of these items are having a problem, components of legally required standby systems needs to be operational. There appears to be a need to keep a safe distance away so that one disaster does not take out the other unit. With real estate prices being so high, areas utilized for transforms and alternate power systems are shrinking to the point that designers are placing these items as close as possible. In many cases, installers are barely meeting safe working clearances required by Article 110 much less looking at how fragile this spacing “safety net” is. A legally required standby source of power should not be compromised because a portion of a building, an electrical distribution system or a transformer is burning or has another severe problem.

700.11 is vague as it merely states that the: “Consideration should be given to the location or design, or both, of all equipment to minimize the hazards that might cause failure...”. This does not give the AHJ any dimensions to enforce this section of a critical code article.

A good starting point for looking at existing rules would bring ten feet (10 ft or 3.05 meters) to the forefront, as a number of large transformer installation codes require this distance from a combustible building. A fire in the building, exterior distribution equipment or a transformer fire would be less likely to affect a generator or other alternate power source. With this in mind, a legally required standby source of power should also be located at least 3.05 m (10 ft) from a combustible wall. At this point the logic would be that two components, such as a generator and transformer shall have a 3.05 m (10 ft) safety zone from each other, that does not overlap the other component's zone. Therefore, 6.1 m (20 ft) would be the acceptable distance between the two units. If one is on fire, there would still be a 3.05 m (10 ft) safe zone beyond the conflagration at the other unit that would permit personnel to work on problems with the particular unit that is needed at that time. As designers still want to minimize any spacing requirement, this dimension should be able to be reduced if the design of the area includes a noncombustible assembly. The dimensions and composition of this barrier listed in the proposal are the same as the ones stated in the State of Wisconsin's Public Service Commission - PSC 114 and have proved to be an acceptable standard for transformer placement for many years. I have provided copies of the applicable portion of this document. PSC 114.317 C 2. states this distance requirement from combustible walls. PSC 114.317 D 2. indicates the dimensions for a noncombustible barrier that will allow a reduction to this dimension for cramped building sites.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-127.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-152 Log #3080 NEC-P13 **Final Action: Reject**
(701.11)

Submitter: Joseph A. Hertel, Safety and Buildings
Recommendation: In addition to the requirements in 701.11 (intro):
The enclosure of the alternate source of power located outdoors for emergency systems shall be located at least 10 ft from a combustible wall and at least 20 ft from an outdoor electrical transformer or normal power distribution equipment. These dimensions may be reduced by one-half where a noncombustible barrier is installed that extends at least 3 ft beyond each side of the transformer The height of the barrier shall be at least one ft above the top of the transformer or alternate power source, whichever is higher.
Substantiation: NFPA 110 provides specific requirements where a generator used for emergency standby power is located indoors. If it is located outdoors, there is a very general statement in 701.11 to consider the hazards involved. Is there hazard if the emergency generator is located immediately adjacent to the service gear or the utility transformer? This language would provide some degree of reliability to the installation in the event of a catastrophic failure of the normal power supply.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on proposal 13-127.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-153 Log #538 NEC-P13 **Final Action: Reject**
(701.11(B)(5))

Submitter: Joel A. Rencsok, Electrical Designs Inc.
Recommendation: Delete the words “or pass through” to read as follows:
(5) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve ~~or pass through~~ the building or structure.
Substantiation: See 225.31. When this section was added, emergency systems feeders were passing through building to building where the feeder could be taken out of service by a fire in the first building. Indoor generator sets still have to comply with NEC Section 225.31.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-129.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-154 Log #548 NEC-P13 **Final Action: Reject**
(701.11(B)(5), FPN (New))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Add a new FPN as follows:
(5) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.
<u>FPN: 250.32(D) provides grounding and bonding requirements for building or structure disconnecting means that are remote from the building or structure.</u>

Substantiation: This proposal is an effort to provide some correlation between the rules in 250.32(D) which provides requirements for grounding and bonding where the building or structure disconnecting means is mounted remote from the building or structure as it would be if it were located on the generator assembly in accordance with this section. A companion proposal is being submitted to 250.32(D) to correlate with the provisions of 701.11(B)(5).
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-130.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: See Negative Comment on Proposal 13-130.

13-155 Log #1284 NEC-P13 **Final Action: Reject**
(701.11(B)(5), FPN (New))

Submitter: Mark R. Hilbert, State of New Hampshire
Recommendation: Revise text to read:
(5) Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.
Add a new fine print note to read as follows:
<u>FPN: Section 225.36 provides additional requirements for the suitability of the disconnecting means.</u>
Substantiation: The recommendation for this fine print note is an attempt to identify the requirements of 225.36 for the building disconnecting means, which in this case will be located at the generator, to be “suitable for use as service equipment.” Additionally, this FPN will help identify an often overlooked requirement, clarify that even though it is remote to the building, the disconnecting means must be suitable for use as service equipment and that the requirement in 225.36 is not amended by 701.11(B)(5).
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-131.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-156 Log #892 NEC-P13 **Final Action: Accept in Principle**
(701.11(D))

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise 701.11(D) as follows:
“Where acceptable to the authority having jurisdiction as a <u>legally required standby</u> source of power, an additional service shall be permitted.” (Remainder unchanged).
Substantiation: This entire section should more closely match the organization of 700.12(D), but at a minimum, it should reinforce the requirement in 701.11 for a second source and state clearly that the second source must be suitable as a standby source similar to the way this rule applies in 700.12.
Panel Meeting Action: Accept in Principle
Revise proposed revision to read as follows:
Separate Service. Where approved, a separate service shall be permitted as a legally required source of standby power. This service…….
Panel Statement: The proposal has been reworded for readability and for compliance with the NEC Manual of Style. The word “approved” is defined as “acceptable to the authority having jurisdiction” in Article 100.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-157 Log #1162 NEC-P13 **Final Action: Reject**
(701.11(E))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change “normal” to “all other systems” in the last sentence.
Substantiation: There is no definition for normal service. Optional standby systems provided by a generator may be the “normal” source of power. 695.4(B)(2)(4) requires fire pump disconnect means to be remote from other service disconnect means including other fire pump systems; 700.12(D) requires service conductors (in service disconnects) to be remote from other service conductors. Subsection (D) requires separation from any other service (which includes disconnect means).
Panel Meeting Action: Reject
Panel Statement: Changing the word “normal” to “all other systems” would add confusion. It is understood what the normal main disconnect is.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-158 Log #3502 NEC-P13 **Final Action: Reject**
(701.17)

Submitter: Jim Pauley, Square D Company
Recommendation: Revise 701.17 as shown:
701.17 Ground Fault Protection of Equipment.
<u>(A) Not Required.</u> ~~The~~ Alternate source <u>s of supply</u> for legally required standby systems <u>not covered by (B)</u> shall not be required to have ground-fault protection of equipment.
<u>(B) Large Systems.</u> <u>Where the alternate source of supply is 1500kVA or larger and is a solidly grounded wye system with more than 150V to ground, but not exceeding 600 volts phase-to-phase, ground-fault protection of equipment shall be provided in accordance with 230.95 or 215.10 for each disconnect rated 1000 amperes or more.</u>
Substantiation: This is a companion proposal to 700.26 to revise the requirements for GFPE. There are two objectives with this proposal:
1) Editorially revise the existing 701.17 to create an (A) and (B) sections. The language of item (A) is revised from the current rule to recognize that the may be multiple sources of supply and to reference the new proposed (B).
2) The technical change in this proposal is the addition of item (B). This new provision would require GFPE to be installed on large alternate source systems. It is realized that this is different from the conventional wisdom of the past, but the panel likely recognizes that the alternate system of yesterday are not the same of today. There are very large systems being installed for alternate standby. We have recently seen systems that range from 2MW to 8MW in size. These systems not only supply legally required power, but they may also operate in parallel with the utility to provide cogeneration.
Previous thinking was that alternate systems should be exempt from GFPE because the generators would not supply enough current to be of concern relative to equipment burn-down. The view was that it created a more reliable system by deciding to withstand some level of damage of the ground-fault and provide some alarm. With the larger systems, not having GFPE not only creates a significant safety hazard, it also decreases the reliability of the system by using multiple levels of coordinated ground-fault protection.
Large standby generators being employed today typically have zero sequence reactance that is less than that of an equivalent power class transformer. For a minimum of two cycles, the generator will provide more short circuit current than an equivalent transformer. As such, the initial available fault current flow from a phase-to-ground fault can be significant. These two cycles of increased fault can have enough energy to initiate the damage sequence in the faulted equipment. Although the current levels will decrease, the damage escalates because the generator continues to supply significant amounts of current.
At the same time, the generators stator and winding will be subjected to significant thermal stresses and mechanical forces. These can partially damage or permanently damage the generators causing them to shutdown and alternate power is lost completely.
The wording of the proposal is to apply the requirements for GFPE from 230.95 and/or 215.10 to an alternate source of supply that is 1500kVA or larger. These systems can deliver current levels that are of a magnitude where equipment damage can continue after the initial fault. GFPE would be applied on disconnecting means rated 1000A or greater on systems 150V to ground or greater. References to 215.10 and 230.95 would pick up the settings and testing requirements as already outlined in those sections.
In summary, it is critical to both safety and reliability of the systems that GFPE be required on these larger systems. Although the previous rule made sense with smaller alternate source systems, it no longer makes technical sense with the increase in the size of these systems.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-136.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: See Negative Comment on Proposal 13-136.

13-159 Log #1946 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)
Recommendation: Delete 701.18
~~701.18 Coordination~~
~~Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.~~
Substantiation: Selective coordination is recognized as a prudent design consideration for emergency and legally required circuits to maximize the reliability of a power system, however it is not practical, necessary, or even desired to require the selectivity of all overcurrent devices in the system to achieve maximum reliability. This is recognized in NFPA 110. Electrical system designs and demands differ based on the size and occupancy needs. Ensuring the maximum reliabiliy of the electrical system must be determined by the engineering professional for each facility. Although selective coordination sounds like a reasonable requirement on the surface, it can and

will drive system design parameters that may make the system less reliable. It will also place restrictions on the design unnecessarily with no added benefit as discussed in IEEE Standard 242. This proposal seeks to delete the requirement for selective coordination in order to ensure that maximum reliability can be designed into the electrical system.

Conflict between NFPA Documents

The International Building Code is adopted across the vast majority of the country. Chapter 27 in IBC specifically requires compliance to NFPA 110 for emergency systems.

The electrical industry has recognized that selective coordination is not always practical or even necessary. The NFPA 110 Technical Committee for Emergency and Standby Power Systems has recognized these limitations as found in paragraph 6.5.1 by requiring the selectivity to be optimized.

"6.5.1 General. The overcurrent protective devices in the EPSS shall be coordinated to optimize selective tripping of the circuit overcurrent protective devices when a short circuit occurs."

The NFPA 110 technical committee further explains why they use the term "optimize" in Annex A.

A.6.5.1 It is important that the various overcurrent devices be coordinated, as far as practicable, to isolate faulted circuits and to protect against cascading operation on short circuit faults. In many systems, however, full coordination is not practicable without using equipment that could be undesirable for other reasons or prohibitively costly. Primary consideration also should be given to prevent overloading of equipment by limiting the possibilities of large current inrushes due to instantaneous reestablishment of connections to heavy loads.

Do I optimize the selectivity or do I coordinate all supply side devices? The NEC and NFPA 110 do not coordinate on this specific topic and industry design documents such as IEEE Standard 242 would support the position of the NFPA 110 technical committee.

Simply not "Practicable"

The implementation of selective coordination is simply not practicable in many instances. The inrush currents for a transformer or the starting current of a motor may drive a large overcurrent device that is not practicable to coordinate with the line side device. IEEE standards also note that in order to obtain a selective coordinated system, the back-up power source which is generally a generator, will be driven closer to the load in the design. Once again, the selectivity requirement is driving a design requirement that may reduce the reliability of the system. NFPA 70B recently published statistics in the annex in support of a new section entitled Reliability-Centered Maintenance. The statistics demonstrate that a major system reliability issue is with the generator starting. Selectivity drives a large single generator rather than distributed smaller generators in the system, such design is directly in opposition of the NFPA 70B statistics when evaluating the entire system for reliability. One design consideration to resolve this reliability issue is to parallel smaller generators. Paralleling multiple generators ensures that I have a power source even if one of the generator sets does not start or is undergoing maintenance. If a generator does not start, the electrical system is not paralyzed due to no power source. Selective coordination is of no use if there is no power for the electrical distribution system to deliver. The requirement for selective coordination, as presently found in the NEC, prohibits solid design consideration that would enhance the reliability of the system.

Selectivity will not enhance performance of the system in specific instances

A review of IEEE documents such as the Buff book or IEEE Standard 242 recognizes that loss of selectivity between two overcurrent devices may have no impact on the system performance. Page 565 in IEEE Standard 242-1986 notes two examples: The first is the primary and secondary protection of a transformer. Requiring selective coordination of the secondary overcurrent is unnecessary where a single main exists on the secondary of the transformer. No reliability is gained by the present restriction in the NEC while placing a design and financial burden on the designer and owner. Another simple example is a load protective device and the next upstream device. Specifically, consider a feeder breaker or fused switch supplying a motor control center. NEC 430.94 requires protection of a motor control center bus by either an integral main or overcurrent device located ahead of the MCC. Based on the size of the motor loads, selectivity will drive the size of the MCC to be larger than necessary where large motors may have been designed into the system to enhance electrical maintenance safety practices. Once again, selective coordination of the feeder and the MCC main overcurrent devices provides no enhancement to the electrical system reliability, but impacts the electrical system design with no added benefit.

Selective coordination of overcurrent protection devices in the system must be addressed by the electrical system design engineer in order to ensure the most reliable electrical system. No data has been presented in the past NEC development cycles that supports selective coordination as a safety or reliability issue existing in the industry. Attempting to govern this performance parameter in the NEC is unnecessary and may reduce the reliability of critical electrical systems as recognized in other industry standards.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 13-135.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 3

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

NASBY, J.: The panel failed to address the substantive points of the proposal. A number of issues have been established that must be addressed:

1) There is a material conflict between NFPA 110 and the NEC that creates a dilemma for the system designer. This design conflict within two NFPA documents is not acceptable.

2) A conflict between the text of 701.18 and the definition of selective coordination in Article 100.

3) Numerous industry standards that point to selectivity impacting reliability negatively or without benefit.

4) Unnecessary selective coordination increases overcurrent device size and can unnecessarily increase the arc-flash hazard on the electrical system.

NFPA 110 is a long standing document which recognizes the importance of selective coordination by requiring selective coordination of overcurrent devices to be "optimized". The International Building Code, adopted by many states, points to NFPA 110 for installing emergency system installations. The NFPA 110 technical committee recognizes selective coordination is prudent to enhance the performance of the electrical system, however, by adding the word "optimized" the committee permits the engineering community to provide the most reliable electrical system.

There is clearly a technical correlation issue between NFPA 110 and the NEC on selective coordination. Furthermore, the definition of selective coordination in article 100 of the NEC requires the "localization of an overcurrent condition to restrict outages to the circuit or equipment affected." The proposal substantiates that the present rule goes well beyond the definition of localizing an overcurrent condition, by requiring "all" overcurrent devices to be selectively coordinated. No other industry document supports all overcurrent devices being selectively coordinated.

The wording in 701.18 must be revised to align with NFPA 110, the definition of selective coordination, and IEEE standards which recognize selective coordination as not being necessary for "all" overcurrent device as follows:

701.18 Coordination. Selective Coordination of overcurrent protective devices shall be optimized.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-160 Log #2167 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

701.18 Coordination. Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices. <u>Series rated combinations as covered in 110.22 and 240.86 shall not be permitted where selective coordination of legally required standby system overcurrent protective devices is required.</u>

Substantiation: Based on the concept of series rated combinations of overcurrent devices and how they are required to operate, be tested and evaluated, it would seem to be rather difficult to comply with the requirements of this section.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 13-138

Number Eligible to Vote: 14

Ballot Results: Affirmative: 11 Negative: 2

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-161 Log #2516 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC

Recommendation: Revise text to read as follows:

701.18 Coordination. Legally required standby system(s) overcurrent devices shall be selectively coordinated <u>in the long-time portion of the time-current curves</u> with all supply side overcurrent protective devices. <u>Coordination shall not be required in the current-limiting or instantaneous portions of the time-current curves.</u>

Substantiation: (1) Molded case circuit breakers with instantaneous trips are unable to provide selectively in the instantaneous range of the breaker trip curve. Thus, fuses would be required for all emergency system circuits - including lighting branch circuits. (2) The substantiation provided for this change is insufficient to demonstrate that non-selective tripping of standby circuits has been problematic.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-139.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.
ZGONENA, T.: See my comments on proposal 13-135.

13-162 Log #2517 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Hugh O. Nash, Jr., Nash Lipsey Burch, LLC
Recommendation: Delete 701.18 in its entirety. ~~Coordination. Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices in the long time portion of the time current curve. Circuit breakers and fuses shall be permitted where it is not possible to provide selectivity in the current limiting or instantaneous portion of the time curves.~~
Substantiation: (1) Molded case circuit breakers with instantaneous trips are unable to provide selectively in the instantaneous range of the breaker trip curve. Thus, fuses would be required for all emergency system circuits - including lighting branch circuits. (2) The substantiation provided for this change is insufficient to demonstrate that non-selective tripping of standby circuits has been problematic. (3) The wording of this section is ambiguous. What are supply side overcurrent protective devices?
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-140.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 10 Negative: 3
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
NASBY, J.: See my explanation of negative vote on Proposal 13-159.
WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.
ZGONENA, T.: See my comments on proposal 13-135.

13-163 Log #2561 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Greg Batie, Sparling / Rep. Electric League of the Pacific Northwest-Code Committee
Recommendation: Add a FPN as follows:
FPN: This requirement can be accomplished by choice of overcurrent protective devices and their ratings or settings at 0.1 seconds and longer.
Substantiation: The requirement for selective coordination in new articles 700.27 and 701.18 will result in more reliable emergency systems but selective coordination is not always possible for all fault current levels when protection is provided by molded case circuit breakers. As seen in the examples provided of typical circuit breaker curves, there is typically some overlap between curves in the instantaneous region below 0.1 seconds.
As documented in the provided references, the majority of faults are not bolted three phase faults. The typical fault involves a lower level line-to-ground fault. This
line -to-ground fault can escalate to a three phase arcing fault, however, this arcing fault is lower than the three phase bolted fault. Therefore, the lower level fault is often low enough to allow selective coordination in the instantaneous region between the upstream and downstream breakers. Therefore, selective coordination in the instantaneous region should not be of a concern. Establishing 0.1 seconds and longer as the level for evaluating selective coordination will ignore the overlap of the instantaneous region. This represents the real world. The addition of this FPN will also eliminate confusion about these new articles prohibiting the use of standard molded case circuit breakers for Emergency and Legally Required Standby Systems. The addition of this FPN will also eliminate confusion on how to apply this requirements to existing installations without having to replace existing switchboards and breakers that are not presently fully coordinated. Note that the Florida Agency for Healthcare Administration (ACHA) has settled at the 0.1 second coordination requiremetrns since about 2002.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 13-146.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 11 Negative: 2
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.
ZGONENA, T.: See my comments on proposal 13-135.

13-164 Log #3429 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete this section.
Substantiation: This is a companion proposal to one submitted to delete 700.27. The substantiation is identical.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 13-135.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 10 Negative: 3
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
NASBY, J.: See my explanation of negative vote on Proposal 13-159.
WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.
ZGONENA, T.: See my comments on proposal 13-135.

13-165 Log #3495 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Alan Manche, Square D Co.
Recommendation: Delete NEC **701.18 Coordination.**
~~**700.27 Coordination.** Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.~~
Substantiation: The application of selective coordination is often misunderstood in that it is perceived as being independent of all other electrical design parameters. The seemingly simple misperception is that you just have to pick the correct fuses or circuit breakers to ensure this particular requirement is met. What has not been considered, at least in the NEC, is the impact placed upon the design and reliability of the entire electrical system. My discussion with engineers and our company involvement with coordination studies indicates they do a comprehensive coordination evaluation of legally required systems and maximize the selectivity, unfortunately the requirement placed in the 2005 NEC for requiring full selectivity is driving system design parameters that can impact the reliability in a negative manner by possibly reducing that reliability. The requirement also places a requirement on the system that is unnecessary in various areas of the electrical system.
Other industry standards, such as NFPA 110 and IEEE Standard 242, recognize the need for this latitude in maximizing system reliability and permitting the engineer to selectively coordinate devices that support the isolation of the system as necessary. Electrical system designs and demands differ based on the size and occupancy needs. Ensuring the maximum reliability of the electrical system must be determined by the engineering professional for each facility.
A brief review of other technical committees guidance that have addressed this issue will support the need to delete this requirement. The NFPA 110 committee recognizes the limitations of selective coordination by requiring the selective coordination of the emergency system to be "optimized." They further provide an explanation in the annex of NFPA 110 regarding this subject:
A.6.5.1 It is important that the various overcurrent devices be coordinated, as far as
practicable, to isolate faulted circuits and to protect against cascading operation on short circuit faults. In many systems, however, full coordination is not practicable without using equipment that could be undesirable for other reasons or prohibitively costly. Primary consideration also should be given to prevent overloading of equipment by limiting the possibilities of large current inrushes due to instantaneous reestablishment of connections to heavy loads.
A review of IEEE Standard 242 also provides further explanation that selectivity of overcurrent devices may not provide any further enhancement to reliability, but this requirement in the NEC simply drives an unnecessary burden for these particular areas of the electrical system. An example is where primary and secondary protection is necessary for a transformer. Selectively coordinating the primary and secondary may or may not have any impact on isolating the fault.
The NEC places an unnecessary burden on the electrical system design without any benefit.

The only reason for requiring selective coordination in the NEC is to drive a performance parameter for enhanced reliability of power for the system. Based on this premise, that goal is not accomplished in many instances. Our company supports the design and installation of many critical electrical infrastructures and this requirement can drive a compromise in electrical reliability. The easiest system to recognize this issue is when an alternate power source is utilized. The system design must take into consideration of whether to have a generator located near the point of use or decide that a more reliable power source is paralleling a number of generators in the event one of the independent generators do not start. NFPA 70B does recognize that the reliability of the generator starting is an issue, likely based on poor maintenance practices, but that is the reality of our electrical infrastructure. If the power source does not exist then having a selectivity coordinated system serves no purpose. Selective coordination will drive large single generators and in effect prohibit the paralleling of small generators to establish a more reliable power source. Once again, an example that selective coordination is not independent from the rest of the electrical system design.

The present NEC requirement for selective coordination prohibits solid design considerations that would enhance the reliability of the system. I urge the committee to accept this proposal and delete the requirement for selective coordination on legally required standby systems. Deleting this requirement will permit the electrical system design engineer to maximize the reliability of the system and remove a restriction placed on the designer that may reduce the reliability of the system.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposals 13-135 and 13-142.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 3

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

NASBY, J.: See my explanation of negative vote on Proposal 13-159.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-166 Log #3623 NEC-P13 **Final Action: Reject**
(701.18)

Submitter: Jon Ross, Smith Seckman Reid, Inc.

Recommendation: Legally required standby system(s) overcurrent protective devices shall be coordinated to optimize selective tripping of the circuit overcurrent protective devices and minimize the extent of interruption to the electrical system due to abnormal current caused by overload and/or short circuits.

Substantiation: The current wording of 701.18 implies complete and absolute coordination of devices. To achieve this, many upstream overcurrent devices will have to be selected to permit higher let-thru energy which will compromise efforts in certain situations to limit the arc-flash potential and equipment damage. In addition it will limit the use of several circuit breaker products currently in use on the market today. This will reduce the ability to achieve the recommendation in NFPA 99.4.4.1.1.2(2) "achieving the fastest possible restoration of any given circuit(s) after clearing a fault". The proposed wording would also bring the requirement for coordination in NFPA 70, 110 & 99 into agreement.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 13-144.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 3

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

NASBY, J.: See my explanation of negative vote on Proposal 13-159.

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

13-167 Log #2717 NEC-P13 **Final Action: Reject**
(701.18 Exception (New))

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Revise text to read:

Exception: The use of molded case circuit breakers which coordinate in the non-instantaneous trip range shall be permitted where restoration of power is as important or more important than the risk of loss of power due to mis-coordination.

Substantiation: Problem: The emergency system overcurrent device coordination requirement added during the last code cycle will force the use of fuses in installations where manufacturer tested coordinating circuit breakers are not available or are no longer available to match upstream/downstream devices due to obsolescence. Application of fuses may lower the needed availability of emergency power in installation where rapid restoration of power is as important or more important than a brief outage.

Substantiation: The ability to retrofit manufacture tested coordinating circuit breakers will often not be possible when modifying existing systems forcing the use of fuses which may not be available when needed to restore emergency power. The code change made requiring coordination without regard to other risks may force installations which increase the risk of more extended outage which may have higher consequence than shorter outages, or may result in unsafe practices such as using incorrectly sized available fuses in place of the needed fuse to quickly restore power to emergency systems when the correct fuse is not available. The user should be able to use engineering judgment to decide whether coordination or rapid restoration of power is more critical in a specific installation. This change to the Code has the effect of eliminating the use of normal molded case circuit breakers in these systems.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 13-147.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 10 Negative: 3

Ballot Not Returned: 1 Gustafson, R.

Explanation of Negative:

ELKINS, D.: This proposal should be accepted in principle. Instead of the exception proposed by the submitter, it is suggested 701.18 be reworded as follows: "Overcurrent protection system design. Legally required standby system(s) overcurrent devices shall be applied according to the safety requirements of the specific installation. Issues such as coordination with supply overcurrent devices, reliable availability of spares, varying levels of normal or standby ground-fault levels, and overcurrent device resetting capability should be evaluated to achieve the optimal safe design."

The language adopted in 2005 presupposes safety in all installations is better served by coordination than rapid recovery of power after an outage. The 2005 code language has the effect of requiring the use of fuses in many installations involving retrofits or expansions of existing installations. Fuses cannot be reset after the cause of an outage has been determined and cleared. A spare matching fuse must be available. The 2005 code language ignores services where rapid restoration of power may be more critical to safety than short outages. This requirement limits engineering solutions and goes counter to the stated intention of the code in 90.1(C) that it "is not a design specification".

WHITTALL, H.: I wish to change my vote from Affirmative to Negative on Proposals 13-135 through 13-147 and 13-159 through 13-167. These items all deal with selective coordination. I agree with those who feel the wording in the NEC should agree with that in NFPA 110. Selective coordination is something that is nice to have and a design consideration, but should not be a requirement in the NEC. Therefore, Proposals 13-135 and 13-159 should have been Accepted and the others listed would have gone along with them.

ZGONENA, T.: See my comments on proposal 13-135.

ARTICLE 702 — OPTIONAL STANDBY SYSTEMS

13-168 Log #2741 NEC-P13 **Final Action: Accept in Principle**
(702.5)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comment expressed in the voting and "with a or b" should be revised to read "with (a) or (b)".

The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with 4.1.1 of the NEC Style Manual.

These actions will be considered by the Panel as a Public Comment.

Submitter: Jim Pauley, Square D Company

Recommendation: Revise NEC 702.5 as shown below.

702.5 Capacity and Rating.

(A) Available Short Circuit Current. Optional standby system equipment shall be suitable for the maximum available ~~fault~~ short-circuit current at its terminals.

(B) System Capacity. The calculations of load on the standby source shall be made in accordance with Article 220 of by another method that is acceptable to the authority having jurisdiction.

(1) Manual Transfer Equipment. Where manual transfer equipment is used an optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. The user of the optional standby system shall be permitted to select the load connected to the system.

(2) Automatic Transfer Equipment. Where automatic transfer equipment is used, an optional standby system comply with a or b.

(a) Full Load. The standby source shall be capable of supplying the full load that is transferred by the automatic transfer equipment.

(b) Load Management. Where a system is employed that will automatically manage the connected load, the standby source shall have a capacity sufficient to supply the maximum load that will be connected by the load management system.

Substantiation: Due to the recent natural disasters the increase in generator installations has grown significantly. At a number of IAEI meetings in 2005, the question has been asked about what to do for the size of an optional standby source that uses automatic transfer. It appears that automatic transfer equipment is being installed with generators that have a capacity that is much smaller than the total load (typically an entire panelboard) being transferred. There has been significant disagreement about how the NEC treats these automatic transfer situations.

The objective of this proposal is to try and address a number of concerns that have been raised by both inspectors and installers. Of primary concern has been that in an automatic transfer application, the user may not be available to "select the loads" that will be supplied. This defeats the intent of the automatic transfer and renders the system somewhat useless.

The proposal does the following:

1. Rearranges the existing 702.5 text to split up the paragraph and provide headings that will make it easier for the code user.
2. Create an "Available Short Circuit Current" heading and moves the sentence about adequate ratings for fault current to this new heading. In addition, the term "fault current" is replaced with "short circuit current" to make it consistent with the rest of the code.
3. System capacity is now split into Manual Transfer and Automatic Transfer applications. In addition text has been added to indicate how the load is to be calculated. For instance if you are including the branch circuits in a home that supply part of the general lighting load, how do you do that calculation. The most logical approach is to use Article 220 and the new language makes that clear. However, it is recognized that a number of jurisdictions are allow recorded load measurements and similar information to be used to provide the capacity. The new text would allow other methods that are acceptable to the AHJ.
4. For manual transfer, the existing language is used to simply require that the supply be adequate to supply the equipment intended to be connected at one time. It also retains the existing permission for the user to be able to select the loads that will be connected.
5. For automatic transfer, new language is provided to address the concerns raised in the field about the user not be available to select the supplied loads. In the automatic situation, there are a couple of options. Item "a" provides and option where you size the standby supply to pick up the entire load that is being transferred. The typical application in this case is where a small generator is connected to a new subpanel with a set number of critical loads. Under normal power the subpanel is supplied by the normal source. When the power fails, the subpanel is transferred to the generator source.

Item "b" is intended to allow a system where some of the load in a larger panel may be shed in order to reduce the loading to an adequate level to be supplied by the standby source. We allow this in larger applications of 700 and 701, so it makes sense here.

Article 702 has become very popular because of the number of outages that have occurred in the country. This proposal updates the requirements to installations that have become more common.

Panel Meeting Action: Accept in Principle

Accept the proposal as submitted except revise (B) as proposed to read as follows:

(B) System Capacity. The calculations of load on the standby source shall be made in accordance with Article 220 or by another approved method.

Panel Statement: The editorial revision conforms to NEC Manual of Style and corrects a typographical error.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

SWAYNE, R.: In Section 702.5(B)(2), editorially add the word "shall" after "system" to complete the sentence structure.

13-169 Log #2983 NEC-P13 **Final Action: Accept in Principle**
(702.5)

Submitter: James S. Gillespie, Brannon & Gillespie, LLC

Recommendation: Revise text as follows:

An optional standby system shall have adequate capacity and rating that complies with one of the following:

(1) For the supply of all equipment intended to be operated at one time. Optional standby system equipment shall be suitable for the maximum available fault current at its terminals. The user of the optional standby system shall be permitted to select the load connected to the system.

(2) Load calculated based on Article 220.

Substantiation: Some AHJs take the requirement of the existing rule to mean that connected load at 100%. This does not work, especially for dwelling units. For "whole house" generators, this can mean in effect that the generator could have to be sized larger than the calculated service disconnect and wire size, which does not make any sense. How can it be justified that a generator has to be able to carry more load than the building service?

Panel Meeting Action: Accept in Principle

Panel Statement: See the panel action and statement on Proposal 13-168.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-170 Log #3145 NEC-P13 **Final Action: Accept in Principle**
(702.5)

Submitter: Dale Rooney, Municipality of Anchorage

Recommendation: Add a new last sentence to read:

Where an automatic transfer switch is used without automatic load shedding the installation shall have adequate capacity for the calculated load being supplied or the maximum demand per 220.87(1).

Substantiation: The last sentence of this section seems to allow the use of an automatic transfer switch in such a way that it may transfer in an overloaded condition. This will, at best, turn it into a manual transfer switch (lighten the load and restart the generator) and at worst could result in damage to the equipment.

This was actually done on the residence of a family which included children with medical needs.

Panel Meeting Action: Accept in Principle

Panel Statement: See the panel action and statement on Proposal 13-168.

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-171 Log #3597 NEC-P13 **Final Action: Accept in Principle**
(702.5)

Submitter: Joe McCann, City of Coral Springs

Recommendation: Revise as follows:

702.5 Capacity and Rating. An optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time when operated automatically . Optional standby system equipment shall be suitable for the maximum fault current at its terminals. The use of the optional standby system shall be permitted to select the load connected to the system when manually transferred .

Substantiation: Generators are being installed permanently that cannot possibly pickup the total connected load of the residence or business. When power goes off and no one is home, there is no way to shift the load. The connected load is picked up by a generator. Say a 5 kW on a 200 A service with a connected load of 170 amps actual submitted this way in plan review.

Panel Meeting Action: Accept in Principle

Panel Statement: See the panel action and statement on Proposal 13-168

Number Eligible to Vote: 14

Ballot Results: Affirmative: 13

Ballot Not Returned: 1 Gustafson, R.

13-172 Log #3276 NEC-P13 **Final Action: Accept in Principle**
(702.5(A) (New))

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review

Recommendation: Add text to read as follows:

702.50(A) Capacity and Rating. An optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at any one time. *To calculate the load when utilizing an automatic transfer switch for individual dwelling units or commercial installation, calculations by any of the excepted methods in Article 220 may be used including 220.87, at peak demand periods during the year to determine the load to be imposed on the generator.*

Substantiation: There is a tendency to just throw any size generator at a problem without taking into consideration what the load is that may be imposed on the generator, or not taking into consideration 702.3, which states that you shall comply with other applicable code articles. By separating the paragraph into sections, this will provide greater clarity.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action and statement on Proposal 13-168.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-173 Log #3277 NEC-P13 **Final Action: Accept in Principle**
(702.5(B) (New))

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review
Recommendation: Add text to read as follows:
702.5(B) Terminal Fault Current. Optional standby system equipment shall be suitable for the maximum available current at its terminals
Substantiation: By separating the second sentence out 502.5, this should provide better meaning to this section.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action and statement on Proposal 13-168.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-174 Log #3278 NEC-P13 **Final Action: Accept in Principle**
(702.5(C))

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review
Recommendation: Add text to read as follows:
702.5(C) User selection. The user of the optional standby system shall be permitted to select the load connected to the system, at any time a manual transfer switch is utilized or pre-select the load through an optional standby panel sized for the generator capacity when an automatic transfer switch is utilized. Load shedding may also be utilized to limit the load on a generator to prevent overloading the generator and its components.
Substantiation: The problem is that retail outlets, manufacturers, and contractors are advertising some of their generators as whole house generators, when in fact some of these generators will not carry the full loads that may be imposed upon them. There are cases where these generators are being installed at homes that have individuals on life support equipment and in the event of generator failure due to overloading would not be able to supply power for the life support equipment.
Panel Meeting Action: Accept in Principle
Panel Statement: See the panel action and statement on Proposal 13-168.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-175 Log #2563 NEC-P13 **Final Action: Accept**
(702.6)

Submitter: Paul Schnackenberg, Gen/Tran Corporation
Recommendation: Delete the following text:
~~Transfer equipment located on the load side of branch circuit protection, shall be permitted to contain supplementary overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent devices shall be part of a listed transfer equipment.~~
Substantiation: In 2000, UL changed the 1008 standard and effectively disallowed the use of supplementary overcurrent devices, using the reasoning that branch circuit rated breakers were necessary between the generator and the individual loads. (We used 4 million of these supplementary devices from 1982 to 2000 without a single incident but were forced to change our design because of this ruling by UL.
Panel Meeting Action: Accept
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-176 Log #2751 NEC-P13 **Final Action: Reject**
(702.6)

Submitter: Jonathan R. Althouse, Michigan State University
Recommendation: Add a new last paragraph to 702.6 to read as follows:
<u>A transfer switch located on the supply side of the service disconnecting means shall be rated as suitable for use as service equipment, and shall be sized in accordance with 230.79. A transfer switch shall be permitted to serve as the service disconnecting means if installed in accordance with the provisions of 230 Part VI and 230 Part VII.</u>
Substantiation: Standby power transfer switches have been installed on the supply side of the service disconnecting means across the country without problems provided they are installed sufficient to handle the load and are listed. There are many transfer switches installed that are not listed and they can be a problem. It is not likely a problem will occur if there is some type of overcurrent protection located down line from the transfer switch. Where there have been problems, there are most likely serious code violations. There needs to be a provision that permits a transfer switch to be located on the outside of a building or structure between the meter and the service disconnect which is usually inside. Most listed transfer switches do not have provisions for overcurrent protection and the issue seems to be 230.91. There needs to be a clear statement of what constitutes a safe installation.
Panel Meeting Action: Reject
Panel Statement: Where a transfer switch suitable for service equipment is installed ahead of an existing service, the transfer switch becomes the service disconnect and grounding requirements in the previous service disconnect change to feeder panel requirements. Because of this, the proposed change is not necessary.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
FLACH, G.: This proposal should be accepted. The Code is not very clear on the location of the transfer switch. There are UL listed transfer switches that are marked “Suitable for Use as Service Equipment”. But, there are no clear cut rules that allow them or indicate that they can be used as a service disconnect. With onsite generators being installed outdoors, a practical location for the transfer switch is also outdoors.

13-177 Log #2770 NEC-P13 **Final Action: Reject**
(702.6)

Submitter: Truman C. Surbrook, Michigan State University
Recommendation: Add a new paragraph to 702.6 as follows:
<u>Listed transfer equipment rated not over 200 amperes shall be permitted to be located on the supply side of the service disconnecting means for an electrical supply operating at not over 250 volts nominal, and shall be suitable for the prevailing conditions.</u>
Substantiation: This new paragraph is sufficiently limiting that it will generally only apply in the case of single-family dwellings, small commercial buildings, and farms. It would be a rare occurrence for such an installation to pose a hazard if the switch is opened under load. The service panel with overcurrent protection is generally located within a few feet of the transfer equipment. Not permitting the transfer equipment to be located on the outside of a building between the meter and the service panel, such as a single-family dwelling, is an unnecessary limiting burden often leading to unsafe alternative installations that are not inspected. Though there may have been a few cases where a problem arose, this procedure has worked safely for years and should be permitted to continue.
Panel Meeting Action: Reject
Panel Statement: Not all transfer equipment is suitable for use as service equipment.
See also the panel action and statement on Proposal 13-176.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-178 Log #3196 NEC-P13 **Final Action: Reject**
(702.6 Exception)

Submitter: Timothy M. Croushore, Allegheny Power
Recommendation: Please revise the exception to 702.6 for temporary connection of portable generators without transfer equipment. The exception should read as follows:
<u>*Exception: Connection of a portable generator without transfer equipment shall be permitted as provided in 590.8.*</u>
Substantiation: The purpose of this change is to revise the exception to conform in accordance with the scope of Article 702 with respect to temporary installations. A companion proposal to Article 590 was submitted to create a new section 590.8. New Section 590.8 is proposed to read as follows:
<u>590.8 Portable Generators. Temporary connection of a portable generator shall be permitted to supply permanent premises wiring where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.</u>
Putting temporary requirements for generators in Article 590 bring all of the other provisions such as time constraints and wiring methods of Article 590 for this application.
Panel Meeting Action: Reject
Panel Statement: The existing exception to 702.6 contains the appropriate text.

Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
HORNBERGER, B.: This proposal should have been accepted. According to the scope of Article 702, the requirements of that Article are for optional standby systems that are permanently installed in their entirety and not for temporary installations. The specific requirements for temporary installations in 590.2, 590.3, and 590.4 should cover the temporary connection of portable generators.
The new Article 590.8 as originally proposed properly deals with the "temporary connection of portable generators", and has additional requirements that are not covered under the provisions of Article 702.

13-179 Log #496 NEC-P13 **Final Action: Reject**
(702.10(A))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise as follows:
702.10 Portable Generator Grounding.
(A) Grounded Separately Derived System. Where a portable optional standby source is used as a separately derived system, it shall be grounded by connecting the grounded conductor of the system to a grounding electrode in accordance with 250.30 (A) .
Substantiation: The system is not "grounded" to a grounding electrode it is grounded by being "connected to a" grounding electrode. This proposal is an effort to clarify the use of the term grounded in this particular section. The proposal is not intended to change the requirements or meaning of the rule, just provided an editorial correction. Grounded separately derived systems are covered in 250.30(A) and ungrounded separately derived systems are covered in 250.30(B).
Panel Meeting Action: Reject
Panel Statement: The proposed change and the substantiation given is unclear and, as proposed, will preclude the use of an ungrounded system.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 12 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
SWAYNE, R.: This Proposal should be Accepted. The present wording of Section 702.10(A) requires that a portable generator used as a separately derived system for an optional standby system be grounded and an ungrounded system, therefore, is not permitted. The Submitter is correct in stating that you do not "ground" but rather "connect" to a grounding electrode.

13-180 Log #549 NEC-P13 **Final Action: Reject**
(702.11, FPN (New))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Add a new FPN as follows:
702.11 Outdoor Generator Sets. Where an outdoor generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.
FPN: 250.32(D) provides grounding and bonding requirements for building or structure disconnecting means that are remote from the building or structure.
Substantiation: This proposal is an effort to provide some correlation between the rules in 250.32(D) which provides requirements for grounding and bonding where the building or structure disconnecting means is mounted remote from the building or structure as it would be if it were located on the generator assembly in accordance with this section. A companion proposal is being submitted to 250.32(D) to correlate with the provisions of 702.11.
Panel Meeting Action: Reject
Panel Statement: See the panel action and statement on Proposal 13-130.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-181 Log #1285 NEC-P13 **Final Action: Reject**
(702.11, FPN (New))

Submitter: Mark R. Hilbert, State of New Hampshire
Recommendation: Revise text to read:
702.11 Outdoor Generator Sets. Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.
Add a new fine print note to read as follows:
FPN: Section 225.36 provides additional requirements for the suitability of the disconnecting means.
Substantiation: The recommendation for this fine print note is an attempt to identify the requirements of 225.36 for the building disconnecting means, which in this case will be located at the generator, to be "suitable for use as service equipment." Additionally, this FPN will help identify an often overlooked requirement, clarify that even though it is remote to the building, the disconnecting means must be suitable for use as service equipment and that the requirement in 225.36 is not amended by 702.11.
Panel Meeting Action: Reject
Panel Statement: See the panel action statement on Proposal 13-131.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-182 Log #689 NEC-P13 **Final Action: Reject**
(702.12)

Submitter: James Filippone, Port Authority of NY & NJ
Recommendation: Add the following:
702.12 Tests. When optional standby systems provide power to elevators the building owner shall test them upon installation and subsequently at least every five years under maximum load conditions to verify that they still have sufficient capacity and rating. A written record shall be kept of all such tests. The authority having jurisdiction shall be notified prior to each test to afford them the opportunity to witness the tests.
FPN: Passenger electric elevators and freight electric elevators permitted to carry passengers must be tested in the down direction with 125 percent of their rated load inside the car and freight elevators must be tested with rated load inside the car. See ASME A17.1 Safety Code for Elevators and Escalators for information on which elevators must be capable of operating in the down direction with 125 percent of rated load.
Substantiation: Requiring testing on a 5-year basis under maximum load condition is reasonable to ensure that the elevators are available to emergency responders. Many elevators are provided with optional standby systems. Over time the loads that the system must supply can change significantly. Experience indicates that systems that were once sufficient are no longer sufficient due to added loads. The system needs to be tested under maximum capacity upon installation and periodically afterwards.
Information on the required load for elevators is provided for testing purposes.
Panel Meeting Action: Reject
Panel Statement: See Panel Action and Statement on Proposal 13-114.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

13-183 Log #3275 NEC-P13 **Final Action: Reject**
(702.13 (New))

Submitter: Leonard F. Devine, Jr., Palm Beach County Plan Review
Recommendation: Add text to read as follows:
702.13 Disconnect. Where the requirements of 702.11 cannot be complied with, an additional disconnect that complies with 225.3(A) and 225.36 shall be installed.
Substantiation: With the number of hurricanes and the explosion of the generator installations advertised as whole house generators, it has become quite clear that there is not a consensus of opinion as to how the generators are to be installed. The installers, manufacturers and the enforcement community are not in agreement. I believe that better direction needs to be supplied in Article 702. This should help to make it clearer as to how the disconnect needs to be handled.
Panel Meeting Action: Reject
Panel Statement: Section 702.11 is a permissive clause. It is unclear what is meant by "can't be complied with" when compliance is not required.
Number Eligible to Vote: 14
Ballot Results: Affirmative: 13
Ballot Not Returned: 1 Gustafson, R.

ARTICLE 705 — INTERCONNECTED ELECTRIC POWER PRODUCTION SOURCES

13-184 Log #2581 NEC-P13 **Final Action: Accept in Principle in Part (705)**

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting.
The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual.
This action will be considered by the Panel as a Public Comment.
Submitter: Timothy M. Croushore, Allegheny Power
Recommendation:
Revise text to read as follows:

ARTICLE 705 Interconnected Electric Power Production Sources

I General

705.1 Scope.

This article covers installation of one or more electric power production sources operating in parallel with a primary source(s) of electricity.

FPN: Examples of the types of primary sources are a utility supply, on-site electric power source(s), or other sources.

705.2 Definition.

*****NOTES – not part of NEC text: MOVE the revised definition of Interactive System TO Article 100. Move Definitions of Hybrid System, and Point of Common Coupling from Article 690 to 705.**

~~**Interactive System.** An electric power production system that is operating in parallel with and capable of delivering energy to an electric primary source supply system.~~

Hybrid System. A system comprised of multiple power sources. These power sources may include photovoltaic, wind, micro-hydro generators, engine-driven generators, and others, but do not include electrical power production and distribution network systems. Energy storage systems such as batteries, flywheels, or superconducting magnetic storage equipment, do not constitute a power source for the purpose of this definition.

Utility-Interactive Inverter Output Circuit. The conductors between the utility-interactive inverter and the service equipment or another electric power production source, such as a utility, for electrical production and distribution network.

Point of Common Coupling. The point at which the power production and distribution network and the customer interface occurs in an interactive system. Typically, this is the load side of the power network meter.

705.3 Other Articles.

Interconnected electric power production sources shall comply with this article and also with the applicable requirements of the articles in Table 705.3.

Table 705.3 Other Articles

Equipment/System	Article
Generators	445
Emergency systems	700
Legally required standby systems	701
Optional standby systems	702

~~*Exception No. 1: Installation of solar photovoltaic systems operated as interconnected power sources shall be in accordance with Article 690.*~~

~~*Exception No. 2: Installation of fuel cell systems operated as interconnected power sources shall be in accordance with Article 692.*~~

705.10 Directory.

A permanent plaque or directory, denoting all electrical power sources on or in the premises, shall be installed at each service equipment location and at locations of all electric power production sources capable of being interconnected.

Exception: Installations with large numbers of power production sources shall be permitted to be designated by groups.

705.12 Point of Connection.

The outputs of electric power production systems shall be interconnected at the premises service disconnecting means beyond the point of common coupling.

(A) Integrated Electric System. The outputs shall be permitted to be interconnected at a point or points elsewhere on the premises where the system qualifies as an integrated electric system and incorporates protective equipment in accordance with all applicable sections of Article 685.

(B) General. The outputs shall be permitted to be interconnected at a point or points elsewhere on the premises where all of the following conditions are met:

(1) The aggregate of nonutility sources of electricity has a capacity in excess of 100 kW, or the service is above 1000 volts.

(2) The conditions of maintenance and supervision ensure that qualified persons service and operate the system.

(3) Safeguards, documented procedures, and protective equipment are established and maintained.

705.14 Output Characteristics.

The output of a generator or other electric power production source operating in parallel with an electric supply system shall be compatible with the voltage, wave shape, and frequency of the system to which it is connected.

FPN: The term *compatible* does not necessarily mean matching the primary source wave shape.

705.16 Interrupting and Short-Circuit Current Rating.

Consideration shall be given to the contribution of fault currents from all interconnected power sources for the interrupting and short-circuit current ratings of equipment on interactive systems.

705.20 Disconnecting Means, Sources.

Means shall be provided to disconnect all ungrounded conductors of an electric power production source(s) from all other conductors.

705.21 Disconnecting Means, Equipment.

Means shall be provided to disconnect power production equipment, such as utility interactive inverters or transformers associated with a power production source, from all ungrounded conductors of all sources of supply. Equipment intended to be operated and maintained as an integral part of a power production source exceeding 1000 volts shall not be required to have a disconnecting means.

705.22 Disconnect Device.

The disconnecting means for ungrounded conductors shall consist of a manually or power operable switch(es) or circuit breaker(s) with the following features:

(1) Located where readily accessible

(2) Externally operable without exposing the operator to contact with live parts and, if power operable, of a type that can be opened by hand in the event of a power supply failure

(3) Plainly indicating whether in the open (off) or closed (on) position

(4) Having ratings not less than the load to be carried and the fault current to be interrupted

(5) Capable of being locked in the open (off) position

For disconnect equipment energized from both sides, a marking shall be provided to indicate that all contacts of the disconnect equipment may be energized.

FPN No. 1: In parallel generation systems, some equipment, including knife blade switches and fuses, is likely to be energized from both directions. See 240.40.

FPN No. 2: Interconnection to an off-premises primary source could require a visibly verifiable disconnecting device.

705.30 Overcurrent Protection.

Conductors shall be protected in accordance with Article 240. Equipment and conductors connected to more than one electrical source shall have a sufficient number of overcurrent devices located so as to provide protection from all sources.

(A) Generators. Generators shall be protected in accordance with 445.12.

(B) Solar Photovoltaic Systems. Solar photovoltaic systems shall be protected in accordance with Article 690.

(C) Transformers. Overcurrent protection for a transformer with a source(s) on each side shall be provided in accordance with 450.3 by considering first one side of the transformer, then the other side of the transformer, as the primary.

(D) Fuel Cell Systems. Fuel cell systems shall be protected in accordance with Article 692.

705.32 Ground-Fault Protection.

Where ground-fault protection is used, the output of an interactive system shall be connected to the supply side of the ground-fault protection.

Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources.

705.40 Loss of Primary Source.

Upon loss of primary source, an electric power production source shall be automatically disconnected from all ungrounded conductors of the primary source and shall not be reconnected until the primary source is restored.

Exception: A listed Utility Interactive Inverter shall be permitted to automatically cease exporting power upon loss of primary source and shall not be required to automatically disconnect all ungrounded conductors from the primary source.. A listed Utility Interactive Inverter shall be permitted to automatically or manually resume exporting power to the utility once the primary source is restored.

FPN No. 1: Risks to personnel and equipment associated with the primary source could occur if an utility interactive electric power production source can operate as an intentional island. Special detection methods are~~can be~~ required to determine that a primary source supply system outage has occurred and whether there should be automatic disconnection. When the primary source supply system is restored, special detection methods can be required to limit exposure of power production sources to out-of-phase reconnection.

FPN No. 2: Induction-generating equipment on systems with significant capacitance can become self-excited upon loss of primary source and experience severe overvoltage as a result.

705.42 Unbalanced Interconnections.

A 3-phase electric power production source shall be automatically disconnected from all ungrounded conductors of the interconnected systems when one of the phases of that source opens. This requirement shall not be applicable to an electric power production source providing power for an emergency or legally required standby system.

Exception: A listed Utility Interactive Inverter shall be permitted to automatically cease exporting power when one of the phases of the source opens and shall not be required to automatically disconnect all ungrounded conductors from the primary source. A listed Utility Interactive Inverter shall be permitted to automatically or manually resume exporting power to the utility once all phases of the source is restored.

705.43 Synchronous Generators.

Synchronous generators in a parallel system shall be provided with the necessary equipment to establish and maintain a synchronous condition.

705.50 Grounding.

Interconnected electric power production sources shall be grounded in accordance with Article 250.

Exception: For direct-current systems connected through an inverter directly to a grounded service, other methods that accomplish equivalent system protection and that utilize equipment listed and identified for the use shall be permitted.

II. Utility Interactive Inverters

705.60 Circuit Sizing and Current.

(A) Calculation of Maximum Circuit Current. The maximum current for the specific circuit shall be calculated in accordance with 705.60 (A)(1) through (A)(2).

(1) Inverter Source Circuit Currents. The maximum current shall be the sum of the rated short-circuit currents of the inverter input circuits multiplied by 125 percent.

(2) Inverter Output Circuit Current. The maximum current shall be the inverter continuous output current rating.

(B) Ampacity and Overcurrent Device Ratings. Inverter system currents shall be considered to be continuous.

(1) Sizing of Conductors and Overcurrent Devices. The circuit conductors and overcurrent devices shall be sized to carry not less than 125 percent of the maximum currents as calculated in 705.60(A). The rating or setting of overcurrent devices shall be permitted in accordance with 240.4(B) and (C).

Exception: Circuits containing an assembly, together with its overcurrent device(s), that is listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

(2) Internal Current Limitation. Overcurrent protection for inverter output circuits with devices that internally limit the current from the inverter output circuit shall be permitted to be rated at less than the value calculated in 705.60 (B)(1). This reduced rating shall be at least 125 percent of the limited current value. Inverter output circuit conductors shall be sized in accordance with 705.60(B)(1).

Exception: An overcurrent device in an assembly listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

705.65 Overcurrent Protection.

(A) Circuits and Equipment. Inverter source circuit, inverter output circuit, and storage battery circuit conductors and equipment shall be protected in accordance with the requirements of Article 240. Circuits connected to more than one electrical source shall have overcurrent devices located so as to provide overcurrent protection from all sources.

Exception: An overcurrent device shall not be required for circuit conductors sized in accordance with 705.60 (B) and located where one of the following apply:

(a) There are no external sources such as parallel-connected source circuits, batteries, or backfeed from inverters.

(b) The short-circuit currents from all sources do not exceed the ampacity of the conductors.

FPN: Possible backfeed of current from any source of supply, including a supply through an inverter into the inverter output circuit and inverter source circuits, is a consideration in determining whether adequate overcurrent protection from all sources is provided for conductors and modules.

(B) Power Transformers. Overcurrent protection for a transformer with a source(s) on each side shall be provided in accordance with 450.3 by considering first one side of the transformer, then the other side of the transformer, as the primary.

Exception: A power transformer with a current rating on the side connected toward the inverter power source, not less than the short-circuit output current rating of the inverter, shall be permitted without overcurrent protection from that source.

(C) Inverter Source Circuits. Branch-circuit or supplementary-type overcurrent devices shall be permitted to provide overcurrent protection in inverter source circuits. The overcurrent devices shall be accessible but shall not be required to be readily accessible.

Standard values of supplementary overcurrent devices allowed by this section shall be in one ampere size increments, starting at one ampere up to and including 15 amperes. Higher standard values above 15 amperes for supplementary overcurrent devices shall be based on the standard sizes provided in 240.6(A).

(D) Direct-Current Rating. Overcurrent devices, either fuses or circuit breakers, used in any dc portion of a utility interactive inverter power system shall be listed for use in dc circuits and shall have the appropriate voltage, current, and interrupt ratings.

(E) Series Overcurrent Protection. In series-connected strings of two or more modules, a single overcurrent protection device shall be permitted.

705.70 Utility-Interactive Inverters Mounted in Not-Readily-Accessible Locations. Utility-interactive inverters shall be permitted to be mounted on roofs or other exterior areas that are not readily accessible. These installations shall comply with (1) through (4):

(1) A direct-current disconnecting means shall be mounted within sight of or in the inverter.

(2) An alternating-current disconnecting means shall be mounted within sight of or in the inverter.

(3) The alternating-current output conductors from the inverter and an additional alternating-current disconnecting means for the inverter shall comply with 705.22.

(4) A plaque shall be installed in accordance with 705.10.

705.80 Utility Interactive Power Systems Employing Energy Storage.

Utility Interactive power systems employing energy storage shall also be marked with the maximum operating voltage, including any equalization voltage and the polarity of the grounded circuit conductor.

705.82 Hybrid Systems.

Hybrid Systems shall be permitted to be interconnected at the point-of common coupling with utility-interactive inverters.

705.85 Identified Interactive Equipment.

Only inverters and ac modules listed and identified as utility interactive shall be permitted in interactive systems.

705.90 Loss of Interactive System Power.

An inverter or an ac module in a utility interactive system shall automatically de-energize its output to the connected electrical production and distribution network upon loss of voltage in that system and shall remain in that state until the electrical production and distribution network voltage has been restored.

A normally utility interactive inverter shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.

705.95 Ampacity of Neutral Conductor.

If a single-phase, 2-wire inverter output is connected to the neutral and one ungrounded conductor (only) of a 3-wire system or of a 3-phase, 4-wire wye-connected system, the maximum load connected between the neutral and any one ungrounded conductor plus the inverter output rating shall not exceed the ampacity of the neutral conductor.

705.100 Unbalanced Interconnections.

(A) Single Phase. Single-phase inverters for hybrid systems and ac modules in interactive hybrid systems shall not be connected to 3-phase power systems unless the interconnected system is designed so that significant unbalanced voltages cannot result.

(B) Three Phase. Three-phase inverters and 3-phase ac modules in interactive systems shall have all phases automatically de-energized upon loss of, or unbalanced, voltage in one or more phases unless the interconnected system is designed so that significant unbalanced voltages will not result.

Substantiation: This proposal is part of 2 other proposals dealing with interconnecting electric power sources in Article 690, Article 692 and Article 705. This proposal is part of 3 other proposals to place common definitions in Article 100. The purpose of this proposal is to revise Article 705. This work incorporates the equipment that would be listed by Underwriters Laboratory Standard 1741 - Inverters, Converters and Controllers for Use in Independent Power Systems.

The figure in the substantiation section of this proposal shows the common wiring in building systems that should be covered by Article 705. The main purpose of this proposal is to put all interconnection requirements in Article 705 and all technology specific issues in their respective articles.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

1. Move the definition of Interactive System to Article 100.

Interactive System. An electric power production system that is operating in parallel with and capable of delivering energy to an electric primary source supply system.

2. Revise text to read as follows:

ARTICLE 705 Interconnected Electric Power Production Sources

I General

705.1 Scope. This article covers installation of one or more electric power production sources operating in parallel with a primary source(s) of electricity. FPN: Examples of the types of primary sources are a utility supply, on-site electric power source(s), or other sources.

705.**2 Definitions.**

~~**Interactive System.** An electric power production system that is operating in parallel with and capable of delivering energy to an electric primary source supply system.~~

Hybrid System. A system comprised of multiple power sources. These power sources may include photovoltaic, wind, micro-hydro generators, engine-driven generators and others. but do not include electrical power production and distribution network systems. Energy storage systems such as batteries, flywheels. or superconducting magnetic storage equipment. do not constitute a power source for the purpose of this definition.

Utility-Interactive Inverter Output Circuit. The conductors between the utility interactive inverter and the service equipment or another electric power production source. such as a utility. for electrical production and distribution network. Point of Common Coupling. The point at which the power production and distribution network and the customer interface occurs in an interactive system. Typically, this is the load side of the power network meter.

705.3 Other Articles. Interconnected electric power production sources shall comply with this article and also with the applicable requirements of the articles in Table 705.3.

Table 705.3 Other Articles

Equipment/System	Article
Generators	445
Emergency systems	700
Legally required standby systems	701
Optional standby systems	702

Exception No. 1: Installation of solar photovoltaic systems operated as interconnected power sources shall be in accordance with Article 690.
Exception No. 2: Installation of fuel cell systems operated as interconnected power sources shall be in accordance with Article 692.

705.4 Equipment Approval. All equipment shall be approved for the intended use. Interconnection systems shall be listed and identified for interconnection service.

705.10 Directory. A permanent plaque or directory, denoting all electrical power sources on or in the premises, shall be installed at each service equipment location and at locations of all electric power production sources capable of being interconnected. Exception: Installations with large numbers of power production sources shall be permitted to be designated by groups.

705.12 Point of Connection. The outputs of electric power production systems shall be interconnected as specified in either (A), (B), or (C):

(A) Integrated Electric Systems. The outputs shall be permitted to be interconnected at a point or points elsewhere on the premises where the system qualifies as an integrated electric system and incorporates protective equipment in accordance with all applicable sections of Article 685.

(B) Greater than 100kW. The outputs shall be permitted to be interconnected at a point or points elsewhere on the premises where all of the following conditions are met:

(1) The aggregate of non-utility sources of electricity has a capacity in excess of 100 kW, or the service is above 1000 volts.

(2) The conditions of maintenance and supervision ensure that qualified persons service and operate the system.

(3) Safeguards, documented procedures, and protective equipment are established and maintained.

(C) Less than or equal to 100 kW. The output of an interactive power source with a capacity of less than or equal to 100kW shall be connected as specified in either (1) or (2):

(1) Supply Side A photovoltaic power source shall be permitted to be connected to the supply side of the service disconnecting means as permitted in 230.82(6).

(2) Load Side A photovoltaic power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises, provided that all of the following conditions are met:

(a) Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.

(b) The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor.

Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.

(c) The interconnection point shall be on the line side of all ground-fault protection equipment.

Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources.

(d) Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.

Exception: Equipment with power supplied from a single point of connection.

(e) Circuit breakers, if backfed, shall be identified for such operation. Dedicated circuit breakers backfed from listed utility-interactive inverters complying with 690.60 shall not be required to be individually clamped to the panelboard busbars. A front panel shall clamp all circuit breakers to the panelboard busbars. Main circuit breakers connected directly to energized feeders shall also be individually clamped.

705.14 Output Characteristics.

The output of a generator or other electric power production source operating in parallel with an electric supply system shall be compatible with the voltage, wave shape, and frequency of the system to which it is connected. FPN: The term compatible does not necessarily mean matching the primary source wave shape.

705.16 Interrupting and Short-Circuit Current Rating.
Consideration shall be given to the contribution of fault currents from all interconnected power sources for the interrupting and short-circuit current ratings of equipment on interactive systems.

705.20 Disconnecting Means, Sources.
Means shall be provided to disconnect all ungrounded conductors of an electric power production source(s) from all other conductors.

705.21 Disconnecting Means, Equipment. Means shall be provided to disconnect power production equipment, such as utility interactive inverters or transformers associated with a power production source, from all ungrounded conductors of all sources of supply. Equipment intended to be operated and maintained as an integral part of a power production source exceeding 1000 volts shall not be required to have a disconnecting means.

705.22 Disconnect Device.
The disconnecting means for ungrounded conductors shall consist of a manually or power operable switch(es) or circuit breaker(s) with the following features:
(1) Located where readily accessible
(2) Externally operable without exposing the operator to contact with live parts and if power operable, of a type that can be opened by hand in the event of a power supply failure
(3) Plainly indicating whether in the open (or closed (on) position
(4) Having ratings not less than the load to be cared and the fault current to be interrupted

For disconnect equipment energized from both sides, a marking shall be provided to indicate that all contacts of the disconnect equipment may be energized.
FPN No. 1: In parallel generation systems, some equipment, including knife blade switches and fuses, is likely to be energized from both directions. See 240.40.
FPN No. 2: Interconnection to an off-premises primary source could require a visibly verifiable disconnecting device.

705.30 Overcurrent Protection.
Conductors shall be protected in accordance with Article 240. Equipment and conductors connected to more than one electrical source shall have a sufficient number of overcurrent devices located so as to provide protection from all sources.
~~**(A) Generators**. Generators shall be protected in accordance with 445.12.~~
(A) Solar Photovoltaic Systems. Solar photovoltaic systems shall be protected in accordance with Article 690.
(B) Transformers. Overcurrent protection for a transformer with a source(s) on each side shall be provided in accordance with 450.3 by considering first one side of the transformer, then the other side of the transformer, as the primary.
(C) Fuel Cell Systems. Fuel cell systems shall be protected in accordance with Article 692.

705.32 Ground-Fault Protection.
Where ground-fault protection is used, the output of an interactive system shall be connected to the supply side of the ground-fault protection.
Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources.

705.40 Loss of Primary Source.
Upon loss of primary source, an electric power production source shall be automatically disconnected from all ungrounded conductors of the primary source and shall not be reconnected until the primary source is restored. *Exception: A listed Utility Interactive Inverter shall be permitted to automatically cease exporting power upon loss of primary source and shall not be required to automatically disconnect all ungrounded conductors from the primary source. A listed Utility Interactive Inverter shall be permitted to automatically or manually resume exporting power to the utility once the primary source is restored.*
FPN No. 1: Risks to personnel and equipment associated with the primary source could occur if an utility interactive electric power production source can operate as an intentional island. Special detection methods are required to determine that a primary source supply system outage has occurred and whether there should be automatic disconnection. When the primary source supply system is restored special detection methods can be required to limit exposure of power production sources to out-of-phase reconnection.
FPN No. 2: Induction-generating equipment on systems with significant capacitance can become self-excited upon loss of primary source and experience severe overvoltage as a result.
A normally utility interactive inverter shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.

705.42 ~~Unbalanced Connections~~ Loss of Three-Phase Primary Source.
A 3-phase electric power production source shall be automatically disconnected from all ungrounded conductors of the interconnected systems when one of the phases of that source opens. This requirement shall not be applicable to an electric power production source providing power for an emergency or legally required standby system.
Exception: A listed Utility Interactive Inverter shall be permitted to automatically cease exporting power when one of the phases of the source ovens and shall not be required to automatically disconnect all ungrounded conductors from the primary source. A listed Utility Interactive Inverter shall be permitted to automatically or manually resume exporting power to the utility once all phases of the source is restored.

705.50 Grounding.
Interconnected electric power production sources shall be grounded in accordance with Article 250.
Exception: For direct-current systems connected through an inverter directly to a grounded service, other methods that accomplish equivalent system protection and that utilize equipment listed and identified for the use shall be permitted.

II. Utility Interactive Inverters

705.60 Circuit Sizing and Current.
(A) Calculation of Maximum Circuit Current. The maximum current for the specific circuit shall be calculated in accordance with 705.60 (A) (1) though (A)(2).
(1) Inverter Source Circuit Currents. The maximum current shall be ~~the sum of the rated short-circuit currents of the inverter input circuits multiplied by 125 percent~~ the maximum rated input current of the inverter.
(2) Inverter Output Circuit Current. The maximum current shall be the inverter continuous output current rating.
(B) Ampacity and Overcurrent Device Ratings. Inverter system currents shall be considered to be continuous.
(1) Sizing of Conductors and Overcurrent Devices. The circuit conductors and overcurrent devices shall be sized to carry not less than 125 percent of the maximum currents as calculated in 705.60(A). The rating or setting of overcurrent devices shall be permitted in accordance with 240.4(B) and(C).
Exception: Circuits containing an assembly together with its overcurrent device(s) that is listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.
~~(2) Internal Current Limitation. Overcurrent protection for inverter output circuits with devices that internally limit the current from the inverter output circuit shall be permitted to be rated at less than the value calculated in 705.60 (0)(1). This reduced rating shall be at least 125 percent of the limited current value. Inverter output circuit conductors shall be sized in accordance with 705.60(O)(1).~~
~~*Exception: An overcurrent device in an assembly listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.*~~

705.65 Overcurrent Protection.
(A) Circuits and Equipment. Inverter input ~~source~~ circuits, inverter output circuit and storage battery circuit conductors and equipment shall be protected in accordance with the requirements of Article 240. Circuits connected to more than one electrical source shall have overcurrent devices located so as to provide overcurrent protection from all sources. *Exception: An overcurrent device shall not be required for circuit conductors sized in accordance with 705.60(B) and located where one of the following apply:*
(a) There are no external sources such as parallel-connected source circuits, batteries. or backfeed from inverters.
(b) The short-circuit currents from all sources do not exceed the ampacity of the conductors.
FPN: Possible backfeed of current from any source of supply. including a supply through an inverter into the inverter output circuit and inverter source circuits. is a consideration in determining whether adequate overcurrent protection from all sources is provided for conductors and modules.
(B) Power Transformers. Overcurrent protection for a transformer with a source(s) on each side shall be provided in accordance with 450.3 by considering first one side of the transformer. then the other side of the transformer. as the primary.
Exception: A power transformer with a current rating on the side connected toward the inverter power source not less than the short-circuit output current rating of the inverter shall be permitted without overcurrent protection from that source.
(C) Inverter Source Circuits. Branch-circuit or supplementary-type overcurrent devices shall be permitted to provide overcurrent protection in inverter source circuits. The overcurrent devices shall be accessible but shall not be required to be readily accessible. Standard values of supplementary overcurrent devices allowed by this section shall be in one ampere size increments. staring at one ampere up to and including 15 amperes. Higher standard values above 15 amperes for supplementary overcurrent devices shall be based on the standard sizes provided in 240.6(A).

(D) Direct-Current Rating. Overcurrent devices. either fuses or circuit breakers. used in any dc portion of a utility interactive inverter power system shall be listed for use in dc circuits and shall have the appropriate voltage, current. and interrupt ratings.
(E) Series Overcurrent Protection. In series-connected strings of two or more modules. a single overcurrent protection device shall be permitted.

705.70 Utility-Interactive Inverters Mounted in Not-Readily-Accessible Locations. Utility-interactive inverters shall be permitted to be mounted on roofs or other exterior areas that are not readily accessible. These installations shall comply with (1) through (4):
(1) A direct-current disconnecting means shall be mounted within sight of, or in the inverter.
(2) An alternating-current disconnecting means shall be mounted within sight of, or in the inverter.
(3) The alternating-current output conductors from the inverter and an additional alternating-current disconnecting means for the inverter shall comply with 705.22.
(4) A plaque shall be installed in accordance with 705.10.

705.80 Utility Interactive Power Systems Employing Energy Storage. Utility Interactive power systems employing energy storage shall also be marked with the maximum operating voltage including any equalization voltage and the polarity of the grounded circuit conductor.

705.82 Hybrid Systems.
Hybrid Systems shall be permitted to be interconnected ~~at the point-of common coupling~~ with utility-interactive inverters.

~~**705.85 Identified Interactive Equipment**~~.
~~Only inverters and ac modules listed and identified as utility interactive shall be permitted in interactive systems.~~

~~**705.90 Loss of Interactive System Power.**~~
~~An inverter or an ac module in a utility interactive system shall automatically deenergize its output to the connected electrical production and distribution network upon loss of voltage in that system and shall remain in that state until the electrical production and distribution network voltage has been restored.~~
~~A normally utility-interactive inverter shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.~~

705.95 Ampacity of Neutral Conductor.
If a single-phase 2-wire inverter output is connected to the neutral and one ungrounded conductor (only) of a 3-wire system or of a 3-phase 4-wire wye-connected system, the maximum load connected between the neutral and anyone ungrounded conductor plus the inverter output rating shall not exceed the ampacity of the neutral conductor.

705.100 Unbalanced Interconnections.
(A) Single Phase. Single-phase inverters for hybrid systems and ac modules in interactive hybrid systems shall not be connected to 3-phase power systems unless the interconnected system is designed so that significant unbalanced voltages cannot result.
(B) Three Phase. Three-phase inverters and 3-phase ac modules in interactive systems shall have all phases automatically de-energized upon loss of. or unbalanced. voltage in one or more phases unless the interconnected system is designed so that significant unbalanced voltages will not result.

III. Generators

705.130 Overcurrent Protection.
Conductors shall be protected in accordance with Article 240. Equipment and conductors connected to more than one electrical source shall have a sufficient number of overcurrent devices located so as to provide protection from all sources.
Generators shall be protected in accordance with 445.12.

705.143 Synchronous Generators.
Synchronous generators in a parallel system shall be provided with the necessary equipment to establish and maintain a synchronous condition.

The overall scheme adopted in addressing proposals 13-17, 13-71 and 13-184 was to accept "in principle" proposals 13-17 (regarding Article 690, Photovoltaics) and 13-71 (Fuel Cells), but to leave the indicated sections on interactive systems in these Articles to ensure that is no unforeseen negative impact could arise. The "Accept in Principle" allows public comment which could include suggestions for removing this redundant text.

Note: The proposed changes to Article 705 from Panel Action 13-185 have also been included in this proposal. The involve the addition of 705.4, and 705.22.

This proposal to change Article 705 was accepted with the following modifications:

1/ The two exceptions at the end of 705.3 Other Articles were retained as Articles 690 and 692 as these Articles contain installation information that is specific to their own technologies.

2/ Article 705-12. The 2005 language for Point of Connection from Article 690 was added as a third alternative to 705(A) and (B). Note: These should be modified according to the results of Panel Actions on Proposals 13-63 through 13-69.

3/ Article 705-22 Disconnect Device. The proposed requirement for a lockable disconnect was deleted as this is typically specified in Area EPS operating practices. (IEEE 1547 requires the following: "When required by the Area EPS operating practices, a readily accessible, lockable, visible-break isolation device shall be located between the Area EPS and the DR unit.")

4/ The title of 705.42 was changed from "Unbalanced Interconnections" to "705.42 Loss of Three-Phase Primary Source" as the title " Unbalanced Interconnections" is used again as the title for 705.100, and also this new title better describes the contents of the Article.

5/ A new Division III. Generators was added to allow these the very different technologies of rotating machines and inverters to be addressed separately. Article 705. 705.43 Synchronous Generators was renumbered to 705.143 and moved to the generator division. A section was added for Generator Overcurrent Protection and this topic was removed from 705.30 which was then renumbered.

6/ 705-60(A)(1) – was changed from a method peculiar to photovoltaics to the inverter input current rating.

7/ 705-60(B)(2) was deleted as it originally applied to photovoltaic (dc) output circuits and thus in inapplicable for inverter output circuits.

8/ "705.85 Identified Interactive Equipment." Was deleted as it is covered by the new section 705.4 and the text was not inclusive of rotating machines: " Only inverters and ac modules listed and identified as utility interactive shall be permitted in interactive systems"

9/ Proposed Article 705.90 Loss of Interactive System Power was deleted (apart from the last sentence) as it duplicated 705.40 Loss of Primary Source. The last sentence of 705.90 regarding stand-alone operation was moved to 705.40.

10/ 705.65(A) – the word "source" was changed to "input".

Panel Statement: The overall scheme adopted in addressing Proposals 13-17, 13-71, and 13-184 was to accept "in principle" proposals 13-17 (regarding Article 690, Photovoltaics) and 13-71 (Fuel Cells) but to leave the indicated sections on interactive systems in these articles to ensure that no unforeseen negative impact could arise. The accept in principle allows public comment, which could include suggestions for removing this redundant text.
Note: The proposed changes to Article 705 from Panel Action 13-185 have also been included in this proposal. They involve the addition of 705.4, and 705.22.
This proposal to change Article 705 was accepted with the following modifications:
1. The two exceptions at the end of 705.3 Other Articles were retained as Articles 690 and 692, as these articles contain installation information that is specific to their own technologies.
2. Article 705-12. The 2005 language for point of connection from Article 690 was added as a third alternative to 705(A) and (B). Note: These should be modified according to the results of panel actions on Proposals 13-63 through 13-69.
3. Article 705-22 Disconnect Device. The proposed requirement for a lockable disconnect was deleted, as this is typically specified in Area EPS operating practices. (IEEE 1547 requires the following: "When required by the Area EPS operating practices, a readily accessible, lockable, visible-break isolation device shall be located between the Area EPS and the DR unit.")
4. The title of 705.42 was changed from "Unbalanced Interconnections" to "705.42 Loss of Three-Phase Primary Source," as the title " Unbalanced Interconnections" is used again as the title for 705.100 and this new title better describes the contents of the Article.
5. A new Division III. Generators was added to allow these the very different technologies of rotating machines and inverters to be addressed separately. Article 705. 705.43 Synchronous Generators was renumbered to 705.143 and moved to the generator division. A section was added for Generator Overcurrent Protection and this topic was removed from 705.30, which was then renumbered.
6. 705-60(A)(1) – was changed from a method peculiar to photovoltaics to the inverter input current rating.
7. 705-60(B)(2) was deleted, as it originally applied to photovoltaic (dc) output circuits and thus is inapplicable for inverter output circuits.

8. "705.85 Identified Interactive Equipment." Was deleted, as it is covered by the new section 705.4 and the text was not inclusive of rotating machines: " Only inverters and ac modules listed and identified as utility interactive shall be permitted in interactive systems."

9. Proposed Article 705.90 Loss of Interactive System Power was deleted (apart from the last sentence) as it duplicated 705.40 Loss of Primary Source. The last sentence of 705.90 regarding stand-alone operation was moved to 705.40.

10. 705.65(A) – the word "source" was changed to "input".

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15

Ballot Not Returned: 1 Gustafson, R.

Comment on Affirmative:

BOWER, W.: I vote affirmative with comment because I believe the panel action to accept in principle in part was an effort to get the proposal to the industry and the public, but that substantiation was absent. The sweeping change as recommended in this proposal on Article 705 needs careful study. I disagree with the recommended duplication of the interconnection issues in Article 705, as accepted, WITHOUT a thorough industry-supported substantiation for each change. I commend the proposer for his efforts and it appears that most changes are correct, but the impacts for each technology must be assessed. There was little or no substantiation provided and little industry input to make the linked proposed changes in Article 690, 692 OR in 705. I believe this change, accepted in principle for 705 is timely, but that it now needs careful public and industry scrutiny.

HORNBERGER, B.: **I agree with the panel action to accept in principle, however two sections of the Article 705 rewrite by the panel should be revised. Section 705.12 should be reworded as shown below to incorporate changes accepted in <u>690.64(B)(2)</u> and <u>692.65(B)(2)</u> , and generalized for Utility Interactive Inverters. Also revise Section 705.22, as shown below, to re-instate the requirement for a "Lockable Disconnect" for the AC output circuits. This disconnect is essential to provide positive and visible confirmation that an interconnected power source has no possible method to backfeed electrical energy into a system which has been de-energized for maintenance or to meet the needs of emergency first response personnel.**

705.12 Point of Connection . The output of an interconnected electric power source shall be connected as specified in 692.65(A), (B), (C), <u>or (D).</u>

(A) Supply Side. Any interconnected electric power source shall be permitted to be connected at the premises service disconnecting means, beyond the point of common coupling.

(B) Integrated Electric Systems. The outputs shall be permitted to be interconnected at a point or points elsewhere on the premises where the system qualifies as an integrated electric system and incorporates protective equipment in accordance with all applicable sections of Article 685.

(C) Greater Than 100 KW The outputs shall be permitted to be interconnected at a point or points else where on the premises where all of the following conditions are met:

(1) The aggregate of non-utility sources of electricity has a capacity in excess of 100 KW, or the service is above 1,000 Volts.

(2) The conditions of maintenance and supervision ensure that qualified persons service and operate the system.

(3) Safeguards, documented procedures, and protective equipment are established and maintained.

(D) Utility Interactive Inverters rated less than 100 KW The output of a utility interactive inverter power source with a capacity of less than or equal to 100 KW shall be permitted to be connected as specified in either 705.12(D)(1) or 705.12(D)((2)

(1) Load Side. A utility-interactive inverter shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises, provided that all of the following conditions of 705.12(D)(1)(a) through 705.12(D)(1)(e) are met:

(a) Dedicated Overcurrent and Disconnect. Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.

(b) Ground Fault Protection. The interconnection point shall be on the line side of all ground-fault protection equipment.

(c) Marking. Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.

(d) Suitable for Back Feed. Equipment such as circuit breakers, if backfed, shall be identified for such operation.

(e) Bus or Conductor Rating. The rating of the bus or conductor to which the utility-interactive inverter breaker or fusible disconnect is connected shall meet all of the conditions in 705.12(D)(1)(e)(1) or 705.12(D)(1)(e)(2)

(1) End Feed Connection. Where the utility-interactive inverter breaker or fusible disconnect is connected in the distribution equipment at the opposite (load) end from the input feeder connection or main circuit location, the bus or conductor rating shall be equal to or larger than the sum of the ampere ratings of all overcurrent devices connecting premise electric power production sources to the bus or conductor. <u>The bus or conductor rating shall have been sized for the loads connected, in accordance with Article 220</u> . A permanent warning label shall be applied to the distribution equipment with the following or equivalent:

WARNING

ELECTRIC POWER PRODUCTION SOURCE OUTPUT

DO NOT RELOCATE THIS OVERCURRENT DEVICE.

(2) General Connection. Where the utility-interactive inverter breaker or fusible disconnect is not end fed, the bus or conductor rating shall be equal to or larger than the sum of the ampere ratings of overcurrent devices in circuits supplying power to the busbar or conductor. Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.

705.22 Disconnect Device

The disconnecting means for ungrounded conductors shall consist of a manually or power operable switch or circuit breaker with the following features:

(1) Located where readily accessible

(2) Externally operable without exposing the operator to contact with live parts and if power operable, of a type that can be opened by hand in the event of a power supply failure.(3) Plainly indicating whether in the open (on) or closed (off) position

(4) Having ratings not less than the load to be carried and the fault current to be interrupted

<u>(5) Lockable in the open position</u>

KRASTINS, K.: See my affirmative with comment on Proposal 13-17.

PASTERNACK, S.: On panel rewrite, typo in 705.42 Exception: ovens=open

STAFFORD, T.: While I do agree with the submitter's intention and the panel's action, I have some comments directed at the modifications made to the proposal.

Note 1 – With the additional language placed in Article 705, I feel the two exceptions noted could be eliminated.

Note 2 – The text associated with Note 2 in the rewrite does not match what had happened in the proposals mentioned, (13-63 to 13-69) which refers you to 13-61. The text as proposed in 13-61 is different text than what is shown in this panel statement.

Note 3 – I don't agree with deleting the requirement for a lockable disconnect. This requirement is becoming standard language in multiple Articles throughout the NEC. See my affirmative comment on 13-9.

The changes made by this proposal and others like 13-17 and 13-71 are indicative of a distributed energy industry asking to be part of the NEC as well. The recommended changes that are removed from Articles 690 and 692 do not belong just to those forms of distributed energy and should be placed in Article 705. At the same time I do not like redundant code and with accepting 13-184 we should remove the same wording from Article 690 and 692.

SWAYNE, R.: This Proposal, in principle needs to be Accepted in Principle because it represents a significant improvement in the present text. There are, however, numerous editorial and technical corrections that need to be made. In order to insure that this Proposal is not totally rejected, I am voting in the Affirmative with the expectation that there will be Public Comments to make the needed corrections. Some of the items that need further consideration are:

1) In Section 705.4, "systems" are not listed but "equipment" is.

2) No explanation has been given for deleting "Generators" from Section 705.30(A).

3) In Section 705.40, it is not evident what a "normally utility interactive system" is. Why is "normally" needed?

4) In Section 705.70(3), Section 705.22 does not apply to "alternating current output conductors from the inverter".

5) In Section 705.95, the use of the word "neutral" is used in place of the term "grounded conductor". If the intention is that the neutral conductor and not necessarily the grounded conductor be sized appropriately, then a distinction should be made.

6) In Section 705.130, "a sufficient number" is superfluous and unnecessary to convey the requirement.

ZGONENA, T.: More input is needed from the DG industries that will be impacted by Article 705 to ensure it addresses the nuances of the various DG products.

13-185 Log #470 NEC-P13 **Final Action: Accept in Principle in Part (705.4, 705.22 and Annex A)**

Submitter: James M. Daley, Facilities Electrical Consulting Services / Rep. ASCO Power Technologies

Recommendation: The following is proposed to be submitted to NFPA 70 Code Making Panel 13:

705 Interconnected Electric Power Production Sources

Change: Add Article 705.4:

705.4 Equipment Approval. All equipment shall be approved for the intended use.

Interconnection systems shall be listed and identified for interconnection service. Alternatively, an interconnection system comprising a compilation of assembled components may be considered as listed where all components of the interconnection system are listed and identified as recognized components for the specific function they serve in the interconnection system.

705.22 Disconnect Device
Change: Add text
(1) Located where readily accessible
Appendix A
Change: Add Interconnection System to listing of standards with UL 1741 as the applicable standard.
Substantiation: The following rational is proposed to be submitted with this proposed Code revision.
Rational:
The proposed revision is consistent with the requirements of the NEC in general. (e.g. Article 700.3, 701.4)
It is necessary to expand the description of what is acceptable because many interconnection systems are site specific and would be comprised of recognized components suitable for the intended use.
Background:
The Electric Power System (EPS) has been deregulated. This allows the interconnection of Distributed Resources (DR) (distributed generation) with the EPS. This action lead to a proliferation of sources seeking interconnection with the EPS. Electric utility companies, EPS System operators, Federal and State Regulators, manufacturers, designers and users are seeking a consistent and dependable process that can assure the safe and proper electrical installation of DR. Given that the point of common coupling of the sources is on the user's side of the electric meter, the interconnection system falls under the jurisdiction of the National Electric Code, NFPA 70 (NEC).
The parties concerned are seeking a means of assuring that interconnection systems are safe and suitable for use without having to test and evaluate each and every installation. It is recognized that the NEC addresses this issue of assurance by Art. 90.7 Examination of Equipment for Safety. Art. 110.2 Approval and Art 110.3 Examination, Identification, installation and Use of Equipment provide the basis for assurance that equipment is suitable for its intended use.
In 2003 ANSI/IEEE Std 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems was published. This standard was developed by a committee of both technical and operating interests from utility companies, EPS system operators, manufacturers and users numbering in excess of 300. When approved, the balloting pool consisted of 230 balloters. Recognizing the expertise of the committee that produced this standard, EPS system operators, State and Federal regulatory Commissions have been adopting this standard as a requirement for assuring suitability for service of interconnections systems. Equipment manufacturers are embracing this standard as the definitive requirement to meet acceptability for service.
In June of 2003, IEEE established a working group to develop IEEE P1547.1 Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems . That working group was comprised of over 80 members having the same demographics as that of ANSI/IEEE 1547. This proposed standard achieved an affirmative ballot from a balloting pool of 118 balloters. The standard was approved by the Standards Board of IEEE at its meeting on June 9, 2005 and published on July 1, 2005. It will have been available in print July 21, 2005.
UL Standard 1741, DRAFT REQUIREMENTS FOR THE PROPOSED SECOND EDITION OF THE STANDARD FOR INVERTERS, CONVERTERS, AND CONTROLLERS FOR USE WITH INDEPENDENT POWER SOURCES, UL 1741 has been expanded in scope to include all interconnection technologies. In a harmonization effort, UL 1741 is in the process of being revised to include all of the requirements of IEEE 1547.1 in addition to the fundamental UL standard requirements for safety. Therefore the loop will have been closed assuring that, when issued, listed and identified by UL or other Nationally Recognized Testing Laboratories (NRTL) having listing services, equipment for interconnection of DR will be approved for its intended use.
At a stakeholders meeting at NEMA Headquarters on April 14, 2005, stakeholders from utility companies, state and federal regulatory commissions and manufacturers met to address the certification task for interconnection systems for suitability of use. Among the concerns is how does the regulator, utility interest, system operator or other interested party determine that a particular interconnection system submittal is suitable for its intended use. The manufacturers suggested that since this equipment would be in the jurisdiction of the NEC, the NEC had an existing infrastructure to assure safety and suitability. That infrastructure includes the Authority Having Jurisdiction, electrical inspector, who looks for appropriate listing and identification. It was indicated that listing included follow-up inspection service at the point of manufacture to confirm that the products being shipped were in compliance with the listing requirements.
A task will be undertaken to explore the preparation and presentation of training materials explaining the requirements, listing and identification of the interconnection system for the Authorities Having Jurisdiction. As an initial consideration, such materials would likely be made available for continuing education purposes for organizations such as the International Association of Electrical Inspectors, IAEI seminars.
Having been made aware of this infrastructure, the stakeholders concluded that the jurisdiction of the NEC was a suitable means to assure safety of the interconnection systems. It was agreed that Code Making Panel #13 would be petitioned to add verbiage to Art 705 to specifically address the interconnection system. To wit, the proposed changes to add Art 705.4 and Art 705.22 are presented herein.
Summary:
Utility companies and System operators are concerned for the safety of their personnel, reliability of their system and quality of power delivered. State and Federal regulators are concerned with standardizing and expediting the DR interconnection process. Manufacturers are concerned with a uniform set of requirements. Users are concerned with assurance that the installed system is safe and compliant. The foundation for meeting these interests exist in UL 1741 as proposed. What remains to be achieved is a jurisdictional inspection process that assures that only qualified equipment is used. This is within the normal scope of the National Electrical Code. The proposed changes herein will provide that assurance.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle in Part
Add new Article 705.4:
705.4 Equipment Approval. All equipment shall be approved for the intended use. Interconnection systems shall be listed and identified for interconnection service.
705.22 Disconnect Device
Insert the word "readily":
(1) Located where readily accessible
Annex A
Change: Change the title of UL 1741 from "Inverters, Converters and Controllers for use in Independent Power Systems" to "Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources".
Panel Statement: The panel accepted the first sentence.
The panel did not accept the second sentence "Alternatively, an interconnection system comprising a compilation of assembled components may be considered as listed where all components of the interconnection system are listed and identified as recognized components for the specific function they serve in the interconnection system," as a compilation of components would not necessarily meet the requirements for interconnection systems unless tested as a complete system. In addition, the submitterr gave no technical substantiation for this part of the proposal.
The panel accepted the change from "accessible" to"readily accessible," as this is the same language that is used in Articles 690 and 692, and is also a part of the change proposed in Panel Action 13-184 (to incorporate the relevant parts of 690 and 692 into 705).
UL1741 is already listed in Annex (not Appendix) A; however, the title has changed since the 2005 Code cycle, and so that change should be made. "Interconnection System" could not be used as a title, as this is a list of standards and their own titles.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Gustafson, R.

13-186 Log #1243 NEC-P13 **Final Action: Accept**
(705.22)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add: (5) Simultaneous disconnect of all ungrounded conductors of the circuit.
Substantiation: Edit. This is a standard Code requirement for disconnecting means.
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Gustafson, R.
Comment on Affirmative:
STAFFORD, T.: See my comment to the affirmative on 13-9.

13-187 Log #1256 NEC-P13 **Final Action: Accept**
(705.30)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "Article 240" to "240.4".
Substantiation: Edit. To conform to Style Manual
Panel Meeting Action: Accept
Number Eligible to Vote: 16
Ballot Results: Affirmative: 14 Negative: 1
Ballot Not Returned: 1 Gustafson, R.
Explanation of Negative:
ZGONENA, T.: The text should remain as is. The reference to 240 is correct as there are numerous appropriate sections in 240, not just 240.4. For example, 240.5, 240.92, 240.100, and 240.101.
Comment on Affirmative:
SWAYNE, R.: The proposed change should change "Article 240" to "Section 240.4". Consistent with this editorial change, editorially need to change "Article 690" to "Section 690.9" in (B) and change "Article 692" to "Section 692.9" in (C).

13-188 Log #903 NEC-P13 **Final Action: Reject**
(705.52(5))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add new text as follows:
(5) Simultaneous disconnection of all ungrounded conductors of the circuit controls.
Substantiation: Edit. This feature should be specified, as in other Code sections.
Panel Meeting Action: Reject
Panel Statement: There is no 705.52.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 15
Ballot Not Returned: 1 Gustafson, R.

ARTICLE 720 — CIRCUITS AND EQUIPMENT OPERATING AT LESS THAN 50 VOLTS

3-132 Log #952 NEC-P03 **Final Action: Accept in Principle**
(720.2)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise as follows:
Installations operating at less than 50 volts, direct current or alternating current, as covered elsewhere in this Code. ~~Articles 411, 517, 550, 551, 552, 650, 669, 690, and 725, and 760~~ shall not be required to comply with this article.
Substantiation: To comply with Style Manual requirements.
Panel Meeting Action: Accept in Principle
Change the text in 720.2 to add various sections and Parts to the text to read as follows:
720.2 Other Articles
Direct current or alternating current installations operating at less than 50 volts, as covered in 411.1 through 411.7, Part VI of Article 517, Part II of Article 551, Parts II and III and 552.60(B) of Article 552, 650.1 through 650.8, 669.1 through 669.9, Parts I and VIII of Article 690, Parts I and III of Article 725, or Parts I and III of Article 760, shall not be required to comply with this article.
Panel Statement: These references should remain so that compliance is not necessary for the referenced articles and sections so each pertinent section and Part was inserted to comply with Section 4.1.1 of the NEC Style Manual. Article 550 was deleted since there wasn't a reference to mobile and manufactured home systems operating at less than 50 volts.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-133 Log #993 NEC-P03 **Final Action: Accept in Principle**
(720.3)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise text to read as follows:
Installations coming within the scope of this article and installed in hazardous (classified) locations shall also comply with ~~the appropriate provisions of Article 500 through 517.~~ <u>other applicable articles of this Code.</u> Alternatively, delete this section.
Substantiation: Edit. To comply with the Style Manual. Already covered by 90.3.
Panel Meeting Action: Accept in Principle
Change the existing text in 720.3 by deleting the word "coming" and adding the phrase "for hazardous locations in other applicable articles of this Code" to read as follows:
720.3 Hazardous (Classified) Locations
Installations within the scope of this article and installed in hazardous (classified) locations shall also comply with the appropriate provisions for hazardous (classified) locations in other applicable articles of this Code.
Panel Statement: The word "coming" was deleted since it was superfluous to the text. The phrase "for hazardous locations in other applicable articles in this Code" was added for clarity.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-134 Log #1140 NEC-P03 **Final Action: Accept in Principle**
(720.8)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete or revise text;
Overcurrent protection shall comply with ~~Article 240~~ <u>all applicable provisions of this code</u> .
Substantiation: To comply with Style Manual requirements. Already covered by 90.3.
Panel Meeting Action: Accept in Principle
Delete this Section Entirely
Panel Statement: The Panel has deleted this section in accordance with the NEC Style Manual, Section 4.1.1 which recommends eliminating general references to other Articles.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-135 Log #992 NEC-P03 **Final Action: Accept in Principle**
(720.9)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete, or revise; Installations of storage batteries shall comply with ~~Article 480~~ <u>all other applicable articles of this Code</u> .
Substantiation: To comply with Style Manual requirements. Already covered by 90.3.
Panel Meeting Action: Accept in Principle
Change the text in the existing Code to read as follows:
720.9 Batteries.
Installations of storage batteries shall comply with 480.1, 480.2, 480.3, 480.4, 480.8, 480.9, and 480.10.
Panel Statement: Making these specific references in Article 480 ensures compliance with 4.1.1 of the NEC Style Manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-136 Log #1141 NEC-P03 **Final Action: Accept in Part**
(720.10)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete, or revise; Grounding shall be as ~~provided in Article 250~~ i <u>n accordance with all applicable provisions of this code</u> .
Substantiation: To comply with Style Manual requirements. Already covered by 90.3.
Panel Meeting Action: Accept in Part
The panel accepts the recommendation to delete 720.10.
Panel Statement: The panel has selected one of the two choices offered by the recommendation which, meets the intent of the submitter.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 725 — CLASS 1, CLASS 2, AND CLASS 3 REMOTE-CONTROL, SIGNALING, AND POWER-LIMITED CIRCUITS

3-137 Log #843 NEC-P03 **Final Action: Accept**
(725)

Submitter: Richard P. Owen, St. Paul, MN
Recommendation: Renumber Article 725 to read as follows:
~~82~~ 725.179 Cable <u>PROPOSED SECTION RE-NUMBERING</u>
ARTICLE 725
Class 1, Class 2, and Class 3
Remote-Control, Signaling, and
Power-Limited Circuits
I. General
725.1 Scope.
725.2 Definitions.
725.3 Other Articles.
~~725.7~~ 725.21 Access to Electrical Equipment Behind Panels Designed to Allow Access.
~~725.8~~ 725.24 Mechanical Execution of Work.
~~725.10~~ 725.30 Class 1, Class 2, and Class 3 Circuit Identification.
~~725.11~~ 725.31 Safety-Control Equipment.
~~725.15~~ 725.35 Class 1, Class 2, and Class 3 Circuit Requirements.
II. Class 1 Circuits.
~~725.21~~ 725-41 Class 1 Circuit Classifications and Power Source Requirements.
~~725.23~~ 725.43 Class 1 Circuit Overcurrent Protection.
~~725.24~~ 725-45 Class 1 Circuit Overcurrent Device Location
~~725.25~~ 725.46 Class 1 Circuit Wiring Methods.
~~725.26~~ 725.48 Conductors of Different Circuits in the Same Cable, Cable Tray, Enclosure, or Raceway.
~~725.27~~ 725.49 Class 1 Circuit Conductors .
~~725~~ .28 725.51 Number of Conductors in Cable Trays and Raceway, and Derating.
~~725.29~~ 725.52Circuits Extending Beyond One Building.
III. Class 2 and Class 3 Circuits
~~725.41~~ 725.121 Power Sources for Class 2 and Class 3 Circuits.
Figure 725.121 Class 2 and Class 3 Circuits.

~~725.42~~ 725.124 Circuit Marking.
~~725.51~~ 725.127 Wiring Methods on Supply Side of the Class 2 or Class 3 Power Source.
~~725.52~~ 725.130 Wiring Methods and Materials on Load Side of the Class 2 or Class 3 Power Source.
~~725.54~~ 725.133 Installation of Conductors and Equipment in Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways for Class 2 and Class 3 Circuits.
~~725.55~~ 725.136 Separation from Electric Light, Power, Class 1, Non–Power-Limited Fire Alarm Circuit Conductors, and Medium Power Network-Powered Broadband Communications Cables.
~~725.56~~ 725.139 Installation of Conductors of Different Circuits in the Same Cable, Enclosure, or Raceway.
~~725.57~~ 725.141 Installation of Circuit Conductors Extending Beyond One Building.
~~725.58~~ 725.143 Support of Conductors.
~~725.61~~ 725.154 Applications of Listed Class 2, Class 3, and PLTC Cables.
Table ~~725.61~~ 725.154 Cable Substitutions
Figure ~~725.61~~ 725.154 Cable Substitution Hierarchy
IV. Listing Requirements
~~725.82~~ 725.179 Listing and Marking of Class 2, Class 3, and Type PLTC Cables.
Table ~~725~~ Marking

Substantiation: This proposal was developed by a Task Group consisting of CMP-3 members Ray Keden, Robert Walsh, Ron Maassen, Mark Ode, Tom Guida and Chair Richard Owen.

The Task Group was formed to look at held Comment 3-108, which suggested a new parallel numbering system for Articles 725 and 760. As a result of several conference calls and by work outside the calls, the Task Group unanimously approved the proposal as shown. The Task Group attempted as much as was possible to correlate the numbering of the two articles, as well as a similar numbering sequence for those related sections in Chapter 8 for overall correlation, while leaving adequate room between sections for future additions. It was impossible to renumber the two articles exactly, since some sections could not be moved without changing their intent. One example of this is newly renumbered Sections 725.52 covering Class 1 circuits extending beyond one building and 760.32 covering both power limited fire alarm and non-power-limited fire alarm circuits extending beyond one building, which both address the same thing, but the numbering could not be the same without changing the intent of these sections due to their location in their respective articles.

There is a companion proposal to this one for Article 760.

Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-138 Log #226 NEC-P03 **Final Action: Accept in Principle**
(725 and 760)

NOTE: The following proposal consists of Comment 3-108 on Proposal 3-126 in the 2004 May Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 2004 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 3-126 was:

Renumber the sections within Articles 725, 760, 770, 800, 820 & 830 as shown on the following table [Table shown on following pages]. For information, the following are pro forma rewrites of the Articles assuming that the individual proposals are accepted.

CMP 16 TG Draft Proposals Inserted into ARTICLE 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power-Limited Circuits

I. General

725.1 Scope.

This article covers remote-control, signaling, and power-limited circuits that are not an integral part of a device or appliance.

FPN: The circuits described herein are characterized by usage and electrical power limitations that differentiate them from electric light and power circuits; therefore, alternative requirements to those of Chapters 1 through 4 are given with regard to minimum wire sizes, derating factors, overcurrent protection, insulation requirements, and wiring methods and materials.

725.2 Definitions.

For purposes of this article, the following definitions apply.

Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.

Class 1 Circuit. The portion of the wiring system between the load side of the overcurrent device or power-limited supply and the connected equipment. The voltage and power limitations of the source are in accordance with 725.21.

Class 2 Circuit. The portion of the wiring system between the load side of a Class 2 power source and the connected equipment. Due to its power limitations, a Class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock.

Class 3 Circuit. The portion of the wiring system between the load side of a Class 3 power source and the connected equipment. Due to its power limitations, a Class 3 circuit considers safety from a fire initiation standpoint. Since higher levels of voltage and current than Class 2 are permitted, additional safeguards are specified to provide protection from an electric shock hazard that could be encountered.

725.3 Other Articles.

Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through (F). Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits.

(A) Number and Size of Conductors in Raceway. Section 300.17.
(B) Spread of Fire or Products of Combustion. Section 300.21. The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall not be permitted to remain.
(C) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22 for Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air. Type CL2P or CL3P cables shall be permitted for Class 2 and Class 3 circuits.

(D) Hazardous (Classified) Locations. Articles 500 through 516 and Article 517, Part IV, where installed in hazardous (classified) locations.

(E) Cable Trays. Article 392, where installed in cable tray.

(F) Motor Control Circuits. Article 430, Part VI, where tapped from the load side of the motor branch-circuit protective device(s) as specified in 430.72(A).

725.7Access to Electrical Equipment Behind Panels Designed to Allow Access.

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels, including suspended ceiling panels.

725.8 Mechanical Execution of Work.
Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the outer surface of ceiling and sidewalls shall be supported by structural components of the building in such a manner that the cable or conductors will not be damaged by normal building use. Such cables shall be attached to structural components by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D).

725.9 Class 1, Class 2, and Class 3 Circuit Grounding.

Class 1, Class 2, and Class 3 circuits and equipment shall be grounded in accordance with Article 250.

725.10 Class 1, Class 2, and Class 3 Circuit Identification.
Class 1, Class 2, and Class 3 circuits shall be identified at terminal and junction locations, in a manner that prevents unintentional interference with other circuits during testing and servicing.

725.11 Safety-Control Equipment.

(A) Remote-Control Circuits. Remote-control circuits for safety-control equipment shall be classified as Class 1 if the failure of the equipment to operate introduces a direct fire or life hazard. Room thermostats, water temperature regulating devices, and similar controls used in conjunction with electrically controlled household heating and air conditioning shall not be considered safety-control equipment.

(B) Physical Protection. Where damage to remote-control circuits of safety control equipment would introduce a hazard, as covered in 725.11(A), all conductors of such remote-control circuits shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, electrical metallic tubing, Type MI cable, Type MC cable, or be otherwise suitably protected from physical damage.

725.15 Class 1, Class 2, and Class 3 Circuit Requirements.

A remote-control, signaling, or power-limited circuit shall comply with the following parts of this article:

(1) Class 1 Circuits, Parts I and II

(2) Class 2 and Class 3 Circuits, Parts I and III

[Proposal 3-138 (Log #226) Tables in Hold Note]

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
#	**ARTICLE 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power-Limited Circuits**	**ARTICLE 760 Fire Alarm Systems**	**ARTICLE 770 Optical Fiber Cables and Raceways**	**ARTICLE 800 Communications Circuits**	**ARTICLE 820 Community Antenna Television and Radio Distribution Systems**	**ARTICLE 830 Network-Powered Broadband Communications Systems**
	I. General	**I. General**	**I. General**	**I. General**	**I. General**	**I. General**
1	725.1 Scope	760.1 Scope	770.1 Scope	800.1 Scope	820.1 Scope	830.1 Scope
2	725.2 Definitions	760.2 Definitions	770.2 Definitions	800.2 Definitions	820-2. Definitions	830.2 Definitions
3	725.3 ~~Locations and~~ Other Articles TG-02	760.3 ~~Locations and~~ Other Articles TG-02	770.3 ~~Locations and~~ Other Articles TG-02	800.3 ~~Hybrid Power and Communications Cables~~ Other Articles TG-12	820.3 ~~Locations and~~ Other Articles TG-02	830.3 ~~Locations and~~ Other Articles TG-29, TG-02 TG-27
4			770.4 Optical Fiber Cables	800.4 Installation of Equipment TG-13	820.4 Energy Limitations	830.4 Power Limitations
5	~~725.5 Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ 725.5 moved to 725.7 TG-03	~~760.5 Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ 760.5 moved to 760.7 TG-03	770.5 Types	~~800.5 Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ 800.5 moved to 800.7 TG-03	~~820.5 Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ 820.5 moved to 820.7 TG-03	~~830.5 Network Powered Broadband Communications Equipment and Cables.~~ 830.5 moved to 830.82 TG-31

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
6	~~725.6 Mechanical Execution of Work.~~ 725.5 moved to 725.8 TG-03	~~760.6 Mechanical Execution of Work.~~ 760.6 moved to 760.8 TG-03	770.6 Raceways for Optical Fiber Cables TG-11	~~800.6 Mechanical Execution of Work.~~ 800.6 moved to 800.7 TG-03	~~820.6 Mechanical Execution of Work.~~ 820.6 moved to 820.8 TG-03	~~830.6 Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ 830.6 moved to 830.7 TG-03
7	725.~~5~~7 Access to Electrical Equipment Behind Panels Designed to Allow Access TG-03	~~760.7 Fire Alarm Circuits Extending Beyond One Building.~~ 760.7 moved to 760.11 760.~~5~~7 Access to Electrical Equipment Behind Panels Designed to Allow Access TG-03	770.7 Access to Electrical Equipment Behind Panels Designed to Allow Access	800.~~5~~7 Access to Electrical Equipment Behind Panels Designed to Allow Access TG-03	820.~~5~~7 Access to Electrical Equipment Behind Panels Designed to Allow Access. TG-03	~~830.7 Mechanical Execution of Work.~~ 830.7 moved to 830.8 830.~~6~~7 Access to Electrical Equipment Behind Panels Designed to Allow Access TG-03

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
8	~~725.8 Safety Control Equipment.~~ 725.8 moved to 725.11 725.~~6~~8 Mechanical Execution of Work TG-03	760.~~6~~8 Mechanical Execution of Work. TG-03	770.8 Mechanical Execution of Work	~~800.8 Hazardous (Classified) Locations.~~ 800.8 moved to 800.3 800.~~6~~8 Mechanical Execution of Work TG-03 TG-12	820.~~6~~8 Mechanical Execution of Work TG-03	830.~~7~~8 Mechanical Execution of Work TG-03
9	725.9 Class 1, Class 2, and Class 3 Circuit Grounding	760.9 Fire Alarm Circuit and Equipment Grounding.				~~830.9 Hazardous (Classified) Locations.~~ TG-27
				II. ~~Conductors~~ Wires and Cables Outside and Entering Buildings TG-20	**II. Cables Outside and Entering Buildings**	**II. Cables Outside and Entering Buildings**
10	725.10 Class 1, Class 2, and Class 3 Circuit Identification	760. Fire Alarm Circuit Identification		~~800.10 Overhead Communications Wires and Cables~~ 800.10 moved to 800.11 TG-22	~~820.10 Outside Cables~~ 820.10 moved to 820.11 TG-32	830.10 Entrance Cables

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
11	725.~~8~~11 Safety-Control Equipment TG-03	760.~~7~~11 Fire Alarm Circuits Extending Beyond One Building TG-03		~~800.11 Underground Circuits Entering Buildings.~~ 800.11 moved to 800.12 800.~~10~~11 Overhead Communications Wires and Cables TG-22	~~820.11 Entering Buildings.~~ 820.11 moved to 820.12 820.~~10~~11 ~~Outside~~ Overhead Cables TG-32	830.11 ~~Aerial~~ Overhead Cables. TG-32
12				~~800.12 Circuits Requiring Primary Protectors.~~ 800.12 moved to 800.13 800.~~11~~12 Underground Circuits Entering Buildings TG-22, TG-23	820.~~11~~12 Underground Circuits Entering Buildings TG-32	830.12 Underground Circuits Entering Buildings.
13				~~800.13 Lightning Conductors.~~ 800.13 moved to 800.14 800.~~12~~13 Circuits Requiring Primary Protectors TG-22		
14				800.~~13~~14 Lightning Conductors. TG-22		
15	725.15 Class 1, Class 2, and Class 3 Circuit Requirements	760.15 Fire Alarm Circuit Requirements				
16-19						
	II. Class 1 Circuits	**II. Non–Power-Limited Fire Alarm (NPLFA) Circuits**				
20						
21	725.21 Class 1 Circuit Classifications and Power Source Requirements	760.21 NPLFA Circuit Power Source Requirements.				
22		.				
23	725.23 Class 1 Circuit Overcurrent Protection	760.23 NPLFA Circuit Overcurrent Protection				
24	725.24 Class 1 Circuit Overcurrent Device Location	760.24 NPLFA Circuit Overcurrent Device Location				
25	725.25 Class 1 Circuit Wiring Methods	760.25 NPLFA Circuit Wiring Methods				
26	725.26 Conductors of Different	760.26 Conductors of Different				
	Circuits in Same Cable, Enclosure, or Raceway	Circuits in Same Cable, Enclosure, or Raceway				

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
27	725.27 Class 1 Circuit Conductors	760.27 NPLFA Circuit Conductors				
28	725.28 Number of Conductors in Cable Trays and Raceway, and Derating	760.28 Number of Conductors in Cable Trays and Raceways, and Derating				
29	725.29 Circuits Extending Beyond One Building					
			II. Protection	**III. Protection**	**III. Protection**	**III. Protection**
30		760.30 Multiconductor NPLFA Cables		800.30 Protective Devices		830.30 Primary Electrical Protection
31		~~760.31 Listing and Marking of NPLFA Cables.~~ 760.31 moved to 760.81 TG-06		~~800.31 Primary Protector Requirements~~ 800.31 moved to 800.80 TG-14		
32				~~800.32 Secondary Protector Requirements~~ 800.31 moved to 800.80 TG-15		

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
33			770.33 Grounding of Entrance Cables	800.33 Cable Grounding	820.33 Grounding of Outer Conductive Shield of a Coaxial Cable	830.33 Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables.
	III. Class 2 and Class 3 Circuits	**III. Power-Limited Fire Alarm (PLFA) Circuits**		**IV. Grounding Methods**	**IV. Grounding Methods**	**IV. Grounding Methods**
40				800.40 Cable and Primary Protector Grounding	820.40 Cable Grounding	830.40 Cable, Network Interface Unit, and Primary Protector Grounding.
41	725.41 Power Sources for Class 2 and Class 3 Circuits	760.41 Power Sources for PLFA Circuits		~~800.41 Primary Protector Grounding and Bonding at Mobile Homes~~ 800.41 moved to 800.42 TG-16	820.41 Equipment Grounding	
42	725.42 Circuit Marking.	760.42 Circuit Marking		800.~~41~~42 Primary Protector Bonding and Grounding ~~and Bonding~~ at Mobile Homes TG-16	820.42 Bonding and Grounding at Mobile Homes	830.42 Bonding and Grounding at Mobile Homes
43-47						

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
			III. Cables Within Buildings	**V. ~~Communications~~ Wires and Cables Within Buildings** TG-21	**V. Cables Within Buildings**	**V. ~~Wiring Methods~~ Cables Within Buildings** TG-21
48				800.48 Raceways for Communications Wires and Cables TG-13		
49			~~770.49 Fire Resistance of Optical Fiber Cables~~ TG-07	~~800.49 Fire Resistance of Communications Wires and Cables.~~ TG-07	~~820.49 Fire Resistance of CATV Cables.~~ TG-07	
50			770.50 ~~Listing, Marking, and~~ Installation of Listed Optical Fiber Cables TG-08	800.50 ~~Listing, Marking, and~~ Installation of Listed Communications Wires and Cables. TG-18	820.50 ~~Listing, Marking, and~~ Installation of Coaxial Cables. TG-25	
51	725.51 Wiring Methods on Supply Side of the Class 2 or Class 3 Power Source	760.51 Wiring Methods on Supply Side of the PLFA Power Source	~~770.51 Listing Requirements for Optical Fiber Cables and Raceways.~~ 770.51 moved to 770.82 TG-11	~~800.51 Listing Requirements for Communications Wires and Cables and Communications Raceways.~~ 800.51 moved to 800.82 TG-19	~~820.51 Additional Listing Requirements.~~ 820.51 moved to 820.82 TG-26	
52	725.52 Wiring Methods and Materials on Load Side of the Class 2 or Class 3 Power Source.	760.52 Wiring Methods and Materials on Load Side of the PLFA Power Source	~~770.52 Installation of Optical Fibers and Electrical Conductors.~~ 770.52 moved to 770.55 TG-09	~~800.52 Installation of Communications Wires, Cables, and Equipment.~~ 800.52(B)&(C) moved to 800.3 the remainder of 800.52 moved to 800.55 TG-09	~~820.52 Installation of Cables and Equipment.~~ 820.52 moved to 820.55 TG-26 TG-09	
53			~~770.53 Applications of Listed Optical Fiber Cables and Raceways~~ 770.53 moved to 770.61 TG-10	~~800.53 Applications of Listed Communications Wires and Cables And Communication Raceways~~ 800.53 moved to 800.61 TG-10	~~820.53 Applications of Listed CATV Cables.~~ 820.53 moved to 820.61 TG-10	
54	725.54 Installation of Conductors and Equipment in	760.54 Installation of Conductors and Equipment in				~~830.54 Medium Power Network~~

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
	Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways for Class 2 and Class 3 Circuits.	Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways for Power-Limited Circuits.				~~Powered Broadband Communications System Wiring Methods~~ 830.54 moved to 830.60 TG-30

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
55	725.55 Separation from Electric Light, Power, Class 1, Non–Power-Limited Fire Alarm Circuit Conductors, and Medium Power Network-Powered Broadband Communications Cables.	760.55 Separation from Electric Light, Power, Class 1, NPLFA, and Medium Power Network-Powered Broadband Communications Circuit Conductors.	770.~~52~~55 Installation of Optical Fibers and Electrical Conductors. TG-09	800.~~52~~55 Installation of Communications Wires, Cables, and Equipment. TG-09	820.~~52~~55 Installation of Cables and Equipment. TG-24 TG-09	~~830.55 Low-Power Network-Powered Broadband Communications System Wiring Method~~ 830.55 moved to 830.61 830.~~58~~55 Installation of Network-Powered Broadband Communications Cables and Equipment TG-30 TG-29 TG-09
56	725.56 Installation of Conductors of Different Circuits in the Same Cable, Enclosure, or Raceway.	760.56 Installation of Conductors of Different PLFA Circuits, Class 2, Class 3, and Communications Circuits in the Same Cable, Enclosure, or Raceway.				~~830.56 Protection Against Physical Damage.~~ 830.56 moved to 830.62 TG-30

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
57	725.57 Installation of Circuit Conductors Extending Beyond One Building.	~~760.57 Support of Conductors.~~ 760.57 moved to 760.58 760.~~58~~57Conductor Size. TG-05				~~830.57 Bends.~~ 830.57 moved to 830.63 TG-30
58	725.58 Support of Conductors.	~~760.58 Conductor Size.~~ 760.58 moved to 760.57 760.~~57~~58 Support of Conductors. TG-05				~~830.58 Installation of Network Powered Broadband Communications Cables and Equipment.~~ 830.58 moved to 830.55 TG-09 TG-29
59		760.59 Current-Carrying Continuous Line-Type Fire Detectors.				
60						830.~~54~~60 Medium Power Network-Powered Broadband Communications System Wiring Methods TG-30

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
61	725.61 Applications of Listed Class 2, Class 3, and PLTC Cables	760.61 Applications of Listed PLFA Cables	770.~~53~~ 61Applications of Listed Optical Fiber Cables and Raceways. TG-10	800.~~53~~61 Applications of Listed Communications Wires and Cables and Communications Raceways. TG-10	820.~~53~~61 Applications of Listed CATV Cables. TG-10	830.~~55~~61 Applications of Listed Low Power Network-Powered Broadband Communications Cables ~~System~~ ~~Wiring Methods~~ TG-10, TG-30
62						830.~~56~~62 Protection Against Physical Damage TG-30
63						830.63~~57~~ Bends. TG-30
64-70						
71	~~725.71 Listing and Marking of Class 2, Class 3, and Type PLTC Cables.~~ 725.71 moved to 725.82 TG-04	~~760.71 Listing and Marking of PLFA Cables and Insulated Continuous Line Type Fire Detectors.~~ 760.71 moved to 760.81 TG-06				
72-79						
	V Listing Requirements TG-04	**V Listing Requirements** TG-06	**V Listing Requirements** TG-11	**VI Listing Requirements** TG-19	**VI Listing Requirements** TG-26	**VI Listing Requirements** TG-31
80				800.~~4~~80 Equipment TG-19		

	ARTICLE 725	ARTICLE 760	ARTICLE 770	ARTICLE 800	ARTICLE 820	ARTICLE 830
81		760.~~31~~81 ~~Listing and Marking of~~ NPLFA Cables. TG-06		800.~~12(A)~~81 Drop wire & cable TG-19		
82	725.~~71~~82 ~~Listing and Marking of~~ Class 2, Class 3, and Type PLTC Cables. TG-04	760.~~71~~82 ~~Listing and Marking of~~ PLFA Cables and Insulated Continuous Line-Type Fire Detectors. TG-06	770.~~51~~82 ~~Listing Requirements for~~ Optical Fiber Cables ~~and Raceways.~~ TG-11	800.~~51~~82 ~~Listing Requirements for~~ Communications Wires and Cables ~~and Communications Raceways.~~ TG-19	820.~~51~~82 ~~Additional Listing Requirements~~ Coaxial Cables. TG-26	830.~~5~~82 Network-Powered Broadband Communications Equipment and Cables TG-29 TG-31
83			770.~~51~~83 ~~Listing Requirements for~~ Optical Fiber ~~Cables and~~ Raceways. TG-11	800.~~51~~83 ~~Listing Requirements for Communications Wires and Cables and~~ Communications Raceways. TG-19		

II. Class 1 Circuits

725.21 Class 1 Circuit Classifications and Power Source Requirements.

Class 1 circuits shall be classified as either Class 1 power-limited circuits where they comply with the power limitations of 725.21(A) or as Class 1 remote-control and signaling circuits where they are used for remote control or signaling purposes and comply with the power limitations of 725.21(B).

(A) Class 1 Power-Limited Circuits. These circuits shall be supplied from a source that has a rated output of not more than 30 volts and 1000 volt-amperes.

(1) Class 1 Transformers. Transformers used to supply power-limited Class 1 circuits shall comply with Article 450.

(2) Other Class 1 Power Sources. Power sources other than transformers shall be protected by overcurrent devices rated at not more than 167 percent of the volt-ampere rating of the source divided by the rated voltage. The overcurrent devices shall not be interchangeable with overcurrent devices of higher ratings. The overcurrent device shall be permitted to be an integral part of the power supply.

To comply with the 1000 volt-ampere limitation of 725.21(A), the maximum output (VA_{max}) of power sources other than transformers shall be limited to 2500 volt-amperes, and the product of the maximum current (I_{max}) and maximum voltage (V_{max}) shall not exceed 10,000 volt-amperes. These ratings shall be determined with any overcurrent-protective device bypassed.

VA_{max} is the maximum volt-ampere output after one minute of operation regardless of load and with overcurrent protection bypassed, if used. Current-limiting impedance shall not be bypassed when determining VA_{max}.

I_{max} is the maximum output current under any noncapacitive load, including short circuit, and with overcurrent protection bypassed, if used. Current-limiting impedance should not be bypassed when determining I_{max}. Where a current-limiting impedance, listed for the purpose or as part of a listed product, is used in combination with a stored energy source, for example, storage battery, to limit the output current, I_{max} limits apply after 5 seconds.

V_{max} is the maximum output voltage regardless of load with rated input applied.

(B) Class 1 Remote-Control and Signaling Circuits. These circuits shall not exceed 600 volts. The power output of the source shall not be required to be limited.

725.23 Class 1 Circuit Overcurrent Protection.

Overcurrent protection for conductors 14 AWG and larger shall be provided in accordance with the conductor ampacity, without applying the derating factors of 310.15 to the ampacity calculation. Overcurrent protection shall not exceed 7 amperes for 18 AWG conductors and 10 amperes for 16 AWG.

Exception: Where other articles of this Code permit or require other overcurrent protection.

FPN: For example, see 430.72 for motors, 610.53 for cranes and hoists, and 517.74(B) and 660.9 for X-ray equipment.

725.24 Class 1 Circuit Overcurrent Device Location.

Overcurrent devices shall be located as specified in 725.24(A) through (E).
(A) Point of Supply. Overcurrent devices shall be located at the point where the conductor to be protected receives its supply.
(B) Feeder Taps. Class 1 circuit conductors shall be permitted to be tapped, without overcurrent protection at the tap, where the overcurrent device protecting the circuit conductor is sized to protect the tap conductor.
(C) Transformer Taps. Class 1 circuit conductors 14 AWG and larger that are tapped from the load side of the overcurrent-protective device(s) of a controlled light and power circuit shall require only short-circuit and ground-fault protection and shall be permitted to be protected by the branch-circuit overcurrent protective device(s) where the rating of the protective device(s) is not more than 300 percent of the ampacity of the Class 1 circuit conductor.
(D) Primary Side of Transformer. Class 1 circuit conductors supplied by the secondary of a single-phase transformer having only a 2-wire (single-voltage) secondary shall be permitted to be protected by overcurrent protection provided on the primary side of the transformer, provided this protection is in accordance with 450.3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary-to-primary transformer voltage ratio. Transformer secondary conductors other than 2 wire shall not be considered to be protected by the primary overcurrent protection.
(E) Input Side of Electronic Power Source. Class 1 circuit conductors supplied by the output of a single-phase, listed electronic power source, other than a transformer, having only a 2-wire (single voltage) output for connection to Class 1 circuits shall be permitted to be protected by overcurrent protection provided on the input side of the electronic power source, provided this protection does not exceed the value determined by multiplying the Class 1 circuit conductor ampacity by the output-to-input voltage ratio. Electronic power source outputs, other than 2 wire (single voltage), shall not be considered to be protected by the primary overcurrent protection.

725.25 Class 1 Circuit Wiring Methods.

Installations of Class 1 circuits shall be in accordance with Article 300 and the other appropriate articles in Chapter 3.
Exception No. 1: The provisions of 725.26 through 725.28 shall be permitted to apply in installations of Class 1 circuits.
Exception No. 2: Methods permitted or required by other articles of this Code shall apply to installations of Class 1 circuits.

725.26 Conductors of Different Circuits in the Same Cable, Cable Tray, Enclosure, or Raceway.

Class 1 circuits shall be permitted to be installed with other circuits as specified in 725.26(A) and (B).

(A) Two or More Class 1 Circuits. Class 1 circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway without regard to whether the individual circuits are alternating current or direct current, provided all conductors are insulated for the maximum voltage of any conductor in the cable, cable tray, enclosure, or raceway.

(B) Class 1 Circuits with Power Supply Circuits. Class 1 circuits shall be permitted to be installed with power supply conductors as specified in 725.26(B)(1) through (B)(4).
(1) In a Cable, Enclosure, or Raceway. Class 1 circuits and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only where the equipment powered is functionally associated.
(2) In Factory- or Field-Assembled Control Centers. Class 1 circuits and power supply circuits shall be permitted to be installed in factory- or field-assembled control centers.
(3) In a Manhole. Class 1 circuits and power supply circuits shall be permitted to be installed as underground conductors in a manhole in accordance with one of the following:

(1) The power-supply or Class 1 circuit conductors are in a metal-enclosed cable or Type UF cable.
(2) The conductors are permanently separated from the power-supply conductors by a continuous firmly fixed nonconductor, such as flexible tubing, in addition to the insulation on the wire.
(3) The conductors are permanently and effectively separated from the power supply conductors and securely fastened to racks, insulators, or other approved supports.

(4) In cable trays, where the Class 1 circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable.

725.27 Class 1 Circuit Conductors.

(A) Sizes and Use. Conductors of sizes 18 AWG and 16 AWG shall be permitted to be used, provided they supply loads that do not exceed the ampacities given in 402.5 and are installed in a raceway, an approved enclosure, or a listed cable. Conductors larger than 16 AWG shall not supply loads greater than the ampacities given in 310.15. Flexible cords shall comply with Article 400.

(B) Insulation. Insulation on conductors shall be suitable for 600 volts. Conductors larger than 16 AWG shall comply with Article 310. Conductors in sizes 18 AWG and 16 AWG shall be Type FFH-2, KF-2, KFF-2, PAF, PAFF, PF, PFF, PGF, PGFF, PTF, PTFF, RFH-2, RFHH-2, RFHH-3, SF-2, SFF-2, TF, TFF, TFFN, TFN, ZF, or ZFF. Conductors with other types and thicknesses of insulation shall be permitted if listed for Class 1 circuit use.

725.28 Number of Conductors in Cable Trays and Raceway, and Derating.

(A) Class 1 Circuit Conductors. Where only Class 1 circuit conductors are in a raceway, the number of conductors shall be determined in accordance with 300.17. The derating factors given in 310.15(B)(2)(a) shall apply only if such conductors carry continuous loads in excess of 10 percent of the ampacity of each conductor.

(B) Power-Supply Conductors and Class 1 Circuit Conductors. Where power-supply conductors and Class 1 circuit conductors are permitted in a raceway in accordance with 725.26, the number of conductors shall be determined in accordance with 300.17. The derating factors given in 310.15(B)(2)(a) shall apply as follows:

(1) To all conductors where the Class 1 circuit conductors carry continuous loads in excess of 10 percent of the ampacity of each conductor and where the total number of conductors is more than three

(2) To the power-supply conductors only, where the Class 1 circuit conductors do not carry continuous loads in excess of 10 percent of the ampacity of each conductor and where the number of power-supply conductors is more than three

(C) Class 1 Circuit Conductors in Cable Trays. Where Class 1 circuit conductors are installed in cable trays, they shall comply with the provisions of 392.9 through 392.11.

725.29 Circuits Extending Beyond One Building.

Class 1 circuits that extend aerially beyond one building shall also meet the requirements of Article 225.

III. Class 2 and Class 3 Circuits

725.41 Power Sources for Class 2 and Class 3 Circuits.

(A) Power Source. The power source for a Class 2 or a Class 3 circuit shall be as specified in 725.41(A)(1), (2), (3), (4), or (5):

FPN No. 1: Figure 725.41 illustrates the relationships between Class 2 or Class 3 power sources, their supply, and the Class 2 or Class 3 circuits.

FPN No. 2: Table 11(A) and Table 11(B) in Chapter 9 provide the requirements for listed Class 2 and Class 3 power sources.

(1) A listed Class 2 or Class 3 transformer

(2) A listed Class 2 or Class 3 power supply

(3) Other listed equipment marked to identify the Class 2 or Class 3 power source

Exception: Thermocouples shall not require listing as a Class 2 power source.

FPN: Examples of other listed equipment are as follows:

(1) A circuit card listed for use as a Class 2 or Class 3 power source where used as part of a listed assembly

(2) A current-limiting impedance, listed for the purpose, or part of a listed product, used in conjunction with a non–power-limited transformer or a stored energy source, for example, storage battery, to limit the output current

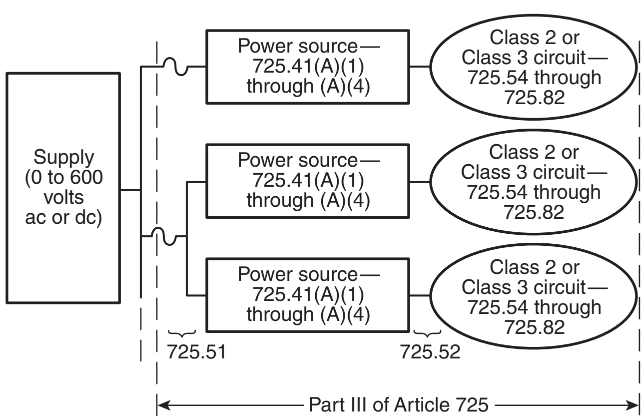
(3) A thermocouple

(4) Listed information technology (computer) equipment limited power circuits.

FPN: One way to determine applicable requirements for listing of information technology (computer) equipment is to refer to UL 1950-1995, *Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.* Typically such circuits are used to interconnect information technology equipment for the purpose of exchanging information (data).

(5) A dry cell battery shall be considered an inherently limited Class 2 power source, provided the voltage is 30 volts or less and the capacity is equal to or less than that available from series connected No. 6 carbon zinc cells.

(B) Interconnection of Power Sources. Class 2 or Class 3 power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection.



725.42 Circuit Marking.

The equipment shall be durably marked where plainly visible to indicate each circuit that is a Class 2 or Class 3 circuit.

725.51 Wiring Methods on Supply Side of the Class 2 or Class 3 Power Source.

Conductors and equipment on the supply side of the power source shall be installed in accordance with the appropriate requirements of Chapters 1 through 4. Transformers or other devices supplied from electric light or power circuits shall be protected by an overcurrent device rated not over 20 amperes.

Exception: The input leads of a transformer or other power source supplying Class 2 and Class 3 circuits shall be permitted to be smaller than 14 AWG, but not smaller than 18 AWG if they are not over 12 in. (305 mm) long and if they have insulation that complies with 725.27(B).

725.52 Wiring Methods and Materials on Load Side of the Class 2 or Class 3 Power Source.
Class 2 and Class 3 circuits on the load side of the power source shall be permitted to be installed using wiring methods and materials in accordance with either 725.52(A) or (B).

(A) Class 1 Wiring Methods and Materials. Installation shall be in accordance with 725.25.

Exception No. 1: The derating factors that are given in 310.15(B)(2)(a) shall not apply.

Exception No. 2: Class 2 and Class 3 circuits shall be permitted to be reclassified and installed as Class 1 circuits if the Class 2 and Class 3 markings required in 725.42 are eliminated and the entire circuit is installed using the wiring methods and materials in accordance with Part II, Class 1 circuits.

FPN: Class 2 and Class 3 circuits reclassified and installed as Class 1 circuits are no longer Class 2 or Class 3 circuits, regardless of the continued connection to a Class 2 or Class 3 power source.

(B) Class 2 and Class 3 Wiring Methods. Conductors on the load side of the power source shall be insulated at not less than the requirements of 725.71 and shall be installed in accordance with 725.54 and 725.61.

Exception No. 1: As provided for in 620.21 for elevators and similar equipment.

Exception No. 2: Other wiring methods and materials installed in accordance with the requirements of 725.3 shall be permitted to extend or replace the conductors and cables described in 725.71 and permitted by 725.52(B).

725.54 Installation of Conductors and Equipment in Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways for Class 2 and Class 3 Circuits.
Conductors and equipment for Class 2 and Class 3 circuits shall be installed in accordance with 725.55 through 725.58.

725.55 Separation from Electric Light, Power, Class 1, Non–Power-Limited Fire Alarm Circuit Conductors, and Medium Power Network-Powered Broadband Communications Cables.

(A) General. Cables and conductors of Class 2 and Class 3 circuits shall not be placed in any cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, non–power-limited fire alarm circuits, and medium power network-powered broadband communications circuits unless permitted by 725.55(B) through (J).

(B) Separated by Barriers. Class 2 and Class 3 circuits shall be permitted to be installed together with Class 1, non–power-limited fire alarm and medium power network-powered broadband communications circuits where they are separated by a barrier.

(C) Raceways Within Enclosures. In enclosures, Class 2 and Class 3 circuits shall be permitted to be installed in a raceway to separate them from Class 1, non–power-limited fire alarm and medium power network-powered broadband communications circuits.

(D) Associated Systems Within Enclosures. Class 2 and Class 3 circuit conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with electric light, power, Class 1, non–power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits, and where (1) or (2) applies:

(1) The electric light, power, Class 1, non–power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are routed to maintain a minimum of 6 mm (0.25 in.) separation from the conductors and cables of Class 2 and Class 3 circuits.

(2) The circuit conductors operate at 150 volts or less to ground and also comply with one of the following:

a. The Class 2 and Class 3 circuits are installed using Type CL3, CL3R, or CL3P or permitted substitute cables, provided these Class 3 cable conductors extending beyond the jacket are separated by a minimum of 6 mm (0.25 in.) or by a nonconductive sleeve or nonconductive barrier from all other conductors.

b. The Class 2 and Class 3 circuit conductors are installed as a Class 1 circuit in accordance with 725.21.

(E) Enclosures with Single Opening. Class 2 and Class 3 circuit conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with Class 1, non–power-limited fire alarm and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits. Where Class 2 and Class 3 circuit conductors must enter an enclosure that is provided with a single opening, they shall be permitted to enter through a single fitting (such as a tee), provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.

(F) Manholes. Underground Class 2 and Class 3 circuit conductors in a manhole shall be permitted to be installed with Class 1, non–power-limited fire alarm and medium power network-powered broadband communications circuits where one of the following conditions is met:

(1) The electric light, power, Class 1, non–power-limited fire alarm and medium power network-powered broadband communications circuit conductors are in a metal-enclosed cable or Type UF cable.

(2) The Class 2 and Class 3 circuit conductors are permanently and effectively separated from the conductors of other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing, in addition to the insulation or covering on the wire.

(3) The Class 2 and Class 3 circuit conductors are permanently and effectively separated from conductors of the other circuits and securely fastened to racks, insulators, or other approved supports.

(G) Article 780. Class 2 and Class 3 conductors as permitted by 780.6(A) shall be permitted to be installed in accordance with Article 780.

(H) Cable Trays. Class 2 and Class 3 circuit conductors shall be permitted to be installed in cable trays, where the conductors of the electric light, Class 1, and non–power-limited fire alarm circuits are separated by a solid fixed barrier of a material compatible with the cable tray or where the Class 2 or Class 3 circuits are installed in Type MC cable.

(I) In Hoistways. In hoistways, Class 2 or Class 3 circuit conductors shall be installed in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or electrical metallic tubing. For elevators or similar equipment, these conductors shall be permitted to be installed as provided in 620.21.

(J) Other Applications. For other applications, conductors of Class 2 and Class 3 circuits shall be separated by at least 50 mm (2 in.) from conductors of any electric light, power, Class 1 non–power-limited fire alarm or medium power network-powered broadband communications circuits unless one of the following conditions is met:

(1) Either (a) all of the electric light, power, Class 1, non–power-limited fire alarm and medium power network-powered broadband communications circuit conductors or (b) all of the Class 2 and Class 3 circuit conductors are in a raceway or in metal-sheathed, metal-clad, non–metallic-sheathed, or Type UF cables.

(2) All of the electric light, power, Class 1 non–power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are permanently separated from all of the Class 2 and Class 3 circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the conductors.

725.56 Installation of Conductors of Different Circuits in the Same Cable, Enclosure, or Raceway.

(A) Two or More Class 2 Circuits. Conductors of two or more Class 2 circuits shall be permitted within the same cable, enclosure, or raceway.

(B) Two or More Class 3 Circuits. Conductors of two or more Class 3 circuits shall be permitted within the same cable, enclosure, or raceway.

(C) Class 2 Circuits with Class 3 Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure, or raceway with conductors of Class 3 circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure, or raceway is at least that required for Class 3 circuits.

(D) Class 2 and Class 3 Circuits with Communications Circuits.

(1) Classified as Communications Circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall be installed in accordance with the requirements of Article 800. The cables shall be listed as communications cables or multipurpose cables.

(2) Composite Cables. Cables constructed of individually listed Class 2, Class 3, and communications cables under a common jacket shall be permitted to be classified as communications cables. The fire resistance rating of the composite cable shall be determined by the performance of the composite cable.

(E) Class 2 or Class 3 Cables with Other Circuit Cables. Jacketed cables of Class 2 or Class 3 circuits shall be permitted in the same enclosure or raceway with jacketed cables of any of the following:

(1) Power-limited fire alarm systems in compliance with Article 760

(2) Nonconductive and conductive optical fiber cables in compliance with Article 770

(3) Communications circuits in compliance with Article 800

(4) Community antenna television and radio distribution systems in compliance with Article 820

(5) Low-power, network-powered broadband communications in compliance with Article 830

725.57 Installation of Circuit Conductors Extending Beyond One Building.

Where Class 2 or Class 3 circuit conductors extend beyond one building and are run so as to be subject to accidental contact with electric light or power conductors operating over 300 volts to ground, or are exposed to lightning on interbuilding circuits on the same premises, the requirements of the following shall also apply:

(1) Sections 800.10, 800.12, 800.13, 800.31, 800.32, 800.33, and 800.40 for other than coaxial conductors

(2) Sections 820.10, 820.33, and 820.40 for coaxial conductors

725.58 Support of Conductors.

Class 2 or Class 3 circuit conductors shall not be strapped, taped, or attached by any means to the exterior of any conduit or other raceway as a means of support. These conductors shall be permitted to be installed as permitted by 300.11(B)(2).

725.61 Applications of Listed Class 2, Class 3, and PLTC Cables.

Class 2, Class 3, and PLTC cables shall comply with any of the requirements described in 725.61(A) through (F).

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CL2P or CL3P. Abandoned cables shall not be permitted to remain. Listed wires and cables installed in compliance with 300.22 shall be permitted.

(B) Riser. Cables installed in risers shall be as described in any of (1), (2), or (3):

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CL2R or CL3R. Floor penetrations requiring Type CL2R or CL3R shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.

(2) Other cables as covered in Table 725.61 and other listed wiring methods as covered in Chapter 3 shall be installed in metal raceways or located in a fireproof shaft having firestops at each floor.

(3) Type CL2, CL3, CL2X, and CL3X cables shall be permitted in one- and two-family dwellings.

FPN: See 300.21 for firestop requirements for floor penetrations.

(C) Cable Trays. Cables installed in cable trays outdoors shall be Type PLTC. Cables installed in cable trays indoors shall be Types PLTC, CL3P, CL3R, CL3, CL2P, CL2R, and CL2.

FPN: See 800.55(D) for cables permitted in cable trays.

(D) Hazardous (Classified) Locations. Cables installed in hazardous locations shall be as described in 725.61(D)(1) through (D)(4).

(1) Type PLTC. Cables installed in hazardous (classified) locations shall be Type PLTC. Where the use of Type PLTC cable is permitted by 501.4(B), 502.4(B), and 504.20, the cable shall be installed in cable trays, in raceways supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, or other mechanical means. The cable shall be permitted to be directly buried where the cable is listed for this use.

(2) Nonincendive Field Wiring. Wiring for Class 2 circuits as permitted by 501.4(B)(3) shall be permitted.

(3) Thermocouple Circuits. Conductors in Type PLTC cables used for Class 2 thermocouple circuits shall be permitted to be any of the materials used for thermocouple extension wire.

(4) In Industrial Establishments. In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the cable is not subject to physical damage, Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring between cable tray and utilization equipment in lengths not to exceed 15 m (50 ft). The cable shall be supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 1.75 m (6 ft).

(E) Other Wiring Within Buildings. Cables installed in building locations other than those covered in 725.61(A) through (D) shall be as described in any of (1) through (6). Abandoned cables in hollow spaces shall not be permitted to remain.

(1) Type CL2 or CL3 shall be permitted.

(2) Type CL2X or CL3X shall be permitted to be installed in a raceway or in accordance with other wiring methods covered in Chapter 3.

(3) Cables shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).

(4) Listed Type CL2X cables less than 6 mm (0.25 in.) in diameter and listed Type CL3X cables less than 6 mm (0.25 in.) in diameter shall be permitted to be installed in one- and two-family dwellings.

(5) Listed Type CL2X cables less than 6 mm (0.25 in.) in diameter and listed Type CL3X cables less than 6 mm (0.25 in.) in diameter shall be permitted to be installed in nonconcealed spaces in multifamily dwellings.

(6) Type CMUC undercarpet communications wires and cables shall be permitted to be installed under carpet.

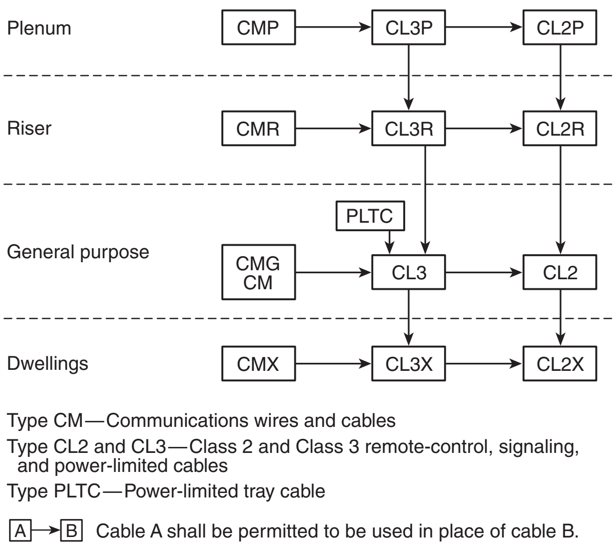
(F) Cross-Connect Arrays. Type CL2 or CL3 conductors or cables shall be used for cross-connect arrays.

(G) Class 2 and Class 3 Cable Uses and Permitted Substitutions. The uses and permitted substitutions for Class 2 and Class 3 cables listed in Table 725.61 shall be considered suitable for the purpose and shall be permitted.

FPN: For information on Types CMP, CMR, CH, and CMX cables, see 800.82.

Table 725.61 Cable Uses and Permitted Substitutions

Cable Type	Use	References	Permitted Substitutions
CL3P	Class 3 plenum cable	725.61(A)	CMP
CL2P	Class 2 plenum cable	725.61(A)	CMP, CL3P
CL3R	Class 3 riser cable	725.61(B)	CMP, CL3P, CMR
CL2R	Class 2 riser cable	725.61(B)	CMP, CL3P, CL2P, CMR, CL3R
PLTC	Power-limited tray cable	725.61(C) and (D)	
CL3	Class 3 cable	725.61(B), (E), and (F)	CMP, CL3P, CMR, CL3R, CMG, CM, PLTC
CL2	Class 2 cable	725.61(B), (E), and (F)	CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3
CL3X	Class 3 cable, limited use	725.61(B) and (E)	CMP, CL3P, CMR, CL3R, CMG, CM, PLTC, CL3, CMX
CL2X	Class 2 cable, limited use	725.61(B) and (E)	CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3, CL2, CMX, CL3X



VI. Listing Requirements

725.82 Class 2, Class 3, and Type PLTC Cables. Class 2, Class 3, and Type PLTC cables installed as wiring within buildings shall be listed in accordance with 725.83(A) through (G) and shall be marked in accordance with 725.82(H).

(A) Types CL2P and CL3P. Types CL2P and CL3P plenum cables shall be marked as Type CL2P or CL3P respectively, and be listed as suitable for use in ducts, plenums, and other space used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining low smoke-producing cable is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-1999, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.

(B) Types CL2R and CL3R. Types CL2R and CL3R riser cables shall be marked as Type CL2R or CL3R respectively, and be listed as suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

FPN: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-1997, Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.

(C) Types CL2 and CL3. Types CL2 and CL3 cables shall be marked as Type CL2 or CL3 respectively, and be listed as suitable for general-purpose use, with the exception of risers, ducts, plenums, and other space used for environmental air and shall also be listed as being resistant to the spread of fire.

FPN: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the vertical tray flame test in ANSI/UL 1581-1991, Reference Standard for Electrical Wires, Cables and Flexible Cords.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, Test Methods for Electrical Wires and Cables.

(D) Types CL2X and CL3X. Types CL2X and CL3X limited-use cables shall be marked as Type CL2X or CL3X respectively, and be listed as being suitable for use in dwellings and for use in raceway and shall also be listed as being resistant to flame spread.

FPN: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-1991, Reference Standard for Electrical Wires, Cables and Flexible Cords.

(E) Type PLTC. Type PLTC nonmetallic-sheathed, power-limited tray cable shall be listed as being suitable for cable trays and shall consist of a factory assembly of two or more insulated conductors under a nonmetallic jacket. The insulated conductors shall be 22 AWG through 12 AWG. The conductor material shall be copper (solid or stranded). Insulation on conductors shall be suitable for 300 volts. The cable core shall be either (1) two or more parallel conductors, (2) one or more group assemblies of twisted or parallel conductors, or (3) a combination thereof. A metallic shield or a metallized foil shield with drain wire(s) shall be permitted to be applied either over the cable core, over groups of conductors, or both. The cable shall be listed as being resistant to the spread of fire. The outer jacket shall be a sunlight- and moisture-resistant nonmetallic material.

Exception No. 1: Where a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armor is applied over the nonmetallic jacket, an overall nonmetallic jacket shall not be required. On metallic-sheathed cable without an overall nonmetallic jacket, the information required in 310.11 shall be located on the nonmetallic jacket under the sheath.

Exception No. 2: Conductors in PLTC cables used for Class 2 thermocouple circuits shall be permitted to be any of the materials used for thermocouple extension wire.

FPN: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the vertical tray flame test in ANSI/UL 1581-1991, Reference Standard for Electrical Wires, Cables and Flexible Cords.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, Test Methods for Electrical Wires and Cables.

(F) Class 2 and Class 3 Cable Voltage Ratings. Class 2 cables shall have a voltage rating of not less than 150 volts. Class 3 cables shall have a voltage rating of not less than 300 volts.

(G) Class 3 Single Conductors. Class 3 single conductors used as other wiring within buildings shall not be smaller than 18 AWG and shall be Type CL3. Conductor types described in 725.27(B) that are also listed as Type CL3 shall be permitted.

FPN: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the vertical tray flame test in ANSI/UL 1581-1991, Reference Standard for Electrical Wires, Cables and Flexible Cords.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA vertical flame test for cables in cable trays as described in CSA C22.2 No. 0.3-M-1985, Test Methods for Electrical Wires and Cables.

(H) Marking. Cables shall be marked in accordance with 310.11(A)(2), (3), (4), and (5). Voltage ratings shall not be marked on the cables.

FPN: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1 electric light and power applications.

Exception: Voltage markings shall be permitted where the cable has multiple listings and a voltage marking is required for one or more of the listings.

Submitter: Stanley D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Renumber Articles 725, 760, 770, 800, 820 and 830 as shown in the table. [Table shown on following pages]

Substantiation: The NEC Technical Correlating Committee action on proposal 3-126 was:

"The Technical Correlating Committee directs the chairs of Code-Making Panels 3 and 16 to establish a small task group to consider the sequential numbering proposed by this and similar proposals. With the numbering as accepted, the addition of a new rule to any article would result in renumbering everything following that section. The task group should consider using a larger range of numbers to allow for future expansion of the articles. The task group can develop comments to accomplish this numbering."

The task group members are:

Jim Brunssen- CMP 16

Paul Casparro- CMP 3

Sandy Egesdal- CMP 3

Stanley Kahn- CMP 16

Stanley Kaufman- CMP 16

Mark Ode- CMP 3

Implementation of the renumbering scheme in the attached table will allow ample room for insertion of future sections.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel actions on Proposals 3-137 and 3-211. In both proposals, a Panel 3 Task Group studied Article 725 and 760 for the 2008 NEC and provided an updated version of the renumbering of Articles 725 and 760 based on the NEC TCC assignment to reformat and renumber these articles. The other articles in the proposal (770, 800, 820, 830) are not under the perview of CMP3.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-139 Log #2361 NEC-P03 **Final Action: Reject**

(725.2. Abandoned Class 2, Class 3, and PLTC Cable)

Submitter: John H. Schmidt, ABC Television Network

Recommendation: In the definition for Abandoned Class 2, Class 3 and PLTC Cable, after the words "and not identified for future use with a tag" add the new text "or in a database."

Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.

Panel Meeting Action: Reject

Panel Statement: Certainly, a computer database can be used to catalogue cables and their potential future use, but the definition provides the information that an abandoned cable is a cable that is disconnected and not identified for future use by a tag. A cable that is disconnected but identified with a physical tag is not abandoned. A database would not be able to be physically attached to the cable as an identification means for that cable. A database may or may not be available at time of use or need.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

PACE, D.: The panel should have accepted this proposal. The intent of the existing wording "identified for future use with a tag" is simply to indicate there are future plans for the cable and that it is not abandoned in place with no intention of future use, left behind because of the cost of removing it. I see no difference in identifying the cable through the use of a tag vs the use of a number on the cable that refers back to a document somewhere that contains additional information about the cable, the installation, future plans, etc. The tag that is now required is certainly not large enough to contain all this informatin, thus it will most likely indicate a reference to a drawing or other document that contains the additional information. At the very least, the present text does not prohibit the tag information from referring the reader to another document that would have additional information. Using a member on the cable that is linked to a document with further information should be an acceptable way to meet this requirement.

3-140 Log #2688 NEC-P03 **Final Action: Reject**

(725.2. Abandoned Class 2, Class 3, and PLTC Cable)

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Recommendation: Revise 725.2 Abandoned Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag which is of a material impervious to the deleterious effects of temperature and dampness. The tag shall be resistant to the effects of gnawing by rodents. The tag shall contain the following information:

(1) Date tag was installed.

(2) Date of intended use of disconnected cable.

(3) Drawing or file number containing information relating to intended future use of disconnected cable.

The date of intended use of disconnected cable shall not exceed 90 days from date of disconnection.

Substantiation: Abandoned cables are a growing problem in the industry. These cables are left for others to deal with when present users discontinue their operation. Understanding this problem, the removal of abandoned cables, is required by Articles 640, 645, 725, 760, 770, 800, 820 and 830. 725.3(B) requires the removal of abandoned Class 2, Class 3, and PLTC cables. Tagging of cables intended for future use without a method of ensuring the intention of future use invites tagging of cables to avoid the responsibility of their proper removal.

Panel Meeting Action: Reject

Panel Statement: The proposed recommendation to require a tag resistant to rodents, the date the disconnected cable is intended to be used, the drawing number intended for the future use of the cable, and the 90-day restriction is too restrictive. These cables are often installed at the time of initial installation as spare cables that can be used as future employee expansion deems necessary or as a cable becomes unusable for one reason or another. For example, assume there is a control or signaling installation that requires 200 low voltage cables or conductors in a raceway. Only 180 cables or conductors are needed at the present time. The other 20 cables are spare cables. It would not be feasible to install only 180 cables or conductors and then, when an expansion or repair is necessary, to pull all 180 cables out of the raceway to install 20 more in 6 months to a year.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-141 Log #3026 NEC-P03 **Final Action: Accept**

(725.2. Abandoned Class 2, Class 3, and PLTC Cable)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council

Recommendation: 725.2 Definitions.

Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.

Keep this definition unchanged for consistency.

Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:

640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.

725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.

The additional wording in this definition causes confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100.

Panel Meeting Action: Accept

Panel Statement: While the recommendation is not to change the definition for abandoned cables in 725.2, the substantiation incorrectly states that all abandoned cable definitions in all other articles should be the same as the one in 725.2. Each article has different requirements for what constitutes an abandoned cable. Some applications require that a connector be installed along with an identification tag on the cable, whereas others, such as the one for Article 725 require only that the cable not be terminated at equipment and an identification tag be installed for it to not be considered to be abandoned.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

[Proposal 3-138 (Log #226) Recommendation]

	725	760	770	800	820	830
#	ARTICLE 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power-Limited Circuits	ARTICLE 760 Fire Alarm Systems	ARTICLE 770 Optical Fiber Cables and Raceways	ARTICLE 800 Communications Circuits	ARTICLE 820 Community Antenna Television and Radio Distribution Systems	ARTICLE 830 Network-Powered Broadband Communications Systems
	I. General	I. General	I. General	I. General	I. General	I. General
1	725.1 Scope.	760.1 Scope.	770.1 Scope.	800.1 Scope.	820.1 Scope.	830.1 Scope.
2	725.2 Definitions.	760.2 Definitions.	770.2 Definitions.	800.2 Definitions.	820.2. Definitions.	830.2 Definitions.
3	725.3 Locations and Other Articles. [ROP changed to: 725.3 Other Articles.]	760.3 Locations and Other Articles. [ROP changed to: 760.3 Other Articles.]	770.3 Locations and Other Articles. [ROP changed to: 770.3 Other Articles.]	800.3 Hybrid Power and Communications Cables. [ROP changed to: 800.3 Other Articles]	820.3 Locations and Other Articles. [ROP changed to: 820.3 Other Articles.]	830.3 Other Articles (Include hazardous locations). [ROP changed to: 830.3 Other Articles.]
4						
5						
6			770.4 Optical Fiber Cables.			
7						
8						
9			770.5 Types.			
10						
11						
12			770.6 Raceways for Optical Fiber Cables.			
13						
14						
15					820.4 Energy Limitations.	830.4 Power Limitations.
16						
17						

	725	760	770	800	820	830
18				800.4 Equipment. [ROP changed to: 800.4 Installation of Equipment.]		
19						
20						
21	725.5 Access to Electrical Equipment Behind Panels Designed to Allow Access. [ROP changed to: 725.7 Access to Electrical Equipment Behind Panels Designed to Allow Access.]	760.5 Access to Electrical Equipment Behind Panels Designed to Allow Access. [ROP changed to: 760.7 Access to Electrical Equipment Behind Panels Designed to Allow Access.]	770.7 Access to Electrical Equipment Behind Panels Designed to Allow Access.	800.5 Access to Electrical Equipment Behind Panels Designed to Allow Access. [ROP changed to: 800.7 Access to Electrical Equipment Behind Panels Designed to Allow Access.]	820.5 Access to Electrical Equipment Behind Panels Designed to Allow Access. [ROP changed to: 820.7 Access to Electrical Equipment Behind Panels Designed to Allow Access.]	830.5 Access to Electrical Equipment Behind Panels Designed to Allow Access. [ROP changed to: 830.7 Access to Electrical Equipment Behind Panels Designed to Allow Access.]
22						
23						
24	725.6 Mechanical Execution of Work. [ROP changed to: 725.8 Mechanical Execution of Work.]	760.6 Mechanical Execution of Work. [ROP changed to: 760.8 Mechanical Execution of Work.]	770.8 Mechanical Execution of Work.	800.6 Mechanical Execution of Work. [ROP changed to: 800.8 Mechanical Execution of Work.]	820.8 Mechanical Execution of Work.	830.8 Mechanical Execution of Work.
				[ROP moved: (800.8 Hazardous (Classified) Locations.) to 800.3]		
25						
26						

	725	760	770	800	820	830
27	725.9 Class 1, Class 2, and Class 3 Circuit Grounding. [Note: 725.9 was omitted from of the ROP Preprint.]	760.9 Fire Alarm Circuit and Equipment Grounding.				
28						
29						
30	725.10 Class 1, Class 2, and Class 3 Circuit Identification	760.10 Fire Alarm Circuit Identification				
31	725.9 Safety-Control Equipment. [ROP changed to: 725.11 Safety-Control Equipment.]	760.11 Fire Alarm Circuits Extending Beyond One Building.				
32						
33						
34	725.15 Class 1, Class 2, and Class 3 Circuit Requirements.	760.15 Fire Alarm Circuit Requirements.				
35						
36						
37						
38						
39						

	725	760	770	800	820	830
				II. Wires and Cables Outside and Entering Buildings	II. Cables Outside and Entering Buildings	II. Cables Outside and Entering Buildings
40						830.10 Entrance Cables.
42						
43						
44				800.10 Overhead Communications Wires and Cables. [ROP changed to: 800.11 Overhead Communications Wires and Cables.]	820.10 Outside Cables [ROP changed to: 820.11 Overhead Cables.]	830.11 Aerial Cables.
45						
46						
47				800.11 Underground Circuits Entering Buildings. [ROP changed to: 800.12 Underground Circuits Entering Buildings.]	820.11 Entering Buildings. [ROP changed to: 820.12 Underground Circuits Entering Buildings.]	830.12 Underground Circuits Entering Buildings.
48						
49						

	725	760	770	800	820	830
50				800.12 Circuits Requiring Primary Protectors. [ROP changed to: 800.13 Circuits Requiring Primary Protectors.] ROP 16-149 extracted the listing requirements for drop wire and created new section 800.81.		
51						
52						
53				800.13 Lightning Conductors. [ROP changed to: 800.14 Lightning Conductors.]		
54						
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59						

	725	760	770	800	820
	II. Class 1 Circuits	II. Non–Power-Limited Fire Alarm (NPLFA) Circuits			
60	725.21 Class 1 Circuit Classifications and Power Source Requirements.	760.21 NPLFA Circuit Power Source Requirements.			
61		.			
62					
63	725.23 Class 1 Circuit Overcurrent Protection.	760.23 NPLFA Circuit Overcurrent Protection.			
64					
65					
66	725.24 Class 1 Circuit Overcurrent Device Location.	760.24 NPLFA Circuit Overcurrent Device Location.			
67					
68					
69	725.25 Class 1 Circuit Wiring Methods.	760.25 NPLFA Circuit Wiring Methods.			
70					
71					
72	725.26 Conductors of Different Circuits in Same Cable, Enclosure, or Raceway.	760.26 Conductors of Different Circuits in Same Cable, Enclosure, or Raceway.			
73					
74					
75	725.27 Class 1 Circuit Conductors.	760.27 NPLFA Circuit Conductors.			

	725	760	770	800	820	830
76						
77						
78	725.28 Number of Conductors in Cable Trays and Raceway, and Derating.	760.28 Number of Conductors in Cable Trays and Raceways, and Derating.				
79						
80						
81	725.29 Circuits Extending Beyond One Building.					
82						
83						
84		760.30 Multiconductor NPLFA Cables.				
85						
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			II. Protection	III. Protection	III. Protection	III. Protection
90				800.30 Protective Devices.		830.30 Primary Electrical Protection.
91						
92						
93			770.33 Grounding of Entrance Cables.	800.33 Cable Grounding.	820.33 Grounding of Outer Conductive Shield of a Coaxial Cable.	830.33 Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables.
94						

	725	760	770	800	820	830
95						
96						
97						
98						
99						
				IV. Grounding Methods	IV. Grounding Methods	IV. Grounding Methods
100				800.40 Cable and Primary Protector Grounding.	820.40 Cable Grounding.	830.40 Cable, Network Interface Unit, and Primary Protector Grounding.
101						
102						
103					820.41 Equipment Grounding.	
104						
105						
106				800.41 Primary Protector Grounding and Bonding at Mobile Homes. [ROP changed to: 800.42 Primary Protector Grounding and Bonding at Mobile Homes.]	820.42 Bonding and Grounding at Mobile Homes.	830.42 Bonding and Grounding at Mobile Homes.
107						
108						
109						

	725	760	770	800	820	830
	III. Class 2 and Class 3 Circuits	III. Power-Limited Fire Alarm (PLFA) Circuits	III. Cables Within Buildings	V. Communications Wires and Cables Within Buildings	V. Cables Within Buildings	V. Wiring Methods Within Buildings
			[ROP deleted: 770.49 Fire Resistance of Optical Fiber Cables.	[ROP deleted: 800.49 Fire Resistance of Optical Fiber Cables.	[ROP deleted: 820.49 Fire Resistance of Optical Fiber Cables.	
110				800.48 Raceways for Communications Wires and Cables.		
111						
112						
113			770.50 Listing, Marking, and Installation of Listed Optical Fiber Cables. [ROP changed to: 770.50 Installation of Optical Fiber Cables.]	800.50 Listing, Marking, and Installation of Communications Wires and Cables. [ROP changed to: 800.50 Installation of Communications Wires and Cables.]	820.50 Listing, Marking, and Installation of Coaxial Cables. [ROP changed to: 820.50 Installation of Coaxial Cables.]	
114						
115						
116						
117						
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119						
120	725.41 Power Sources for Class 2 and Class 3 Circuits	760.41 Power Sources for PLFA Circuits.				
121	725.42 Circuit Marking.	760.42 Circuit Marking.				

	725	760	770	800	820	830
122						
123						
124	725.51 Wiring Methods on Supply Side of the Class 2 or Class 3 Power Source.	760.51 Wiring Methods on Supply Side of the PLFA Power Source.				
125						
126						
127	725.52 Wiring Methods and Materials on Load Side of the Class 2 or Class 3 Power Source.	760.52 Wiring Methods and Materials on Load Side of the PLFA Power Source.				
128						
129						
130	725.54 Installation of Conductors and Equipment in Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways for Class 2 and Class 3 Circuits.	760.54 Installation of Conductors and Equipment in Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways for Power-Limited Circuits.				
131						
132						

	725	760	770	800	820	830
142		760.57 Conductor Size.				
143						
144						
145	725.58 Support of Conductors.	760.58 Support of Conductors.				
146						
147						
148		760.59 Current-Carrying Continuous Line-Type Fire Detectors.				
149						
150						
151						830.54 Medium Power Network-Powered Broadband Communications System Wiring Methods. [ROP changed to: 830.60 Medium Power Network-Powered Broadband Communications System Wiring Methods.]
152						
153						

	725	760	770	800	820	830
142		760.57 Conductor Size.				
143						
144						
145	725.58 Support of Conductors.	760.58 Support of Conductors.				
146						
147						
148		760.59 Current-Carrying Continuous Line-Type Fire Detectors.				
149						
150						
151						830.54 Medium Power Network-Powered Broadband Communications System Wiring Methods. [ROP changed to: 830.60 Medium Power Network-Powered Broadband Communications System Wiring Methods.]
152						
153						

	725	760	770	800	820	830
154	725.61 Applications of Listed Class 2, Class 3, and PLTC Cables.	760.61 Applications of Listed PLFA Cables.	770.53Applications of Listed Optical Fiber Cables and Raceways. [ROP changed to: 770.61Applications of Listed Optical Fiber Cables and Raceways.]	800.53 Applications of Listed Communications Wires and Cables and Communications Raceways. [ROP changed to: 800.61 Applications of Listed Communications Wires and Cables and Communications Raceways.]	820.53 Applications of Listed CATV Cables. [ROP changed to: 820.61 Applications of Listed CATV Cables.]	830.55 Low Power Network-Powered Broadband Communications System Wiring Methods. [ROP changed to: 830.61 Low Power Network-Powered Broadband Communications System Wiring Methods.]
155						
156						
157						830.56 Protection Against Physical Damage. [ROP changed to: 830.62 Protection Against Physical Damage.]
158						
159						
160						830.57 Bends. [ROP changed to: 830.63 Bends.]
161						
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163						
164						

	725	760	770	800	820	830
165						
166						
167						
168						
169						

	725	760	770	800	820	830
	V Listing Requirements	V Listing Requirements	IV Listing Requirements	VI Listing Requirements	VI Listing Requirements	VI Listing Requirements
170				800.4 Equipment [ROP changed to: 800.80 Equipment.]		
171						
172						
173				[ROP 16-149 created: 800.81 Drop wire & cable.]		
174						
175						
176		760. 31 NPLFA Cables. [ROP changed to: 760. 81 NPLFA Cables.]				
177						
178						

	725	760	770	800	820	830
179	725.71 Class 2, Class 3, and Type PLTC Cables. [ROP changed to: 725.82 Class 2, Class 3, and Type PLTC Cables.]	760.71 PLFA Cables and Insulated Continuous Line-Type Fire Detectors. [ROP changed to: 760.82 PLFA Cables and Insulated Continuous Line-Type Fire Detectors.]	770.51 Optical Fiber Cables. [ROP changed to: 770.82 Optical Fiber Cables.]	800.51 Communications Wires and Cables. [ROP changed to: 800.82 Communications Wires and Cables.]	820.51 Additional Listing Requirements. [ROP changed to: 820.82 Coaxial Cables.]	830.5 Network-Powered Broadband Communications Equipment and Cables. [ROP changed to: 830.82 Network-Powered Broadband Communications Equipment and Cables.]
180						
181						
182			770.51 Optical Fiber Raceways. [ROP changed to: 770.83 Optical Fiber Raceways.	800.51 Communications Raceways. [ROP changed to: 800.83 Communications Raceways.]		
183						

3-142 Log #3441 NEC-P03 **Final Action: Reject**
(725.2, 725.11, 725.15, 725.21, 725.22)

Submitter: David Wechsler, The Dow Chemical Company
Recommendation: Redefine Class I as a single wiring method by taking the actions shown below:

Revise 725.2 definition per the NFPA style manual to eliminate a design requirement from a definition as follows:

725.2 Class 1 Circuit. The portion of the wiring system between the load side of the overcurrent device or power-limited supply and the connected equipment. ~~The voltage and power limitations of the source are in accordance with 725.21.~~

Delete the entire 725.11.

Revise 725.15 as follows:

725.15 Class 1, Class 2, and Class 3 Circuit Requirements. Class 1 circuits shall comply with Parts I and II of this Article. Class 2 and Class 3 Circuits shall comply with Parts I and III of this Article. ~~A remote control, signaling, or power limited circuits shall comply with the following parts of this article:~~

~~(1) Class 1 Circuits: Parts I and II~~

~~(2) Class 2 and Class 3 Circuits: Parts I and III~~

Revise 725.21 as shown below:

725.21 Class 1 Circuit Classifications ~~and Power Source Requirements~~ . Class 1 circuits shall be classified as either Class 1 power-limited circuits where they comply with the power limitations of 725.21(A) or as Class 1 Non-Power Limited ~~remote control and signaling circuits~~ where they ~~are used for remote-control or signaling purposes and~~ comply with the power limitations of 725.21(B).

Retain existing 725.21(A).

Revise 725.21(B) as shown below:

(B) Class 1 Non-Power Limited ~~Remote Control and Signaling~~ Circuits. These circuits shall not exceed 600 volts. The power output of the source shall not be required to be limited.

Add new 725.22 as follows:

725.22 Class I Transformers and Power Sources.

(1) Class 1 Transformers. Transformers used to supply power-limited Class 1 circuits shall comply with the applicable sections within Parts I and II of Article 450.

(2) ~~Other~~ Class 1 Power Sources. Power sources other than transformers shall be protected by overcurrent devices rated at not more than 167 percent of the volt-ampere rating of the source divided by the rated voltage. The overcurrent devices shall not be interchangeable with overcurrent devices of higher ratings. The overcurrent device shall be permitted to be an integral part of the power supply. [Note: continue with existing paragraph through "...load with rated input applied".]

Revise 725.28 as indicated below:

725.28 ~~Number of~~ Conductors in Raceways ~~Cable Trays and Raceway, and Derating~~ .

(A) Class 1 Circuit Conductors. Where only Class 1 circuit conductors are in a raceway, the number of conductors shall be determined in accordance with 300.17. The derating factors given in 310.15(B)(2)(a) shall apply only if such conductors carry continuous loads in excess of 10 percent of the ampacity of each conductor.

(B) Power-Supply Conductors and Class 1 Circuit Conductors. Where power-supply conductors and Class 1 circuit conductors are permitted in a raceway in accordance with 725.26, the number of conductors shall be determined in accordance with 300.17. The derating factors given in 310.15(B)(2)(a) shall apply as follows:

(1) To all conductors where the Class 1 circuit conductors carry continuous loads in excess of 10 percent of the ampacity of each conductor and where the total number of conductors is more than three.

(2) To the power-supply conductors only, where the Class 1 circuit conductors do not carry continuous loads in excess of 10 percent of the ampacity of each conductor and where the number of power-supply conductors is more than three.

~~(C) Class 1 Circuit Conductors in Cable Trays. Where Class 1 circuit conductors are installed in cable trays, they shall comply with the provisions of 392.9 through 392.11.~~

Add new 725.29 as follows:

725.29 Conductors in Cable Trays.

(A) Class 1 Circuit Conductors in Cable Trays. Where Class 1 circuit conductors are installed in cable trays, they shall comply with the provisions of 392.9 through 392.11.

Renumber 725.29, 725.33 as indicated below:

725.33 ~~725.29~~ Circuits Extending Beyond One Building.

Substantiation: Over the years, Article 725 and companion Articles like 760 and 800 have been revised with an objective of retaining degrees of consistent language and format. Additionally, revisions have been made to either correct or modify requirements demonstrated as being undesirable or unclear. One aspect of this has been the use of the terms power-limited and non-power limited. An aspect preventing Parts I and II from being revised has been the concept of remote-control circuits. Under today's current technology the quite literal understanding of the phrase "failure of the equipment to operate introduces a direct fire or life hazard" would cause may control, alarm and emergency systems all to be considered as Class I circuits when in fact few have been so designated. For example, the entire concept of a circuit integrity cable (CI) is grounded upon being able to operate to prevent loss of life or a direct hazard, but they are not Class 1 circuits. The entire technology movement with process control logic solves with SIL 3 Safety Instrumented Systems, intelligent emergency and security alarm systems all have moved into what was long ago the domain of Class 1 circuits. This is no longer true and the changes made reflect these conditions. Again aligning with the concepts in other Articles, such as 760, power limited and non-power limited concepts have been introduced so that the circuit applications can still be utilized under the appropriate design applications. Because of the inter-dependency of these clauses, these suggested changes are proposed under a single proposal for action.

Panel Meeting Action: Reject
Panel Statement: No technical substantiation has been provided for these suggested changes. There are many Class 1 circuits that are being used as remote control circuits for equipment. For example, a control device located remotely from a motor and supplied from a separate power source or a separate overcurrent protective device from the motor is a remote controlled motor circuit. Section 430.72(A), last sentence, provides this reference by sending the installer to 725.23 or the Notes for Tables 11A or 11B for overcurrent protection of these remote control circuits. This same remote control function would apply to power supplying a photocell connected to a lighting controller where the control coil is supplied by a separate 15- or 20-ampere circuit. Deleting remote control and signaling from Article 725 would affect literally thousands of common applications now covered by Article 725 without any technical substantiation for this suggested change.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:

PACE, D.: The panel should have accepted this proposal.

I do not believe the submitter's intent was to delete remote control and signaling from Article 725, rather he changed some words to better align with similar concepts in other articles so the applications can still be utilized under the appropriate design application. The wording chosen by the submitter does not delete these applications, rather replaces those words with more general terms that still would allow for the intent of the existing text, and at the same time allowing better application of the requirements.

3-143 Log #1371 NEC-P03 **Final Action: Reject**
(725.3)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete reference to 300.17

725.3 Other Articles.

Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through 725.3(G). Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits.

~~(A) Number and Size of Conductors in Raceway. Section 300.17.~~

(A) Spread of Fire or Products of Combustion. Section 300.21. The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.

(B ~~C~~) Ducts, Plenums, and Other Air-Handling Spaces. Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22. Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air.

(C ~~D~~) Hazardous (Classified) Locations. Articles 500 through 516 and Article 517, Par IV, where installed in hazardous (classified) locations.

(D ~~E~~) Cable Trays. Article 392, where installed in cable tray.

(E ~~F~~) Motor Control Circuits. Article 430, Part VI, where tapped from the load side of the motor branch-circuit protective device(s) as specified in 430.72(A).

(F ~~G~~) Instrumentation Tray Cable. See Article 727.

Substantiation: Raceway fill for limited energy circuits is a design issue, not a safety issue. Class I circuits may be a safety issue, but the raceway fill requirements for them are already spelled out in section 725.25, as they should be. The functionality of Class II and Class III circuits is not within the purpose of the NEC, and therefore the raceway fill provisions should not be required.
Panel Meeting Action: Reject
Panel Statement: Deleting this reference to 300.17 would not only affect Class 2 circuits but it would affect Class 3 circuits. The definition of Class 3 Circuit states that, due to its power limitations, a Class 3 circuit considers safety from a fire initiation standpoint. The definition further states that since higher levels of voltage and current than those permitted for Class 2 circuits are often utilized, additional safeguards are specified to provide protection from electric shock. The raceway fill requirements in 300.17 provide limitations on the number of Class 3 conductors that can be installed. Exceeding the fill capacity of a raceway can cause stretching of the conductors and insulation with permanent damage to the insulation, thus constituting a potential shock hazard.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-144 Log #1372 NEC-P03 **Final Action: Reject**
(725.3)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete text concerning abandoned cables
725.3 Other Articles.
Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through 725.3(G). Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits.
(A) Number and Size of Conductors in Raceway. Section 300.17.
(B) Spread of Fire or Products of Combustion. Section 300.21. ~~The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.~~
(C) Ducts, Plenums, and Other Air-Handling Spaces. Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22. Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air.
(D) Hazardous (Classified) Locations. Articles 500 through 516 and Article 517, Part IV, where installed in hazardous (classified) locations.
(E) Cable Trays. Article 392, where installed in cable tray.
(F) Motor Control Circuits. Article 430, Part VI, where tapped from the load side of the motor branch-circuit protective device(s) as specified in 430.72(A).
(G) Instrumentation Tray Cable. See Article 727.
Substantiation: The NEC is an installation standard, not a maintenance standard. Because of this, this rule should not be a part of the NEC. Furthermore, this provision does not accomplish its intent, as the *Code* is not a retroactive document. To require abandoned cables to be removed is similar to requiring facilities to update their receptacles to the new GFCI provision every three years. With that said, the only time this rule applies is when an installer creates an abandoned cable. Also, this provision does not fall within the purpose of the NEC 90.1(A). The NEC is concerned with the hazards created from the use of electricity…this rule seems to imply that a cable with a voltage applied to it is safe, but a cable with no voltage applied to it is dangerous.
This proposal is also being made to 760.3(A), 770.3(A), 800.3(C), 820.3(A) and 830.3(A).
Panel Meeting Action: Reject
Panel Statement: This is not a retroactive requirement, since the abandoned cable either must be marked at the time it is disconnected or it must be removed. Removal of discontinued conductors is not new to the Code.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-145 Log #3108 NEC-P03 **Final Action: Reject**
(725.3)

Submitter: Donald Hall, Corning Cable Systems
Recommendation: Revise text to read as follows:
725.3 Other Articles.
Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through 725.3(G). Only those sections of Article 300 referenced in this article shall apply to Class1, Class 2, and Class 3 circuits.
(B) Spread of Fire or Products of Combustion. 300.21shall apply. ~~The accessible portion of a~~ Abandoned Class 2, Class 3, and PLTC cables shall be removed.
Also, add the following FPN to 725.3(B):
<u>FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.</u>
Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.
The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.
Panel Meeting Action: Reject
Panel Statement: Requiring inaccessible portions of a cable to be removed could mean damaging building finish and demolition or destruction of the building to remove abandoned cable, which is unrealistic to require. There is no added benefit to the user of the NEC in adding this fine print note since the removal of cable in accordance with 725.3(B) is already a requirement. The relevant portions of the suggested document in the FPN have not been provided for informational purposes. With regard to the addition of the FPN, the panel refers to 90.1(C): The Code is not for untrained personnel and is not an instruction manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-146 Log #2805 NEC-P03 **Final Action: Reject**
(725.3(B))

Submitter: Harold C. Ohde, IBEW #134
Recommendation: Revise text to read as follows:
725.3 Other Articles. No change.
(A) Number and Size of Conductors in Raceway. No change.
(B) Spread of Fire or Products of Combustion. ~~Section~~ 300.21 <u>shall apply</u> . ~~The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.~~
Substantiation: The requirements for removal of abandoned Class 2, Class 3, and PLTC cables would be better suited in appropriate code section within Article 725. I have submitted another proposal that would move the abandoned Class 2, Class 3, and PLTC cables requirements to 725.8 - Mechanical Execution of Work. The abandoned Class 2, Class 3, and PLTC cables requirements are out of place in 725.3 - Other articles. The requirements are not part of another Article as they are part of Article 725 and are located within Article 725.
The addition of the words "shall apply" would incorporate language that is consistent with 800.3, 820.3 and 830.3.
Similar proposals have been submitted for 640.3, 760.3, 770.3, 800.3, 820.3, and 830.3 to revise these sections as well.
Panel Meeting Action: Reject
Panel Statement: Moving this text to a new section without this restriction would make this a requirement for every location within a building. There has been no substantiation provided to expand this requirement beyond hollow spaces, vertical shafts and air-handling areas. The concern of 300.21 is the spread of fire and products of combustion in hollow spaces, vertical shafts, and ventilation and air-handling ducts caused by electrical installations. Removing the accessible portion of the cable seems to fit very well within 300.21 and should remain in Section 725.3(B) as a means of reducing unnecessary electrical products in these areas.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 2
Explanation of Negative:
CASPARRO, P.: This proposal should have been accepted. This proposal was submitted not to interfere with the intent of 300.21, but rather locate all abandoned cable requirements in one code section located in Part I - General. Having the requirements in a central section in Part I - General would eliminate confusion or concerns in regards to the removal of abandoned requirements.
EGESDAL, S.: See my Explanation of Negative for Proposal 3-148.

3-147 Log #3003 NEC-P03 **Final Action: Reject**
(725.3(B))

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
725.2 Definitions.
Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.
725.3 Other Articles.
Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through 725.3(G). Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits.
(B) Spread of Fire or Products of Combustion. Section 300.21. ~~The accessible portion of abandoned~~ <u>Abandoned</u> Class 2, Class 3, and PLTC cables shall be removed. <u>Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components.</u>
Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in "inaccessible spaces". This is not conducive to safe electrical practice; this the key change is the elimination of the words "the accessible portion of".
If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.
Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.
For information, see the relevant definitions in the NEC.
Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.
Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.
Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready

access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.

Panel Meeting Action: Reject

Panel Statement: This proposed change would make it a requirement that removal of abandoned cable never damage the building finish or compromise adjacent wiring systems or components. This expectation is unrealistic. If the building owner wants to take a ceiling down to access and remove abandoned cables, the NEC should not and cannot restrict this action. In regard to the removal of accessible cable, the panel refers to the definition of Accessible as it applies to wiring methods.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-148 Log #2386 NEC-P03 **Final Action: Reject**

(725.3(B) and 725.17 (new))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Move the abandoned cable requirements from 725.3(B) to new 725.17.

(B) Spread of Fire or Products of Combustion. Section 300.21. ~~The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.~~

Abandoned Cables . The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.

Substantiation: This change is editorial. The requirement to remove abandoned cables applies to Article 725, not other articles.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-146.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: This proposal should be accepted. The removal of abandoned cable should be in its own section to make it clear that the requirements applies to Parts I, II and III of Article 725. Presently, the removal of abandoned cable in 725.3(B) applies when 300.21 is required to be referenced. Additionally, 725.3 identifies requirements in “Other Articles” that apply. The removal of abandoned cable applies to Article 725, not 300.21.

The 2002 NEC had the removal of abandoned cable requirements in Sections 725.3(B), 725.61(A), Plenums; 725.61(B), Risers; and 725.61(E), Other Wiring in Buildings. As 725.3(B) would supposedly cover all the Parts of Article 725, the requirements were removed from 725.61(A), (B), and(C) in an effort to simplify the NEC. As a former member of Panel 16, I know the intent of the requirements in Article 725 (2002 edition) was to require removal of abandoned cable, regardless of where the cable was installed in a building. The Panel should reconsider the proposals that recommend moving the requirements for removal of abandoned cable to its own section in Part I of Article 725.

3-149 Log #3294 NEC-P03 **Final Action: Accept in Principle**

(725.3(C))

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Revise 725.3(C) to read as follows:

(C) Ducts, Plenums, and Other Air-Handling Spaces. Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22. ~~Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air.~~

Exception to (C): As permitted in Section 725.61(A).

Substantiation: This proposal corrects an error made by CMP 16 during the 2002 code cycle. Changing the exception to positive text caused an inadvertent technical change. Changing the second sentence to an exception provides requirements parallel to those found in Articles 760, and 770.

Section 725.3(b) from the 1999 NEC follows:

“(b) Ducts, Plenums, and Other Air-Handling Spaces. Section 300-22, where installed in ducts or plenums or other space used for environmental air.

Exception to (b): As permitted in Section 725-61(a).”

Section 760.3(B) from the 2005 NEC follows:

“(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts or plenums or other spaces used for environmental air.

Exception: As permitted in 760.30(B)(1) and (B)(2) and 760.61(A).”

Section 770.3(B) from the 2005 NEC follows:

“(B) Ducts, Plenums, and Other Air-Handling Spaces. The requirements of 300.22 for electric wiring shall also apply to installations of optical fiber cables and raceways where they are installed in ducts or plenums or other space used for environmental air.

Exception: As permitted in 770.154(A).”

Panel Meeting Action: Accept in Principle

Revise 725.3(C) to read as follows:

(C) Ducts, Plenums, and Other Air-Handling Spaces. Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22. ~~Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air.~~

Exception: Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air in accordance with Section 725.61(A).

Panel Statement: The Panel has relocated the existing text as an exception without modifying the intent and has provided the exception as a complete sentence as required by the NEC Manual of Style.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-150 Log #1179 NEC-P03 **Final Action: Reject**

(725.3(D) and (E))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Delete.

Substantiation: Already covered by 90.3.

Panel Meeting Action: Reject

Panel Statement: References to these articles are necessary since there are specific requirements in these other articles that affect the requirements in Article 725. For example, PLTC cable requirements in Part III of Article 725 would apply, unless amended by the text in Article 501. Without this tie from Article 725 to Article 501, the supplemented or modified information in Article 501 would not necessarily apply to Article 725 low voltage wiring.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-151 Log #872 NEC-P03 **Final Action: Reject**

(725.3(G))

Submitter: Michael J. Timpanaro, Lake County Building Services

Recommendation: Add new text to read:

(G) Circuits for control of irrigation shall comply with the minimum cover requirements of 300.5. (Table 300.5 Column 5).

Substantiation: Typically, irrigation circuits are Class 2. Since 725.3 requires: “Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits,” it is necessary to provide uniformity between 725.3 and the minimum cover requirements for irrigation circuits referenced in Table 300.5, column 5.

Panel Meeting Action: Reject

Panel Statement: This new subsection referencing Table 300.5 is unnecessary, since Class 1 circuit installations in accordance with 725.25 already deal with Part I of Article 300 and Class 2 and 3 do not require burial depths based on Table 300.5. The panel also notes that the submitter has added subparagraph (G) and subparagraph (G) already exists.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-152 Log #680 NEC-P03 **Final Action: Reject**

(725.8)

Submitter: Jamie McNamara, Hastings, MN

Recommendation: Revise as follows:

725.8 Mechanical Execution of Work. …….

The installation shall also conform with 300.4(D) and 300.11.

Substantiation: To harmonize with the requirements in articles 770, 800, 820 and 830.

Panel Meeting Action: Reject

Panel Statement: Section 725.25 requires Class 1 wiring methods to comply with Part I of Article 300, including 300.4 as necessary. However, since Part I of Article 725 applies to Class 2 and 3 circuits, there was no technical substantiation provided in the proposal to require Class 2 and 3 cables to comply with Section 300.11. In fact, there was no technical substantiation provided with the panel action in Proposal 16-81 in the 2005 NEC ROP to justify adding this requirement to Section 800.6 (later changed to 800.24). Both negative votes made note of this addition and the second negative vote stated that Panel 16 had no technical data to show that a safety problem existed to warrant this change. The one affirmative vote for this suggested change stated he did not agree that requiring compliance with 300.11 is appropriate for small cable systems. This same issue applies here.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

CASPARRO, P.: I believe that the submitter raises a valid concern. All of the other articles that he listed in his substantiation have the requirement to be installed as 300.11. The panel statement says that there were some dissenting votes on Panel 16 when this requirement went into Article 800, but the fact is it is now a part of Article 800. These Class 2 and 3 cables are no less a danger than the cables in other articles where 300.11 is a requirement.

The fact is that if the reference to 300.11 does not exist; when a ceiling installer works on a ceiling and notices that there are cables attached to the ceiling support wires they usually remove the cables from the ceiling support wires which leaves them on the ceiling pads. This leaves the cables unsupported and makes other equipment in the suspended ceiling space inaccessible.

OWEN, S.: I believe that the submitter was correct in requesting this proposed change to Articles 770, 800, 820, and 830.

In general, I believe that all electrical wiring systems of any type, for any electrical installation, should comply with the requirements of 300.11 (unless a specific situation related to a specific section of the NEC would require or permit otherwise). I do not have facts and figures to support my long held belief (based on field installations), that compliance with 300.11 is very important to a safe electrical installation, however, the fact that 300.11 exists illustrates that it is important for safe electrical installations.

3-153 Log #893 NEC-P03 **Final Action: Reject**
(725.8)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise 725.8 as follows:

"...Cables and conductors installed exposed ~~on the surface of ceilngs and sidewalls~~ shall be supported in such a manner...The installation shall also conform to 300. 4 ~~(D)~~ and 300.11 ." (Other portions to remain unchanged.)
Substantiation: Current cable support rules apply only to cables exposed to view (on surfaces). Cables above ceilings are "exposed" as defined, but such cables are only required to be "neat and workmanlike." All of 300.4 should apply. 300.4(D) is only for cables run parallel to framing. 300.11 should apply as it does in 640.6.
Panel Meeting Action: Reject
Panel Statement: The use of the word "exposed" was to recognize that exposed cables that are installed horizontally on framing members are more apt to be damaged than those cables installed through framing members or otherwise protected inside a drop ceiling or similar application.
There is no substantiation provided that justifies requiring remote control, signaling, and power-limited cables of smaller sizes to be supported separate from the ceiling wires. This is a different issue from raceways containing power conductors being connected to ceiling wires. Where ceiling wires were used to support these raceways, the ceiling runners were often pulled higher, thus causing a problem with the entire drop ceiling appearance. The ceiling contractor would often simply pop the raceway clips off the ceiling wire. This caused improper support of the raceways and potential damage that was possibly hazardous.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13
Comment on Affirmative:

AYER, L.: The wording of 725.8 is a result of the 2002 code cycle. The text was changed to notify the user of the code that cables are required to be supported and secured differently below ceilings and sidewalls as compared to cables installed in the void spaces above an accessible ceiling. To require low-energy low-hazard thermostat cables to be supported above an accessible ceiling to the same requirements of exposed cables below the ceiling that could be damaged would not be appropriate.

The addition of 300.11 would also be considered excessive. Some installations may have 10 feet of space between the dropped ceiling and the structure above. To require an independent support wire when adding a few low voltage Class 2 or 3 cables would be costly and burdensome with no apparent benefit. There has been no technical substantiation provided that low voltage cabling is causing a problem with existing or new ceiling grids. Power wiring was moved to independent support wires due to actual problems that were occurring with dropped ceilings.

3-154 Log #1373 NEC-P03 **Final Action: Reject**
(725.8)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete requirement to comply with 300.4(D)

725.8 Mechanical Execution of Work.

Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be supported by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. ~~The installation shall also conform with 300.4(D).~~
Substantiation: There is no reason to protect limited energy circuits from accidental contact with nails or screws. Limited energy circuits are considered to be inherently safe from a fire and electric shock perspective, hence the allowances of lesser wiring methods and allowances for open splicing with out boxes. The protection of these circuits is a design and/or performance issue, not a safety issue. The requirement found in the existing *Code* text does not fit into the purpose of the NEC, as addressed in 90.1(A).
Panel Meeting Action: Reject
Panel Statement: This section applies to Class 1, Class 2, and Class 3. The statement in the substantiation that there is no reason to protect limited energy circuits is incorrect. Class 1 circuits can be limited energy circuit at 30 volts and 1000 VA but there is also up to 33 amps in regular current available in the circuit. In addition, the definition of a Class 3 circuit states that, due to its power limitations, a Class 3 circuit considers safety from a fire initiation standpoint. The definition further states that since higher levels of voltage and current from those permitted for Class 2 circuits are often utilized, additional safeguards are specified to provide protection from electric shock. Both limited energy Class 1 circuits and Class 3 circuits can be a shock hazard and must be protected accordingly.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-155 Log #1374 NEC-P03 **Final Action: Reject**
(725.8)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add "Cable Ties" to the list of supporting methods

725.8 Mechanical Execution of Work.
Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be supported by straps, staples, hangers, cable ties, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D).
Substantiation: This is being proposed in an effort to create uniform language with the chapter three cable wiring method support sections, specifically, 230.30(A), 330.30(A) and 334.30. Similar proposals are also being made to sections: 640.6, 760.8, 770.24, 800.24, 820.24 and 830.24
Panel Meeting Action: Reject
Panel Statement: It is not acceptable to use a cable tie to serve as a sole support for a cable when there is no spacing requirement provided for the distance between supports.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 9 Negative: 4
Explanation of Negative:

AYER, L.: Cable ties should be added to 725.8 as proposed by the submitter. These support devices have been used for years without hazard even though they are not mentioned in this section. Adding this wording is just to notify users of the code that Class I, Class 2 and Class 3 cables can be supported by this device. The panel's substantiation that cable ties cannot be used since there is no spacing requirement provided between supports does not make sense. There has never been spacing requirements when supporting control cables on straps, staples and hangers. To allow a thermostat cable to be supported by a strap, but not a cable tie, is not logical. The rejection of this proposal will cause confusion since cable ties will be allowed to support low-energy cables above a dropped ceiling but not below.

EASTER, L.: Unspecified strap staples, hangers and similar fittings are in this section to provide required support without prescribed spacing intervals. The Code Making Panel has not seen it necessary to prescribe maximum spacing intervals for cables covered by Article 725. UL 1565 provides requirements for listed cable ties intended for primary support of flexible conduits and cables in accordance with the NEC. Such cable ties must have a minimum loop tensile strength rating of 23 kg (50 lbs) or greater. NEMA believes that the panel action should be changed to Accept in Principle. Accept the proposed addition in the third sentence but add the following new fourth sentence: "Cable ties that provide primary support for such cables shall have a minimum loop tensile strength to 23 kg (50 lbs)."

PACE, D.: The panel should have accepted the proposal.

The existing text says "or similar fittings" leaving the list of support means open to other methods other than those listed. The use of cable ties or other methods is not prohibited by the existing text. Other parts of the NEC contain adequate requirements relating to issues such as the items being suitable for the service, adequate support distances, and being such that the cable is not subject to damage. The panel statement is not sufficient justification to reject including cable ties to the list in the existing text. If properly selected and installed, cable ties are a suitable means of support.

SANDERS, M.: Class 1, Class 2 and Class 3 Remote- Control, Signaling, and Power- Limited circuits typically involve the use of cables that are of lighter weight. FPN to 725.1 Scope clearly indicates that "These circuits described herein are characterized by usage and electric power limitation...".

Members of the IEEE Standards Coordinating Committee 18, responsible for formulating IEEE directed vote, did not indicate any problems with using cable ties for support. Currently, there are no spacing requirements provided in 725.8 for other allowable wiring support methods such as straps, staples, hangers, or similar fittings. Experience has proven that workmanship recognizes where undue sags or spacing between cable ties occur and additional straps, hangers or cables ties are then easily added as the need rises.

Comment on Affirmative:

CASPARRO, P.: While the submitter is correct in stating that cable ties are allowed in the other articles that he cites; all of the other articles that allow the use of cable ties as a means of support also contain a requirement for spacing between supports. It was pointed out in the panel discussion that a 100 foot run of cable with a tie wrap at each end would be allowed by the proposed text, this is certainly not acceptable.

EGESDAL, S.: This proposal should have been rejected by referring to the NFPA Standards Council directive on NFPA 90A. Cable ties are often used in plenums. UL Categories ZODZ and DWFV cover cable ties and other hardware listed as suitable for use in air handling spaces in accordance with Section 300.22(C) and (D) of the National Electrical Code.

3-156 Log #3050 NEC-P03 **Final Action: Reject**
(725.8)

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Revise 725.8 as follows:

725.8 Mechanical Execution of Work

(A) Neat and Workmanlike Manner. Class 1, Class 2, Class 3, and PLTC equipment, cables and circuits shall be installed in a neat and workmanlike manner.

(B) Installation of Class 1, Class 2, Class 3. Class 1, Class 2, Class 3 cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the Class 1, Class 2, Class 3 cables will not be damaged by normal building use. Such cables shall be secured by listed straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D) and 300.11 .

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling*, and other ANSI-approved installation standards.

(C) **Abandoned Class 1, Class 2, Class 3, and PLTC Cables.** Abandoned Class 1, Class 2, Class 3, and PLTC cables shall be removed.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling*, and other ANSI- approved standards which provide cable installation that facilitates the removal of abandoned cables.

Substantiation: This proposal revises this section into a practical working tool which will assist in making 725.8 a clear, usable and enforceable code. Each first level subdivision contains a code rule that requires action and the required action has been presented in clear, usable and enforceable manner.

In the electrical industry, the electrician, contractor and AHJ have been taught the importance and significance of the concept of mechanical execution of work. I am an electrical instructor who teaches this important concept to the people involved. This is one of the basis for 90.1(A) which serves as the purpose of this Code. The Code's purpose is to provide a safe installation from hazards arising from the use of electricity.

The revised text in 725.8(A) will require all Class 1, Class 2, Class 3, and PLTC equipment, cables and circuits to be installed in a neat and workmanlike manner.

725.8(B) is an editorial change with additional language to require the means of securing and supporting to be listed for the purpose. The inclusion of "and 300.11" will provide the same installation requirements that can be found be in 640.3, 770.24, 800.24, 820.24 and 830.24. The wording "and 300.11" was accepted by both CMP 12 and CMP 16 for the 2005 NEC edition.

The addition of 725.8(C) would replace the requirement that was in 725.3(B). It makes sense to have the requirements of both the installation of cable and the removal of cable in the same Code section. This would provide the proper guidance to everyone involved. The installer, contractor and the AHJ would gain from this revised section as the rules are centrally located in one Code section. If Class 2, Class 3, and PLTC cable is installed properly then the removal of Class 2, Class 3, and PLTC cables should be no problem if it is not needed anymore or abandoned. The proposed FPN will provide useful guidance and information to everyone involved regarding correct installation practices which would facilitate the removal of the cable as well.

Similar proposals have been submitted for 640.6, 760.8, 770.24, 800.24, 820.24, and 830.24.

Panel Meeting Action: Reject

Panel Statement: Class 1, Class 2, and Class 3 equipment is already required specifically to be installed in a neat and workmanlike manner by 110.12, so inserting it here is unnecessary.

Requiring listed straps, staples, and other supporting means for Class 2 and Class 3 cables is not necessary as long as the support mechanism can be accomplished without harming the cable. Section 725.25 already provides the link to the appropriate wiring methods used for the Class 1 circuit.

The requirement in Section 725.8 to apply Section 300.11 to Class 1, Class 2, and Class 3 circuits is not necessary. Section 725.25 requires Class 1 wiring methods to comply with Part I of Article 300, including 300.4 as necessary. However, since Part I of Article 725 applies to Class 2 and 3 circuits, there was no technical substantiation provided in the proposal to require Class 2 and 3 cables to comply with Section 300.11. In fact, there was no technical substantiation provided with the panel action in Proposal 16-81 in the 2005 NEC ROP to justify adding this requirement to Section 800.6 (later changed to 800.24). Both negative votes made note of this addition, and the second negative vote stated that Panel 16 had no technical data to show that a safety problem existed to warrant this change. The one affirmative vote for this suggested change stated he did not agree that requiring compliance with 300.11 is appropriate for small cable systems. This same issue applies here.

In Section 725.3(B), the concern of 300.21 is the spread of fire and products of combustion in hollow spaces, vertical shafts, and ventilation and air-handling ducts caused by electrical installations. Removing the accessible portion of the cable seems to fit very well within 300.21 and should remain in Section 725.3(B) as a means of reducing unnecessary electrical products in these areas. There is no added benefit to the user of the NEC in adding these fine print notes since the removal of cable in accordance with 725.3(B) is already a requirement.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

CASPARRO, P.: This proposal should have been accepted in part. In the submitter's substantiation, he revised and restructured 725.8 into a practical working tool for all involved. This would have significant impact and provide guidance for the contractor, the installer and the AHJ. This would provide good and sound code that is easy to enforce.

The FPNs that follow 725.8(B) and 725.8(C) provide no guidance nor any added benefit to the user of the code, therefore, should be deleted.

3-157 Log #2219 NEC-P03 **Final Action: Reject**
(725.11(B))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for information.

Submitter: Kyle Cope, Prysmian Cables and Systems

Recommendation: Revise as follows:

"...rigid nonmetallic conduit, electrical metallic tubing. Type MI cable, Type PA cable , Type MC cable, or be otherwise suitably protected from physical damage."

Substantiation: Statement of problem: Material technology advancements now allow for cable designs that provide improved mechanical damage protection. i.e., crush and impact, over standard Type MC cable without sacrificing flame performance properties. The characteristics achieved using traditional metallic components can now be realized using polymeric materials. The use of polymeric materials also provides the opportunity for lighter and smaller diameter cables.

Substantiation for Proposal: Type PA has been proposed as a new type (Article 3XX) and should be included in this list (725.11(B)) as it offers enhanced mechanical benefits as an alternate to Type MC cable. See test data provided. A UL Fact-Finding study comparing the subject cable to type MC is ongoing at the time of proposal submittal. This data will be forwarded once the study is complete.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: This cable and the acceptance of a special article covering this type of cable is under the jurisdiction of panel 7 and must first be accepted by panel 7 before it is included in the NEC. In addition, the UL Fact Finding Report should be submitted as part of the substantiation for acceptance of the cable to help determine the acceptability and the installation criteria for the cable.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-158 Log #2650 NEC-P03 **Final Action: Reject**
(725.16)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Move to a new section:

725.16 Abandoned Cables. The accessible portion of abandoned Class 2, Class 3, and PLTC cables shall be removed.

Remove wording in 725.3(B) "The accessible portion of Class 2, Class 3, and PLTC cables shall be removed."

Substantiation: The title of Section 725.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 725. It is out of place in section 725.3. This proposal will move it to a new section of Article 725.

Panel Meeting Action: Reject

Panel Statement: See the panel statement in Proposal 3-146. This particular recommendation would include removal of these cables even where installed in a raceway and no substantiation has been provided.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-148.

3-159 Log #1990 NEC-P03 **Final Action: Accept in Principle**
(725.26)

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group
Recommendation: Add the words "Power-Limited" in various places of Article 725.26(A) & (B) and add a new Section 725.26(C) as follows (additions underlined):
725.26 Conductors of Different Circuits in the Same Cable, Cable Tray, Enclosure, or Raceway. Class 1 circuits shall be permitted to be installed with other circuits as specified in 725.26(A), (B), <u>and (C).</u>
(A) Two or More Class 1 <u>Power-Limited</u> Circuits. Class 1 <u>power-limited</u> circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway without regard to whether the individual circuits are alternating current or direct current, provided all conductors are insulated for the maximum voltage of any conductor in the cable, cable tray, enclosure, or raceway.
(B) Class 1 <u>Power-Limited</u> Circuits with Power Supply Circuits. Class 1 <u>power-limited</u> circuits shall be permitted to be installed with power supply conductors as specified in 725.26(B)(1) through (B)(4).
(1) In a Cable, Enclosure or Raceway. Class 1 <u>power-limited</u> circuits and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only where the equipment powered is functionally associated.
(2) In Factory- or Field-Assembled Control Centers. Class 1 <u>power-limited</u> circuits and power supply circuits shall be permitted to be installed in factory- or field-assembled control centers.
(3) In a Manhole. Class 1 <u>power-limited</u> circuits and power supply circuits shall be permitted to be installed as underground conductors in a manhole in accordance with one of the following:
(1) The power-supply or Class 1 <u>power-limited</u> circuit conductors are in a metal enclosed cable or Type UF cable.
(2) The conductors are permanently separated from the power-supply conductors by a continuous firmly fixed nonconductor, such as flexible tubing, in addition to the insulation on the wire.
(3) The conductors are permanently and effectively separated from the power supply conductors and securely fastened to racks, insulators, or other approved supports.
(4) In Cable Trays. In cable trays, where the Class 1 <u>power-limited</u> circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 <u>power-limited</u> circuit conductors are in a metal-enclosed cable.
<u>**(C) Class 1 Remote-Control and Signaling Circuits with Power Supply Circuits.** Class 1 remote-control and signaling circuits, and power supply circuits shall be permitted to occupy the same cable, enclosure, cable tray, raceway or manhole, provided the insulation on all such conductors is suitable for the maximum voltage present.</u>
Substantiation: There is confusion in the industry concerning Class I circuits. The current rule allows the mixing of 30 Volt power limited circuits with 600 Volt remote control circuits. At the same time, the rule prohibits running most 600 volt lighting circuits within that same cable, cable tray, enclosure, or raceway.

There is a level of safety associated with the power limited circuit. On the other hand, the non power limited circuit is just as deadly as a branch circuit of equal voltage. This proposed rule change addresses that difference. It allows 600 Volt Class 1 circuits to be run with other 600 Volt circuits, while placing appropriate restrictions on the installation of 30 Volt maximum circuits. Thus, a level of safety is assigned to the 30 Volt circuit that cannot be assumed for the 600 Volt circuit. Changing the rule as proposed will make Article 725.26 similar to 725.21 in that there are many requirements shown to assure the safety level of the power limited circuit (in paragraph A) while allowing (in paragraph B), the non power limited circuit which has no similar level of safety. This concept is similar to the provisions of 300.3 (C)(1) which allow conductors of circuits rated 600 volts, nominal or less to occupy the same equipment wiring enclosure, cable or raceway. This proposal does not apply to Class 2 and Class 3 circuits.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 3-160.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-160 Log #821 NEC-P03 **Final Action: Accept in Principle**
(725.26(B)(4))

Submitter: Richard P. Owen, St. Paul, MN
Recommendation: Revise text to read as follows:
(4) In Cable Trays. ~~In cable trays, where the Class 1 circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable.~~ <u>Multi-conductor Type TC, Type AC, Type MC, or Type MI cables shall be permitted to be installed in cable trays without barriers where all conductors in the cables are insulated at 600 volts or greater.</u>
Substantiation: This Proposal is the result of the work of a Task Group that was directed by the Technical Correlating Committee to study the issues of Section 725.26(B) (4). This Task Group consisted of: Steven Owen, Paul Casparro, David Weschler, Robert Walsh, Mark Ode and Richard Owen, Chair.

Comment 3-165 in the 2005 NEC cycle questioned the restriction of requiring a solid fixed barrier between Class 1 circuit conductors and power conductors that were not functionally associated where installed in a cable tray. Many cable trays are open with conductors more exposed to possible damage than raceways and this requirement for separation within raceways has been in the NEC since before the 1951 Code.
This issue was discussed at length by the Task Group and it was pointed out that this restriction was primarily limited to individual conductors and, if the conductors were installed in a multiconductor TC cable or in a metal-enclosed cable, this extra protection would provide the separation necessary to limit the possibility of a short circuit between Class 1 and power conductors from affecting the operation and safety of other non-related circuits. The Task Group was unanimous in its support of the proposal for the 2008 NEC cycle of removing the existing text in 725.26(B)(4) and replacing it with the new text permitting multiconductor TC cable, Type AC, Type MC, or Type MI in a cable tray.

The Task Group agreed that by requiring Class 1 circuits to be installed with a minimum 600-volt insulation in multiconductor TC cable, Type AC, or Type MC cable that an equivalent level of mechanical and electrical protection could be achieved without requiring a permanent barrier in the cable tray.
Panel Meeting Action: Accept in Principle
Revise text to read as follows:
(4) In Cable Trays. ~~In cable trays, where the Class 1 circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable.~~ <u>In cable trays Class 1 circuit conductors and power-supply conductors, within multiconductor Type AC, Type MC, Type MI or Type TC cables shall be permitted to be installed in a cable tray without barriers where all the conductors in the cables are insulated at 600 volts.</u>
Panel Statement: The issue at hand was potential damage to power and Class 1 circuit conductors in a cable tray where the Class 1 circuit conductors were not functionally associated with other power circuits, thus affecting the operation and safety of the other non-related circuits. Providing the separation of different wiring methods in a cable tray, if the Class 1 and the power conductors are not functionally associated, would seem to satisfy the submitter's intent without making sweeping changes to the remainder of this section, which has been relatively the same since the 1951 NEC.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-161 Log #3367 NEC-P03 **Final Action: Accept in Principle**
(725.26(B)(4))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
Recommendation: Revise to read as follows:
(4) In Cable Trays. In cable trays, where (1) the power-supply conductors are run in wiring methods listed in Table 392.3(A), or where (2) the power supply conductors are run as single conductors as covered in 392.3(B)(1) and all Class 1 circuit conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the Class 1 circuit conductors are in a metal-enclosed cable.
Substantiation: Cable trays are not supposed to be raceways; they are intended to be a mechanical support for cabled wiring methods. As such, the presence of a Class 1 control cable next to a multiconductor power cable, whether or not functionally related, should not provoke a code objection, any more than one would object to the same power cable secured to a wall with the same control cable run next to it, with identical spacing. Nevertheless, the 2005 NEC prohibits this application.

The only time the functional relationship limitation should come into play is when the cable tray actually functions as some sort of raceway, and that only occurs where the industrial/single conductor option is in use. This proposal limits the application of the separation requirement to the sole cable tray application that is comparable to the 725.26(B)(1) limitation. In so doing it removes a major source of expense without making any change in terms of public safety. Although it is distressingly true that cable trays have a long history of misuse, that is no reason to disqualify reasonable proposals that offer substantial benefits to Code users who abide by its terms.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 3-160.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-162 Log #3626 NEC-P03 **Final Action: Accept in Principle**
(725.26(B)(4))

Submitter: David Wechsler, The Dow Chemical Company
Recommendation: Change Section 725.26(B) (4) by deleting the text in [ ] and replacing it with the text shown below (without brackets)

(4) In Cable Trays. [In cable trays, where the Class 1 circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable.] Multi-conductor Type TC, Type AC, Type MC, or Type MI cables shall be permitted to be installed in cable trays without barriers where all conductors in the cables are insulated at 600 volts or greater.

Substantiation: In the 1999 NEC ROP, Proposal 16-54 Log 2493, stated that field experience had shown that there was often a total intermixing of all Class I circuits with electric light, power where cable trays were used as a wiring method. This proposal further suggested that the then current section did not appear to address cable tray as a wiring method, resulting in its "intent being missed in both the design and construction phases of a project" and the "prohibited intermixing can only be inferred". The text which appears as the current 725.26 (B)(4) was the resultant action. This action was challenged by a number of comments and proposals since this change was made; an example of which is Comment 3-165 in the 2005 NEC Cycle.

As clarification cable trays are defined as being support system and unlike a raceway they are not addressed as "wiring method". The cables which may be used in a cable tray, such as Type TC, are wiring methods. This may be a difficult concept to understand because cable trays are an article found in Chapter 3 "Wiring methods and materials" and the NEC does not define "wiring methods". Further in 392.3 (A) the Code states "Wiring Methods. The wiring methods in Table 392.3(A) shall be permitted to be installed in cable tray systems under the conditions described in their respective articles and sections." and this clearly separates the tray from the wiring method consideration. Because cable trays have not been considered the same as raceways, the rules have been different. Article 725 has permitted Class I circuits cables to be mixed with electric light and power cables in cable trays without an additional restriction of requiring a solid fixed barrier between Class 1 circuits and electric light and power cables.

This issue of the solid barrier for cable trays was discussed at length by an NFPA NEC Task Group. That Task Group supported the above revised text and noted in that substantiation that by revising the text to address what was actually meant, that is requiring Class 1 circuits to be installed with a minimum 600-volt insulation in multiconductor Type TC cable, Type AC cable, Type MC cable, or Type MI cable that an equivalent level of mechanical and electrical protection would be achieved without requiring a permanent barrier in the cable tray.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 3-160.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-163 Log #1694 NEC-P03 **Final Action: Accept in Principle**

(725.26(B)(4) Exception (New))

Submitter: Paul E. Guidry, Fluor Enterprises, Inc.

Recommendation: Add text to read as follows:

725.26(B)(4). Exception: Where all cables in the cable tray have insulation suitable for 600V, listed multiconductor Type AC, TC, MC and MI cables shall be allowed to be installed together without barriers regardless of function.

Substantiation: The reason for maintaining functionally associated power and control in raceways and enclosures seems to be based on the conductors being a single conductor type. Type AC, TC, MI and MC cables are constructed and listed to be installed in close proximity to one another without the use of barriers. The additional protective coverings over the conductor insulation should allow cables that aren't functionally associated to be installed in the same tray without the use of barriers.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Proposal 3-160.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-164 Log #3293 NEC-P03 **Final Action: Reject**

(725.30 (New))

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Add new 725.30, as shown below.

725.30 Multiconductor Class 1 Cables.

Multiconductor Class 1 cables that meet the requirements of 725.81 shall be permitted to be used on remote-control, signaling, and power-limited circuits operating at 150 volts or less and shall be installed in accordance with 725.30(A) and 725.30(B).

(A) Class 1 Wiring Method. Multiconductor Class 1 circuit cables shall be installed in accordance with 725.30(A)(1), (A)(2), and (A)(3).

(1) Exposed or Fished in Concealed Spaces. In raceway or exposed on surface of ceiling and sidewalls or fished in concealed spaces. Cable splices or terminations shall be made in listed fittings, boxes, enclosures, fire alarm devices, or utilization equipment. Where installed exposed, cables shall be adequately supported and installed in such a way that maximum protection against physical damage is afforded by building construction such as baseboards, door frames, ledges, and so forth. Where located within 2.1 m (7 ft) of the floor, cables shall be securely fastened in an approved manner at intervals of not more than 450 mm (18 in.).

(2) Passing Through a Floor or Wall. In metal raceway or rigid nonmetallic conduit where passing through a floor or wall to a height of 2.1 m (7 ft) above the floor unless adequate protection can be afforded by building construction such as detailed in 725.30(A)(1) or unless an equivalent solid guard is provided.

(3) In Hoistways. In rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or electrical metallic tubing where installed in hoistways.

Exception: As provided for in 620.21 for elevators and similar equipment.

(B) Applications of Listed Class 1 Cables. The use of Class 1 circuit cables shall comply with 725.30(B)(1) through (B)(4).

(1) Ducts and Plenums. Multiconductor Class 1 circuit cables, Types CL1P, CL1R, and CL1, shall not be installed exposed in ducts or plenums.

FPN: See 300.22(B).

(2) Other Spaces Used for Environmental Air. Cables installed in other spaces used for environmental air shall be Type CL1P.

Exception No. 1: Types CL1R and CL1 cables installed in compliance with 300.22(C).

Exception No. 2: Other wiring methods in accordance with 300.22(C).

Exception No. 3: Type CL1P-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.

(3) Riser. Cables installed in vertical runs and penetrating more than one floor or cables installed in vertical runs in a shaft shall be Type CL1R. Floor penetrations requiring Type CL1R shall contain only cables suitable for riser or plenum use.

Exception No. 1: Type CL1 or other cables that are specified in Chapter 3 encased in metal raceway.

Exception No. 2: Type CL1 cables located in a fireproof shaft having firestops at each floor.

FPN: See 300.21 for firestop requirements for floor penetrations.

Exception No. 3: Type CL1R-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.

(4) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 725.30(B)(1), (B)(2), and (B)(3) shall be Type CL1.

Exception No. 1: Other wiring methods in compliance with Chapter 3.

Exception No. 2: Type CL1P or Type CL1R cables shall be permitted.

Exception No. 3: Type CL1-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.

Substantiation: The proposal provides a Class 1 cable to permit more effective installation methods. Section 725.52(A) permits Class 2 and Class 3 circuits to be "reclassified" as Class 1 circuits. Presently, this means the reclassified circuits would be installed in raceway. Having a Class 1 cable would permit the same installation method using a robust cable and overcurrent protection on every conductor, as required by 725.23.

Here is an application example, based on Article 760: Assume a listed fire alarm panel is also listed for smoke control. The smoke control system could have a damper operator being controlled by a non-power-limited circuit, and the damper having end switches being monitored by a power-limited circuit. These two circuits would require separate cables and/or raceways, or reclassify the power-limited circuit to a non-power-limited circuit, and then run both circuits in the same cable or raceway.

Here's an application example of the same system, based on Article 725: Assume a temperature control panel is also listed for smoke control. [Note: In this case, the temperature control system gets the control signal from a listed fire alarm panel.] The temperature control system could have a damper operator being controlled by a Class 1 circuit, and the damper end switches being monitored by a Class 2 circuit. This part of the smoke control system would require the Class 1 circuit to be installed in raceway, and the Class 2 circuit to be installed in a separately run cable or separately run raceway. If the Class 2 circuit was reclassified as a Class 1 circuit, both could be run in the same raceway. If this proposal is accepted, both circuits could be installed in the same cable.

Access control systems run multiple circuits to each door that is controlled: card reader, request-to-exit, door contact, and door strike. If the door strike power requirements exceed Class 2 limit, it is a Class 1 circuit and required to be installed in raceway. It would be an installation convenience to reclassify all circuits to Class 1 and install using a multiconductor Class 1 cable, or install all circuits in the same raceway. If the door just described was connected to a fire alarm system, with the strike being "fail-safe," a non-power-limited fire alarm cable (raceway optiona) could control the door strike.

As other systems, such as temperature control, security, and access control continue to be combined with fire alarm systems, it makes sense to have parallel wiring method for similar circuits. "Section 760.26(A) Class 1 with NPLFA Circuits. Class 1 and non–power-limited fire alarm circuits shall be permitted to occupy the same cable, enclosure, or raceway…".

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any technical substantiation that a Listed Class 1 multiconductor cable exists and the proposal references a cable meeting the requirements in a proposed 725.81. This section does not

exist, in the 2005 NEC. In addition, a fact finding report should be submitted as part of the substantiation for acceptance of the cable to help determine the acceptability and the installation criteria for the cable.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-165 Log #984 NEC-P03 **Final Action: Reject**
(725.36(B)(4))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
"...or in raceway".
Substantiation: Edit. Raceways also provide suitable separation.
Panel Meeting Action: Reject
Panel Statement: The section referenced by the submitter does not exist.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-166 Log #1485 NEC-P03 **Final Action: Reject**
(725.41)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Revise as follows:
~~725.41 Power Sources for Class 2 and Class 3 Circuits.~~
~~(A) Class 2 Power Source. The power source for a Class 2 or a Class 3 circuit shall be as specified in 725.41(A)(1), (A)(2), (A)(3), (A)(4), or (A)(5):~~
~~FPN No. 1: Figure 725.41 illustrates the relationships between Class 2 or Class 3 power sources, their supply, and the Class 2 or Class 3 circuits.~~
~~FPN No. 2: Table 11(A) and Table 11(B) in Chapter 9 provide the requirements for listed Class 2 and Class 3 power-sources.~~
~~(1) A listed Class 2 or Class 3 transformer.~~
~~(2) A listed Class 2 or Class 3 power supply.~~
~~(3) Other listed equipment marked to identify the Class 2 or Class 3 power source.~~
~~Exception No. 1: thermocouples shall not require listing as a Class 2 power source.~~
~~Exception No. 2: Limited power circuits of listed equipment where these circuits have energy levels rated at or below the limits established in Chapter 9, Table 11(A) and Table 11(B).~~
~~FPN: examples of other listed equipment are as follows:~~
~~(1) A circuit card listed for use as a Class 2 or Class 3 power source where used as part of a listed assembly~~
~~(2) A current-limiting impedance, listed for the purpose, or part of a listed product, used in conjunction with a nonpower-limited transformer or a stored energy source, for example, storage battery, to limit the output current.~~
~~(3) A thermocouple~~
~~(4) Limited voltage/current or limited impedance secondary communications circuits of listed industrial control equipment.~~
~~(4) Listed information technology (computer) equipment limited power circuits.~~
~~FPN: One way to determine applicable requirements for listing of information technology (computer) equipment is to refer to UL 1950-1995, Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment. Typically such circuits are used to interconnect information technology equipment for the purpose of exchanging information (data).~~
~~(5) A dry cell battery shall be considered an inherently limited Class 2 power source, provided the voltage is 30 volts or less and the capacity is equal to or less than that available from series connection No. 6 carbon zinc cells.~~
~~(B) Interconnection of Power Sources. Class 2 or Class 3 power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection.~~
~~Figure 725.41 Class 2 and Class 3 Circuits.~~
Revise to read:
725.41 Power Sources for Class 2 and Class 3 Circuits.
(A) Class 2 Power Source. The power source for a Class 2 circuit shall be as specified in 725.41(A)(1), (A)(2), (A)(3), (A)(4), or (A)(5):
FPN No. 1: Figure 725.41 illustrates the relationships between Class 2 power sources, their supply, and the Class 2 circuits.
FPN No. 2: Table 11(A) and Table 11(B) in Chapter 9 provide the requirements for listed Class 2 power sources.
(1) A listed Class 2 transformer.
(2) A listed Class 2 power supply.
(3) Other listed equipment marked to identify the Class 2 power source.
Exception No. 1 to (3): Thermocouples shall not require listing as a Class 2 power source.
Exception No. 2 to (3): Limited power circuits of listed equipment where these circuits have energy levels rated at or below the limits established in Chapter 9, Table 11(A) and Table 11(B).
FPN: Examples of other listed equipment are as follows:
(1) A circuit card listed for use as a Class 2 power source where used as part of a listed assembly.
(2) A current-limiting impedance, listed for the purpose, or part of a listed product, used in conjunction with a nonpower-limited transformer or a stored energy source, for example, storage battery, to limit the output current.
(3) A thermocouple
(4) Limited voltage/current or limited impedance secondary communications circuit of listed industrial control equipment.
(4) Listed information technology (computer) equipment limited power circuits.
FPN; One way to determine applicable requirements for listing of information technology (computer) equipment is to refer to UL 1950-1995, Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment. Typically such circuits are used to interconnect information technology equipment for the purpose of exchanging information (data).
(5) A dry cell battery shall be considered an inherently limited Class 2 power source, provided the voltage is 30 volts or less and the capacity is equal to or less than that available from series connected No. 6 carbon zinc cells.
(B) Class 3 Power Source. The power source for a Class 3 circuit shall be as specified in 725.41(B)(1), (B)(2), (B)(3), or (B)(4):
FPN No. 1: Figure 725.41 illustrates the relationships between Class 3 power sources, their supply, and the Class 3 circuits.
FPN No. 2: Table 11(A) and Table 11(B) in Chapter 9 provide the requirements for listed Class 3 power sources.
(1) A listed Class 3 transformer.
(2) A listed Class 3 power supply.
(3) Other listed equipment marked to identify the Class 3 power source.
Exception to (3): Limited power circuits of listed equipment where these circuits have energy levels rated at or below the limits established in Chapter 9, Table 11(A) and Table 11(B).
FPN: Examples of other listed equipment are as follows:
(1) A circuit card listed for use as a Class 3 power source where used as part of a listed assembly.
(2) A current-limiting impedance, listed, for the purpose, or part of a listed product, used in conjunction with a nonpower-limited transformer or a stored energy source, for example, storage battery to limit the output current.
(4) Limited voltage/current or limited impedance secondary communications circuits of listed industrial control equipment.
(4) Listed information technology (computer) equipment limited power circuits.
FPN: One way to determine applicable requirements for listing of information technology (computer) equipment is to refer to UL 1950-1995, Standard for Safety of Information Technology equipment including electrical business equipment. Typically, such circuits are used to interconnect information technology equipment for the purpose of exchanging information (data).
(C) Interconnection of Power Sources. Class 2 or Class 3 power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection. Figure 725.41 Class 2 and Class 3 Circuits.
Substantiation: The intent of this change is simply to clarify the fact that a Class 3 power supply is not suitable for a Class 2 circuit. As written, the code is vague on this. The existing language of the section makes the code user think that any of the items of 725.41(A)(1), (A)(3) can be used to create a Class 2 or a Class 3 circuit. This obviously is not the case, and, therefore, the code should be clearer on the topic.
Panel Meeting Action: Reject
Panel Statement: Section 90.1(C) makes it very clear that the NEC is not an instruction manual for untrained personnel. The 1993 and previous Codes included in Tables (a) and (b) Section 725.31 so the user could seemingly build a Class 2 or Class 3 power supply or transformer. This was changed in the 1996 NEC when the panel moved these tables to Chapter 9 as Tables 11(A) and 11(B) and required Class 2 and 3 power sources to be listed as can now be seen in 725.41 in the 2005 NEC. Power sources will not be listed for both Class 2 and 3 at the same time, so the suggested separation in text in 725.41 is unnecessary.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-167 Log #2298 NEC-P03 **Final Action: Accept**
(725.41(A)(4), FPN)

Submitter: Thomas J. Burke, Jr., Underwriters Laboratories
Recommendation: Revise the FPN of Section: 725.41(A)(4) to read:
(4) Listed information technology (computer) equipment limited power circuits.
FPN: One way to determine applicable requirements for listing of information technology (computer) equipment is to refer to UL ~~1950 1995~~ 60950-1-2003, *Standard for Safety of Information Technology Equipment*, ~~*Including Electrical Business Equipment.*~~ Typically such circuits are used to interconnect information technology equipment for the purpose of exchanging information (data),
Substantiation: UL 60950-1 has replaced UL 1950 for safety of information technology equipment (ITE). The title of the Standard also has been revised. However, the same requirements remain for circuits powered by a Limited Power Source (LPS).

Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-168 Log #3442 NEC-P03 **Final Action: Reject**
(725.55(G))

Submitter: David Wechsler, The Dow Chemical Company
Recommendation: Revise the text by inclusion of the underlined text to the existing as follows:
(G) Closed-Loop and Programmed Power Distribution. Class 2 and Class 3 conductors shall be permitted to be installed in accordance with <u>780.6(B)</u> .
Substantiation: 780(A) deals only with cables and not conductors. The current text would have conductors and cables treated identically. Clearly, the construction and design of a cable are sufficiently different from a conductor so as not to permit the seemingly interchangeability and the total disregard for the differences between these wiring methods as the current code text would permit.
Panel Meeting Action: Reject
Panel Statement: The present wording is correct. Section 780.6(A) covers hybrid cables, and Section 780.6(B) covers the conductors in the cable when they are to be terminated.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
PACE, D.: The panel should have accepted this proposal.
As stated by the submitter, the existing text can be interpreted as unclear as to the treatment of conductors vs cables. If the submitter's suggested text change is not acceptable to the panel, this issue should be addressed in some manner that would be acceptable.

3-169 Log #3 NEC-P03 **Final Action: Accept**
(725.56(D)(1))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.
Submitter: Stanley Kaufman, CableSafe, Inc.
Recommendation: Revise as follows:
(1) Classified as Communications Circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall be installed in accordance with the requirements of Article 800. The cables shall be listed as communications cables ~~or multipurpose cables~~ .
Substantiation: Panel 16 eliminated multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-170 Log #1292 NEC-P03 **Final Action: Reject**
(725.56(E))

Submitter: Gerald Lee Dorna, Belden CDT. Inc.
Recommendation: Revise text to read:
(E) Class 2 or Class 3 Cables with Other Circuit Cables. Jacketed cables of Class 2 or Class 3 circuits shall be permitted in the same enclosure <u>, cable tray</u> or raceway with jacketed cables of any of the following:
(1) Power-limited fire alarm systems in compliance with Article 760
(2) Nonconductive and conductive optical fiber cables in compliance with Article 770
(3) Communications circuits in compliance with Article 800
(4) Community antenna television and radio distribution systems in compliance with Article 820
(5) Low-power, network-powered broadband communications in compliance with Article 830
Substantiation: Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray. Stating that these cables are allowed "in the same cable tray" will avoid having the user assume that they are not permitted to be installed together in the same cable tray. It clarifies the use in the Code. Article 770, in section 770.133(B), has text similar to that proposed here. This is one of five similar proposals that are being submitted for Articles 725, 760, 800, 820 and 830.
Panel Meeting Action: Reject
Panel Statement: The submitter's statement that cables that can be safely installed in the same raceway or cable can also safely be installed in the same cable tray is incorrect. Raceway is a type of wiring method that has to meet construction requirements to allow easy insertion and removal, and provide a smooth interior to avoid damaging the cable. Cable trays provide a support system for specific wiring methods. Jacketed cables can be supported by a cable tray in accordance with Article 392.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 2
Explanation of Negative:
AYER, L.: 725.56(E) permits a jacketed Class 2 or Class 3 cable to be installed in the same raceway or enclosure with other Class 2 or Class 3 jacketed cables. These type cables are different from normal power wiring and Class 1 circuits because of their low-energy characteristics which eliminates almost any fire and shock hazard. I would agree with the submitter's substantiation that if low-voltage low-energy cables can be safely installed together in the same enclosure or raceway then surely they can coexist in a cable tray.
PACE, D.: The panel should have accepted this proposal.
Cable trays also have to meet certain requirements relating to placement and prevention of damage, and I do not believe this is the primary issue here. The issue is whether or not permitting these cables together would pose a concern and the existing text indicates that there would not be a concern. If placing them together is not a concern, then what or where they are placed together is not a concern either.

3-171 Log #2521 NEC-P03 **Final Action: Reject**
(725.61)

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Add the following sentence to 725.61, to read as follows:
Class 2, Class 3, and PLTC cables shall comply with the requirements described in 725.61(A) through 725.61(H). <u>Types CL250 or CL350 very-low-smoke cable shall be permitted to be installed meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.</u>
Substantiation: NFPA 13-2002 has requirements for installation of sprinklers where a concealed space has combustible loading. The proposed very-low-smoke producing cables have a heat release that is significantly lower than combustible plenum cable listed using NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces* .
The 2003 International Mechanical Code (IMC), 602.2.1 requires a smoke developed index less than 25 and a smoke developed index less than 50 for materials in plenums.
The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).
NFPA 13-2002, Installation of Sprinkler Systems, requires installation of a sprinkler system in concealed spaces where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:
"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:
(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.
(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."
"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."
The definition of combustible, from NFPA 5000 is:
"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."
During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because communications cables are permitted to substitute for Class 2 and Class 3 circuit cables, it is important to have parallel requirements in both NEC Sections. Additionally, the Fine Print Note applies to all concealed spaces.
In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied.
There is a companion proposal for the listing and marking of Type CL250 and CL350.

Panel Meeting Action: Reject

Panel Statement: The added text does not belong in the main paragraph as proposed, and the panel is unsure of the appropriate location for this material. As submitted, the proposal could apply to plenum applications.

The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

In addition the submitter's substantiation makes reference to an FPN that does not appear in the recommendation.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

EGESDAL, S.: As submitter of this proposal, I agree with the part of the Panel Statement indicating the proposed text would have been more appropriate in another section, such as 725.61(E), Other wiring Within Buildings.

However, the Panel is in error by stating that the proposed Types CL250 or CL350 could be used in a plenum. Section 725.61(A) requires a Type CL2P or CL3P cable. The proposed cable does not have a "P" in the marking. So, clearly, referencing the NFPA 90A directive on NFPA 90A is in error.

3-172 Log #2200 NEC-P03 **Final Action: Reject**
(725.61 and 725.82)

Submitter: Frank Peri, Communications Design Corporation

Recommendation:

In 725.61 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Also revise (G) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Air Ducts. Cables installed in air ducts shall be Type CL2D or CL3D and shall be associated with the air distribution system and shall be as short as practicable. Types CL2D, CL3D, CL2P, CL3P, CL2, CL3, CL2X and CL3X cables installed in raceway that is installed in compliance with 300.22(B) shall also be permitted.

(B~~A~~) Plenum. Cables installed in ~~ducts,~~ plenums~~,~~ and other space~~s~~ used for environmental air shall be Types CL2D, CL3D, CL2P or CL3P. Listed wires and cables installed in compliance with 300.22 shall be permitted. Listed plenum signaling raceways shall be permitted to be installed in other space~~s~~ used for environmental air as described in 300.22(C). Only Type~~s~~ CL2D, CL3D, CL2P or CL3P cable shall be permitted to be installed in these raceways.

(H~~G~~) Class 2 and Class 3 Cable Substitutions. The substitutions for Class 2 and Class 3 cables listed in Table 725.61 shall be permitted. Where substitute cables are installed, the wiring requirements of Article 725, Parts I and III, shall apply.

FPN: For information on Types CMD, CMP, CMR, CM, and CMX cables, see 800.179.

Table 725.61 Cable Substitutions

Cable Type	Permitted Substitutions
CL3P	CMD, CL3D CMP
CL2P	CMD, CL3D, CL2D, CMP, CL3P
CL3R	CMD, CL3D, CMP, CL3P, CMR
CL2R	CMD, CL3D, CL2D, CMP, CL3P, CL2P, CMR, CL3R
PLTC	
CL3	CMD, CL3D,CMP, CL3P, CMR, CL3R, CMG, CM, PLTC
CL2	CMD, CL3D, CL2D, CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3
CL3X	CMD, CL3D, CMP, CL3P, CMR, CL3R, CMG, CM, PLTC, CL3, CMX
CL2X	CMD, CL3D, CL2D,CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3, CL2, CMX, CL3X

In 725.82 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Revise section (L) as show. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Types CL2D and CL3D. Types CL2D and CL3D class 2 and class 3 air duct cables shall be listed as suitable for use in air ducts and shall be rated for continuous use at 121ºC. Types CL2D and CL3D class 2 and class 3 air duct cables shall also be listed as having a low potential heat value, low flame spread characteristics, and very low smoke-producing characteristics.

FPN: One method of defining a low potential heat cable is establishing an acceptable value of potential heat when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, to a maximum potential heat value not exceeding 8141 kJ/kg (3500 BTU/lb). One method of defining low flame spread cable is establishing an acceptable value of flame spread when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to a maximum flame spread index of 25, with the cable unslit (intact) and slit. Similarly, one method of defining very low smoke-producing cable is establishing an acceptable value when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to maximum smoke developed index of 50, with the cable unslit (intact) and slit. These test methods and resultant values correlate with the requirements of NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems* for materials installed in ducts and plenums. *For additional testing information see Underwriters Laboratories Subject 2424, Outline of Investigation For Cable Marked Limited Combustible.*

(B~~A~~) Types CL2P and CL3P. Types CL2P and CL3P plenum cable shall be listed as being suitable for use in ~~ducts,~~ plenums~~,~~ and other space for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining low smoke-producing cable is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces*, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.

(M~~L~~) Marking. Cables shall be marked in accordance with 310.11A(2), (A)(3), (A)(4), and (A)(5) and Table 725.82. Voltage ratings shall not be marked on the cables.

FPN: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1 electric light and power applications.

Exception: Voltage markings shall be permitted where the cable has multiple listings and a voltage marking is required for one or more of the listings.

Table 725.82 Cable Marking

Cable Marking	Type
CL3D	Class 3 air duct cable
CL2D	Class 2 air duct cable
CL3P	Class 3 plenum cable
CL2P	Class 2 plenum cable
CL3R	Class 3 riser cable
CL2R	Class 2 riser cable
PLTC	Power-limited tray cable
CL3	Class 3 cable
CL2	Class 2 cable
CL3X	Class 3 cable, limited use
CL2X	Class 2 cable, limited use

FPN: Class 2 and Class 3 cable types are listed in descending order of fire resistance rating, and Class 3 cables are listed above Class 2 cables because Class 3 cables can substitute for Class 2 cables.

Substantiation: Summary

This proposal is submitted to accomplish four things:

1) Change the code to not allow the dangerous practice of using air ducts as a cable pathway.

2) Code recognition that there may be instances where a small amount of in-duct cable is necessary for air handling equipment, dampers, security, temperature control, fire protection, etc.

3) Establish minimum requirements for flame spread, smoke, and potential heat for in-duct (CL2D, CL3D, FPLP, OFND, OFCD, CMD and CATVD) cables used in this special hazard space.

4) Include air duct "D" cables as permissible substitute for plenum "P" cables for installation in ceiling cavity and raised floor plenums (other space used for environmental air).

This proposal correlates with a TIA that I submitted for NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems.* Similar proposals have been submitted for Articles 725, 760, 770, 800 and 820.

The substantiation for the TIA is shown below:

"This TIA is being submitted in accordance with Section 5 of the *2005 NFPA REGULATIONS GOVERNING COMMITTEE PROJECTS.* In particular, it addresses a hazard meeting the criteria of section 5-2(d), which states:

(d) The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

The purpose of this TIA is to address the dangerous practice of installing combustible communications/data cables in air ducts.

NFPA 90A-2002 does not have explicit requirements for electrical wiring in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cable into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This TIA would greatly reduce the amount of wiring in air ducts by only permitting wiring and raceways associated with the air distribution system and also requiring that they be as short as practicable. It would require that the wiring and nonmetallic raceway in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A permits the supplied air to be at 121 o C (250 o F). The permitted wiring and nonmetallic raceway would be required to have initial flame spread and smoke requirements identical to those for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). In addition to these initial requirements, there are slitting and ageing requirements to assure that the cables installed in air ducts meet the flame spread, smoke and potential heat requirements equivalent to those for limited combustible materials. Essentially they would be required to be listed to the UL 2424.

Combustible plenum cable is unsuitable and dangerous for this application. Typically, combustible plenum cable has a temperature rating of 60 o C, which is significantly less that the 121 o C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests, these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

It is essential that these requirements be adopted now in NFPA 90A."

Section 725.61(A) in the 2005 NEC permits unlimited amounts of Types CL2P and CL3P cables in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of an air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cables into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This proposal would greatly reduce the amount of wiring in air ducts by only permitting wiring associated with the air duct and as short as practicable. It would require that the wiring in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* permits the supplied air to be at 121^{o} C (250^{o} F). The permitted wiring would be required to have flame spread and smoke requirements identical to those in NFPA 90A-2002 section 4.3.3.1 for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). Essentially they would be required to be listed to the UL 2424, *Outline of Investigation For Cable Marked Limited Combustible* (copy attached) .

"P" type plenum cables are unsuitable and dangerous for this application. Typically, they have a temperature rating of 60^{o} C, which is significantly less that the 121 o C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests (copy attached), these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

"D" type air duct cables will meet the NFPA 90A listing requirements for use in ceiling cavity and raised floor plenums (other space used for environmental air) and therefore will be able to safely substitute for "P" type plenum cables. "D" type air duct cables have approximately 1/20 the smoke production of "P" type plenum cables.

In order to be consistent with the applications of plenum cable, this proposal will also prohibit the installation of plenum communications raceways in air ducts.

The cable substitution table and figure have been revised to permit air duct cables to substitute for plenum cables since air duct cables are superior cables. "D" type air duct cables also meet the requirements in NFPA 90A for use in ceiling cavity plenums and raised floor plenums (other space used for environmental air).

Some of the applications that require the installation of cables in air ducts are fire alarm (Article 760), temperature sensing and control (Article 725), security (Articles 725 and 820) and communications (Article 800). Optical fiber cables (Article 770) could be used in place of copper conductor cables. Communications cables are permitted to substitute for Class 2 & 3, fire alarm and CATV cables. I am submitting similar proposals for each of these articles.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-173 Log #3247 NEC-P03 **Final Action: Reject**

(725.61(A))

Submitter: Frank Peri, Communications Design Corporation

Recommendation: Revise 725.61(A), as shown.

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CL2D, CL3D, CL2P or CL3P. Listed wires and cables installed in compliance with 300.22 shall be permitted. Listed plenum signaling raceways shall be permitted to be installed in other spaces used for environmental air as described in 300.22(C). Only Type CL3D, CL2D, CL2P or CL3P cable shall be permitted to be installed in these raceways.

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1: a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements in Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-174 Log #2370 NEC-P03 **Final Action: Reject**
(725.61(A), FPN (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add the following Fine Print Note to 725.61(A).
FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation:
The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).

NFPA 13, Installation of Sprinkler Systems, requires installation of a sprinkler system where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:

"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:

(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.

(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."

"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."

The definition of combustible, from NFPA 5000 is:

"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."

During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because Type CMP cable is permitted to substitute for Type CL2P and Type CL3P cables, it is important to have parallel requirements in both NEC Sections.

In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied in Standards Council Decision 04-7-1-z-cc, copy provided

Note: Supporting material is available for review at NFPA Headquarters..
Panel Meeting Action: Reject
Panel Statement: The recommended fine print note referencing ducts, plenums, and other spaces for environmental air does not address an installation issue since the word "concealed" has a different definition in Article 100 related to wiring methods. "Concealed" in Article 100 of the NEC means rendered inaccessible by the structure or finish of the building.
The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 which states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-175 Log #1 NEC-P03 **Final Action: Accept**
(725.61(B)(1))

Submitter: Stanley Kaufman, CableSafe, Inc.
Recommendation: Revise as follows:
(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CL2R or CL3R. Floor penetrations requiring Type CL2R or CL3R shall contain only cables suitable for riser or plenum use. Listed riser signaling raceways and listed plenum signaling raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CL2R, CL3R, CL2P, or CL3P cables shall be permitted to be installed in these raceways.
Substantiation: Plenum raceways should be permitted to substitute for riser and general purpose raceways just as plenum cable is permitted to substitute for riser and general purpose cables.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-176 Log #2 NEC-P03 **Final Action: Accept**
(725.61(C))

Submitter: Stanley Kaufman, CableSafe, Inc.
Recommendation: Revise as follows:
(C) Cable Trays. Cables installed in cable trays outdoors shall be Type PLTC. Cables installed in cable trays indoors shall be Types PLTC, CL3P, CL3R, CL3, CL2P, CL2R, and CL2.

Listed general-purpose signaling raceways , listed riser signaling raceways and listed plenum signaling raceways shall be permitted for use with cable trays.

FPN: See 800.133(B) for cables permitted in cable trays.
Substantiation: The proposed text mentions all the signaling raceways explicitly so it is clear that all of these raceways are permitted in cable trays.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-177 Log #367 NEC-P03 **Final Action: Reject**
(725.61(D)(4))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
"3: In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to ~~physical~~ damage, Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use...".
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion." I also leave it to you whether you want to consider updating the other language, supporting AHJs e.g., ~~industrial~~ premises where the Authorities Having Jurisdiction are satisfied that ...).

Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: In Webster's Dictionary, the word "physical" is used with "environment" to pertain to material things. "Physical" is used throughout the NEC as a descriptive adjective to the noun "damage." While the submitter feels the word "physical damage" is superfluous, the word "physical" seems to provide a certain emphasis and a further description where combined into the phrase "physical damage." This phrase tends to draw more attention than just "damage." In addition, physical damage provides a description of thermal and mechanical damage where the damage can be readily identified, such as a raceway that has been physically damaged versus damage from ultraviolet light where the raceway may be more brittle and thus can be easily damaged physically by impact to the raceway. Chemicals or heat can cause unseen damage to electrical components that can eventually lead to physical damage at a later time. This phrase is used in the NEC Style Manual in 3.2.5.5 as an acceptable method to describe physical damage.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-178 Log #1290 NEC-P03 **Final Action: Accept in Principle**
(725.61(D)(4))

Submitter: Gerald Lee Dorna, Belden CDT. Inc.
Recommendation: Revise text to read:
(4) In Industrial Establishments. In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons

service the installation, and where the cable is not subject to physical damage, Type PLTC cable ~~that complies with the crush and impact requirements of Type MC cable and is identified for such use~~ shall be permitted to be ~~exposed~~ run between the cable tray and utilization equipment or device. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be secured at intervals not exceeding 1.8 m (6 ft).

Substantiation: If the cable is "protected against physical damage using mechanical protection such as dedicated struts, angles, or channels" as stated in Article 725.61(D)(4), there is no need for the cable to additionally have to meet the crush and impact requirements of Type MC cable.

I also changed the word "exposed" to "run" because again if the cable is protected as stated above it really is not exposed.

I have also put in a proposal to Article 727.4(5) & (6) to combine (5) & (6) so as to have the same wording. Therefore, PLTC and ITC will have the same wording.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel considers this to be an exposed installation in accordance with the definition of Exposed in Article 100. There is no substantiation for eliminating the crush and impact tests for the non-armored cables.

Also, see panel action and statement on Proposal 3-179.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-179 Log #2719 NEC-P03 **Final Action: Accept in Principle**
(725.61(D)(4))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for information.

Submitter: Dorothy Kellogg, American Chemistry Council

Recommendation: Revise text of section as follows:

725.61 Applications of Listed Class 2, Class 3, and PLTC Cables.

(D) Hazardous (Classified) Locations.

(4) In Industrial Establishments. In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation and where the cable is not subject to physical damage, Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted to be exposed. ~~between the cable tray and utilization equipment or device.~~ The cable shall be ~~continuously~~ supported and protected against physical damage using mechanical protection such as ~~dedicated~~ struts, angles, or channels. The cable shall be secured at intervals not exceeding 1.8 m (6 ft).

Substantiation: There are three different installation methods for Type TC, Type PLTC and Type ITC. All of these cables are permitted to be installed as Exposed Routing (ER) when the cable is listed as ER. The installation requirements should be similar to reduce confusion in field. A similar proposal is being submitted for Articles 725 and 727 in an effort to align the installation methods.

There are no technical reasons to limit this installation method to only between a cable tray and utilization equipment or device. Cables listed for ER installations are a stronger cable, capable of withstanding more abuse than cables not listed for use in ER installations.

Panel Meeting Action: Accept in Principle

Revise 725.61(D)(4) to read as follows:

(4) In Industrial Establishments. In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, Type PLTC cable shall be permitted in accordance with either (a) or (b).

(a) Type PLTC cable, with a metallic sheath or armor in accordance with 725.82(E), shall be permitted to be installed exposed. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be secured at intervals not exceeding 1.8 m (6ft).

(b) Type PLTC cable, without a metallic sheath or armor, that complies with the crush and impact requirements of Type MC cable and identified for such use with the marking PLTC-ER, shall be permitted to be installed exposed. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be secured at intervals not exceeding 1.8 m (6 ft).

Panel Statement: The panel concurs that Types TC, PLTC, and ITC should have similar if not identical installation methods. The panel also recognizes that TC cable is primarily limited to use in cable trays and raceways and that this limitation does not apply to PLTC and ITC cables. Also, Type TC cable is limited to constructions with a nonmetallic jacket and does not have metallic sheathed or armored designs. The revised wording accepts the submitter's position that this cable does not need to be limited for use only from cable tray to equipment. The revised wording also acknowledges that the armored or sheathed designs are inherently suitable for this application and do not need special marking. The UL Standard for Power Limited Circuit Cable was recently revised to replace the "open wiring" wording to "-ER". The phrase "to be exposed" was changed to "to be installed exposed" to provide clarity.
The text in the proposal was changed by restructuring the format such that it contains an introductory statement dealing with the limitation to only applying to industrial establishments and then subdividing the types of PLTC into two subsections for clarity. The phrase "and where not subject to physical damage" was removed, since each cable must be protected against physical damage based on the text in the second to last sentence in each subsection. The word "dedicated" was not removed, since the intent is to require dedicated support for the cable installation.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-180 Log #2371 NEC-P03 **Final Action: Reject**
(725.61(E), FPN (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Add the following Fine Print Note to 725.61(E).

FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation:

The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).

NFPA 13, Installation of Sprinkler Systems, requires installation of a sprinkler system where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:

"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:

(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.

(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."

"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."

The definition of combustible, from NFPA 5000 is:

"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."

During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because Type CMP cable is permitted to substitute for Type CL2P and Type CL3P cables, it is important to have parallel requirements in both NEC Sections.

In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied in Standards Council Decision 04-7-1-z-cc, copy provided.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The definition for "concealed" in Article 100 in the 2005 NEC does not apply to the proposed fine print note. The reference to NFPA 13 does not seem appropriate in 725.61(E) at this time, since putting a sprinkler head in an inaccessible location inside the wall or above a drywall ceiling would not permit access for servicing. The area above a suspended ceiling is not considered by the NEC to be a concealed space.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: The panel statement is correct that the term "concealed" in the proposed Fine Print Note does not apply using NEC terminology. The term "concealed" as used in NFPA 13 applies to the proposed FPN. See additional information in my Explanation of Negative for Proposal 3-89, which shows that NFPA 13 does requrie sprinklers in certain concealed spaces rendered inaccessible by the building finish (e.g. drywall).

3-181 Log #3292 NEC-P03 **Final Action: Accept in Principle**
(725.61(E)(1) through 725.61(E)(7))

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Add titles, as shown:

(E) Other Wiring Within Buildings. Cables installed in building locations other than those covered in 725.61(A) through 725.61(D) shall be as described in any of (1) through (7).

(1) **General.** Type CL2 or CL3 shall be permitted.
(2) **In Raceways.** Type CL2X or CL3X shall be permitted to be installed in a raceway or in accordance with other wiring methods covered in Chapter 3.
(3) **Nonconcealed Spaces.** Cables shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).
(4) **One- and Two-Family Dwellings.** Listed Type CL2X cables less than 6 mm (0.25 in.) in diameter and listed Type CL3X cables less than 6 mm (0.25 in.) in diameter shall be permitted to be installed in one- and two-family dwellings.
(5) **Multi-Family Dwellings.** Listed Type CL2X cables less than 6 mm (0.25 in.) in diameter and listed Type CL3X cables less than 6 mm (0.25 in.) in diameter shall be permitted to be installed in nonconcealed spaces in multifamily dwellings.
(6) **Under Carpets.** Type CMUC undercarpet communications wires and cables shall be permitted to be installed under carpet.
(7) **Industrial Establishments.** In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the cable is not subject to physical damage, Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted to be exposed between the cable tray and the utilization equipment or device. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).
Substantiation: This proposal is editorial. This proposal adds titles to subsections in accordance with the NEC Style Manual. Additionally, the titles are parallel to titles in 800.154(E).
Panel Meeting Action: Accept in Principle
In the recommended text, (2) title should be "(2) In Raceways or Other Wiring Methods." The entire title, including the number in parenthesis should be bolded.
Panel Statement: These numbered items are simply a list and, by the NEC Style Manual, do not require titles but, if the titles are to be used, they should be complete.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-182 Log #3291 NEC-P03 **Final Action: Accept in Principle**
(725.61(E)(3), 725.61(E)(4) & 725.61(E)(5))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 725.61(E) as follows:
(3) Type CL2X and Type CL3X c ~~C~~ ables shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).
(4) ~~Listed~~ Type CL2X cables less than 6 mm (0.25 in.) in diameter and listed Type CL3X cables less than 6 mm (0.25 in.) in diameter shall be permitted to be installed in one- and two-family dwellings.
(5) ~~Listed~~ Type CL2X cables less than 6 mm (0.25 in.) in diameter and listed Type CL3X cables less than 6 mm (0.25 in.) in diameter shall be permitted to be installed in nonconcealed spaces in multifamily dwellings.
Substantiation: 725.61(E) (3) applies to "X" cables, and does not apply to Type CL2 and Type CL3 cables.
Deletion of "Listed" in 725.61(E)(4) & (5) is editorial, as all cables are required to be listed.
Panel Meeting Action: Accept in Principle
Accept the submitter's recommendation but additionally remove the word "listing" before "CL3X in both (4) and (5).
Panel Statement: Since "listing" is being removed for CL2X in both locations, then it should also be removed in CL3X.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-183 Log #368 NEC-P03 **Final Action: Reject**
(725.61(E)(7))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
"3: In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to ~~physical~~ damage, Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use...protected against ~~physical~~ damage...".
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion." I also leave it to you whether you want to consider updating the other language, supporting AHJs e.g., ~~industrial~~ premises where the Authorities Having Jurisdiction are satisfied that ...).
Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-184 Log #3231 NEC-P03 **Final Action: Reject**
(725.61(G))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Revise 725.61(G), as shown.
(G) Class 2 and Class 3 Cable Substitutions. The substitutions for Class 2 and Class 3 cables listed in Table 725.61 shall be permitted. Type CL3D shall be permitted to substitute for all Class 2 and Class 3 cables listed in Table 725.61 and Figure 725.61. Type CL2D shall be permitted to substitute for all Class 2 cables listed in Table 725.61 and Figure 725.61. Where substitute cables are installed, the wiring requirements of Article 725, Parts I and III, shall apply.
FPN: For information on Types CMD, CMP, CMR, CM, and CMX cables, see 800.179.
Substantiation: This proposal correlates the substitution table and figure with the listing and application requirements for air duct cable.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-185 Log #2522 NEC-P03 **Final Action: Reject**
(725.61(G) and FPN to 725.61(G))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 725.61(G), as shown.
(G) Class 2 and Class 3 Cable Substitutions. The substitutions for Class 2 and Class 3 cables listed in Table 760.61 shall be permitted. Types CL250 and CL350 very-low-smoke cables shall be permitted to substitute for all Class 2 and Class 3 cables in Table 725.61 to meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics. Where substitute cables are installed, the wiring requirements of Article 725, Parts I and III shall apply.
FPN No. 1 : For information on Types CMP, CMR, CM, and CMX, see 800.179.
FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation: This proposal correlates with the proposal to add Types CL250 and CL350 cables to 725.61.
There is a companion proposal for the listing and marking of Types CL250 and CL350.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-186 Log #3290 NEC-P03 **Final Action: Reject**
(725.81)

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Add new 725.81, as shown

725.81 Listing and Marking of Class 1 Cables.

Class 1 cables installed as wiring within buildings shall be listed in accordance with 725.81(A) and 725.81(B) and as being resistant to the spread of fire in accordance with 725.81(C) through 725.81(F), and shall be marked in accordance with 725.81(G).

(A) Class 1 Conductor Materials. Conductors shall be 18 AWG or larger, solid or stranded copper.

(B) Insulated Conductors. Insulated conductors shall be suitable for 600 volts. Insulated conductors 14 AWG and larger shall be one of the types listed in Table 310.13 or one that is identified for this use. Insulated conductors 18 AWG and 16 AWG shall be in accordance with 725.27.

(C) Type CL1P. Type CL1P plenum cable shall be listed as being suitable for use in other space used for environmental air as described in 300.22(C) and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining low smoke-producing cable is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is be establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.

(D) Type CL1R. Type CL1R riser cable shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

FPN: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass ANSI/UL 1666-2002, Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts.

(E) Type CL1. Type CL1 able shall be listed as being suitable for general-purpose use, with the exception of risers, ducts, plenums, and other space used for environmental air, and shall also be listed as being resistant to the spread of fire.

FPN No. 1: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991, Reference Standard for Electrical Wires, Cables and Flexible Cords.

FPN No. 2: Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, Test Methods for Electrical Wires and Cables.

(F) Circuit Integrity (CI) Cable or Electrical Circuit Protective System. Cables used for survivability of critical circuits shall be listed as circuit integrity (CI) cable. Cables specified in 725.81(C), (D), and (E), and used for circuit integrity shall have the additional classification using the suffix "-CI." Cables that are part of a listed electrical circuit protective system shall be considered to meet the requirements of survivability.

FPN No. 1: Fire alarm circuit integrity (CI) cable and electrical circuit protective systems may be used for fire alarm circuits to comply with the survivability requirements of NFPA 72®-2002, National Fire Alarm Code®, 6.9.4.3 and 6.9.4.6, that the circuit maintain its electrical function during fire conditions for a defined period of time.

FPN No. 2: One method of defining circuit integrity (CI) cable is by establishing a minimum 2-hour fire resistance rating for the cable when tested in accordance with UL 2196-1995, Standard for Tests of Fire Resistive Cables.

(G) Class 1 Cable Markings. Multiconductor non–power-limited cables shall be marked in accordance with Table 725.81(G). Class 1 circuit cables shall be permitted to be marked with a maximum usage voltage rating of 150 volts. Cables that are listed for circuit integrity shall be identified with the suffix "CI" as defined in 725.81(F).

Table 725.81(G) Class 1 Cable Markings

Cable Marking	Type
CL1P	Class 1 circuit cable for use in "other space used for environmental air"725.31(D) and (H)
CL1R	Class 1 circuit riser cable 725.31(E) and (H)
CL1	Class 1 circuit cable 725.31(F) and (H)

Note: Cables identified in 725.81(C), (D), and (E) and meeting the requirements for circuit integrity shall have the additional classification using the suffix "CI" (for example, CL1P-CI, CL1R-CI, and CL1-CI).

FPN: Cable types are listed in descending order of fire resistance rating.

Substantiation: The listing requirements for the proposed cables are identical to the requirements for non-power-limited fire alarm cable. See proposal for new 725.30 for applications.

Section 760.26(A) permits "Class 1 and non–power-limited fire alarm circuits shall be permitted to occupy the same cable, enclosure, or raceway…", so identical listing requirements make sense.

Panel Meeting Action: Reject
Panel Statement: The submitter has not provided any technical substantiation that a Listed Class 1 multiconductor cable exists. No information has been provided with the proposal that non-power-limited fire alarm cable is the same cable as this proposed Class 1 cable, especially since NPLFR is a specifically listed fire alarm cable.
In addition, a fact-finding report should be submitted as part of the substantiation for acceptance of the cable to help determine the acceptability and the installation criteria for the cable.
The panel refers to (C) of the submitter's recommendation. The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-187 Log #3232 NEC-P03 **Final Action: Reject**
(725.82)

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Add CL2D and CL3D to the top of the cable list in Table 725.82, preceding CL3P, as shown.

Type CL3D	Class 3 air duct cable
Type CL2D	Class 2 air duct cable

Substantiation: This addition to the table correlates with the listing and marking of air duct cable.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-188 Log #2002 NEC-P03 **Final Action: Reject**
(725.82(G))

Submitter: Richard Carswell, The Okonite Company
Recommendation: Revise as follows:

725.82(G) Class 2 and Class 3 cables shall have a voltage rating of not less than 300 volts.

Substantiation: Voltage ratings of 150 volts for Class 2 cables and voltage ratings of 300 volts for Class 3 cables create additional confusion. Consistent ratings of 300 volts for both Class 2 and Class 3 cables allows for continuity of both cable type.
Panel Meeting Action: Reject
Panel Statement: There was no technical substantiation submitted with the proposal to warrant raising the insulation rating on Class 2 cables to 300 volts.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-189 Log #3033 NEC-P03 **Final Action: Reject**
(725.82(A), FPN)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Revise text to read as follows:
725.82 Listing and Marking of Class 2, Class 3, and Type PLTC Cables.
Class 2, Class 3, and Type PLTC cables installed as wiring within buildings shall be listed as being resistant to the spread of fire and other criteria in accordance with 725.82(A) through 725.82 (K) and shall be marked in accordance with 725.82(L).
(A) Types CL2P and CL3P. Types CL2P and CL3P plenum cables shall be listed as being suitable for use in ducts, plenums, and other space used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.
FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces. ~~is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-1999, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.~~
No change for 725.82 (B) through 725.82 (K)
Substantiation: This comment recommends a slight change in wording for the existing Fine Print Note, by recognizing that listing of plenum cable by NFPA 262 represents listing to both low smoke and low flame spread, and that cables cannot be listed separately to either property. This is basically an editorial change, as a clarification, to the existing Fine Print Note.
The same change is being proposed to the corresponding Fine Print Notes in article 760. The new language is consistent with the language in the corresponding fine print notes in articles 770, 800, 820 and 830, all of which deal with the same type of cables.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
GUIDA, T.: This proposal should have been accepted. With reference to the Panel Statement, this proposal does not change the "status quo" with regard to plenum cables. The proposal is essentially editorial. The proposed revised FPN actually aligns the wording of the FPN with the existing wording in NFPA 90A for cables in ceiling cavity and raised floor plenums.

3-190 Log #1419 NEC-P03 **Final Action: Accept**
(725.82(C), 725.8 (E) and 725.82(H) FPNs)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
FPN: One method of defining "resistant to the spread of fire" is that the cables do not spread fire to the top of the tray in the " UL Flame Exposure , Vertical Tray Flame Test" in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords~~ . UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.
Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M- ~~1985~~ 2001 , Test Methods for Electrical Wires and Cables.
Substantiation: The revised wording is an update of the standard references and not a change in the test method. UL 1581 references UL 1685 for the text of the test method.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-191 Log #2005 NEC-P03 **Final Action: Accept**
(725.82(E))

Submitter: Richard Carswell, The Okonite Company
Recommendation: Revise as follows:
(E) Insulation on conductors shall be rated for 300 volts.
Substantiation: As written: "Suitable" for 300 volts is not the same as rated for 300 volts. This change will be consistent with 725.82(G).
Panel Meeting Action: Accept
Panel Statement: The panel clarifies that the recommendation only affects the 4th sentence of 725.82(E).
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-192 Log #2984 NEC-P03 **Final Action: Accept in Principle**
(725.82(E)(1) (New))

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add text to read as follows:
(1) Wet Locations: Type PLTC cable used in a wet location shall be listed for use in wet locations, or have a moisture impervious metal sheath.
Substantiation: PLTC cable is allowed to be used outdoors per 725.61(C), and direct buried per 725.61(D)(1). The new wording paraphrased from 310.8 clarifies that PLTC cable used in wet locations shall be listed for this use, or protected from the wet location by a moisture impervious metal sheath. UL has an optional listing for wet rated PLTC cable.
Panel Meeting Action: Accept in Principle
Add as a new last sentence to the existing first paragraph of 725.82(E) to read as follows:
Type PLTC cable used in a wet location shall be listed for use in wet locations, or have a moisture impervious metal sheath.
Panel Statement: The panel has accepted the recommendation but provided more appropriate direction for the location of this text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-193 Log #2523 NEC-P03 **Final Action: Reject**
(725.82(G))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise Section 725.82 and Table 725.82, as shown below.
Sections 725.82(A), through (F) do not change.
Insert new 760.82(G), renumber existing subsections as follows: "G" to "H", "H" to "I"; and "I" to "J", "J" to "K", "K" to "L", and "L" to "M".
(G) Type CL250 and Type CL350. Types CL250 and Type CL350 cables shall be listed as suitable for installation in concealed spaces having restrictive requirements for smoke generation, combustible loading, and flame spread and shall be listed as having very-low-smoke producing characteristics, a low potential heat release value, and low flame spread characteristics.
FPN No. 1: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*
FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
FPN No. 3: Building codes adopted by code jurisdictions may contain restrictions on permissible flame spread index and smoke developed index.
Add the following to Table 725.82, on the line above "CL3P Class 3 plenum cable".

CL350	Class 3 very low-smoke cable
CL250	Class 2 very low-smoke cable

Substantiation: This proposal establishes a listing and marking for cable permitted as an electrical wiring option in concealed spaces where a smoke developed index no greater than 50 is required or large quantities of cable may cause combustible loading. The proposed cable has very-low-smoke-producing characteristics, a low potential heat release value, and low flame spread characteristics. Presently, a number of manufacturers have cables listed to the proposed requirements.
The testing criteria are based on the requirements found in NFPA 13-2003 and the 2003 International Mechanical Code, as revised.
NFPA 13, Section 8.14.1.2.1 follows: "Noncombustible and limited combustible concealed spaces with no combustible loading having no access

shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum." The proposed cable has a very low heat of combustion. While the term "combustible loading" is not defined, the fuel load can be calculated to determine the potential hazard from large quantities of cable.

The 2003 International Mechanical Code, 602.2.1, requires materials in plenums to be noncombustible or have a flame spread index no greater 25 and a smoke index no greater than 50. At the recent ICC meeting in Detroit, exception #5 to 602.2.1 was revised to include "combustible material (electrical wiring) installed in noncombustible raceways or enclosures." The requirements in IMC 602.2.1.1 permits cables meeting NFPA 262 test requirements. Cables meeting NFPA 262 requirements, according to Fire Protection Research Foundation testing using NFPA 255, have a smoke developed index that varies between 450 and 850. The proposed cable meets the requirements of the base paragraph, 602.2.1.

The following (change is underlined) shows the result of action on IMC public comment on M 77 (floor actions in Detroit, September 2005).

602.2.1 Materials exposed within plenums. Except as required by Sections 602.2.1.1 through 602.2.1.5, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84.

Exceptions:

1. Rigid and flexible ducts and connectors shall conform to Section 603.
2. Duct coverings, linings, tape and connectors shall conform to Sections 603 and 604.
3. This section shall not apply to materials exposed within plenums in one- and two-family dwellings.
4. This section shall not apply to smoke detectors.
5. Combustible materials enclosed in noncombustible raceways or enclosures, approved gypsum board assemblies or enclosed in materials listed and labeled for such application.

602.2.1.1 Wiring. Combustible electrical or electronic wiring methods and materials, optical fiber cable, and optical fiber raceway exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread not greater than 5 feet (1524 mm) when tested in accordance with NFPA 262. Only type OFNP (plenum rated nonconductive optical fiber cable) shall be installed in plenum-rated optical fiber raceways. Wiring, cable, and raceways addressed in this section shall be listed and labeled as plenum rated and shall be installed in accordance with ICC *Electrical Code* .

The Fire Protection Research Foundation report demonstrated that NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* , provides a suitable test method for establishing the cable characteristics (flame spread index & smoke developed index) specified in the FPN.

Establishing a listing and marking for a Types CL250 and CL350 cables provides a wiring option for complying with requirements of other standards and building codes. The NEC has previously established listings and markings for cable to correlate with other codes and standards. Additionally, the listing and marking may or may not have a specific application. Specific examples follow:

1. Type CMG cable was included in the 1993 NEC to correlate with the Canadian Electrical Code. The change was proposed by the Chair of NEC TCC, Harold Ware and Roy Hicks from Canada. Type CMG has a listing and marking in the NEC. Article 800 permits "Type CM or Type CMG" to be installed as a general purpose cable. Note: Type CMG does not have a unique application, and neither cable is considered a minimum requirement.
2. Types MP, MPR, and MPP cable was included in the 1990 NEC. The cables had a listing and marking. The multiple-purpose cables were permitted to substitute for similar cables in Articles 725, 760, & 800. Note: Types MP, MPR, and MPP cables do not have a unique application, just a listing and marking.
3. A change to the 1999 NEC permitted Types NPLF, NPLFR, NPLFP, FPL, FPLR, and FPLP to have a "-CI" suffix. The change included only listing and marking requirements. This change to the NEC correlated with NFPA 72, National Fire Alarm Code, requirements for a circuit integrity cable. Note: Cables with a "-CI" suffix did not have an application, until changes were made to the 2005 NEC.
4. A change to the 2005 NEC permitted Types CM, CMR and CMP to have a "-CI" suffix. As of today, no company has a listed circuit integrity using the permitted markings. Note: Types CM-CI, CMR-CI, and CMP-CI do not have an application, just a listing and marking.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: Referencing the NFPA 90A directive on NFPA 90A as a reason to reject this proposal is in error. The proposed cable marking clearly indicates the cable could not be installed in a plenum, and could only be installed in spaces permitted by 725.61(E), Other Wiring Within Buildings.

Section 725.82 provides for listing and marking requirements for cables referenced in Section 725.61. The marking requirements in the various 725.82 sections correlate with the various applications in the various 725.61 sections. For example 725.82(A) provides the listing and marking requirements for Type CL2P and CL3P plenum cable that correlates with the application requirements in 725.61(A).

The Panel is in error by stating that the proposed application CL250 or CL350 could be used in a plenum. Again, Section 725.61(A) requires a Type CL2P or CL3P cable. The proposed cable does not have a "P" in the marking. Likewise, the proposed cable does not have an "R" in the marking, so could not be installed in a riser.

3-194 Log #3289 NEC-P03 **Final Action: Reject**

(725.82(G))

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Revise 782.82(G) and reformat as shown.

(G) Class 2 and Class 3 Cable ~~Voltage~~ Ratings.

Voltage . Class 2 cables shall have a voltage rating of not less than 150 volts. Class 3 cables shall have a voltage rating of not less than 300 volts..

Temperature. Conductor insulation shall have a rating of not less than 60ºC. Class 2 and Class 3 cables shall be marked with the temperature rating of the insulation immediately following the Type designation.

FPN No. 1: For more information, see 310.10 Temperature Limitation of Conductors.

FPN No. 2: Building codes may have a cable insulation temperature requirement as high as 200ºC.

FPN No. 3: An example of the marking is CL2P 200ºC, or CL3P 200ºC, indicating a plenum cable rated at 200ºC.

Substantiation: Presently, this article does not have a temperature rating requirement on conductor insulation.

Class 3 and Class 2 cables on the market today are typically listed with a 60ºC temperature rating on the conductors. Some applications may a temperature rating much higher than , perhaps as high as high as 200ºC.

By referencing to 310.10, users will be aware that a cable with a temperature rating higher than 60ºC is required to meet a high temperature application. For information 310.10 follows:

310.10 Temperature Limitation of Conductors.

No conductor shall be used in such a manner that its operating temperature exceeds that designated for the type of insulated conductor involved. In no case shall conductors be associated together in such a way, with respect to type of circuit, the wiring method employed, or the number of conductors, that the limiting temperature of any conductor is exceeded.

FPN No. 1: The temperature rating of a conductor (see Table 310.13 and Table 310.61) is the maximum temperature, at any location along its length, that the conductor can withstand over a prolonged time period without serious degradation. The allowable ampacity tables, the ampacity tables of Article 310 and the ampacity tables of Annex B, the correction factors at the bottom of these tables, and the notes to the tables provide guidance for coordinating conductor sizes, types, allowable ampacities, ampacities, ambient temperatures, and number of associated conductors.

The principal determinants of operating temperature are as follows:

(1) Ambient temperature — ambient temperature may vary along the conductor length as well as from time to time.

(2) Heat generated internally in the conductor as the result of load current flow, including fundamental and harmonic currents.

(3) The rate at which generated heat dissipates into the ambient medium. Thermal insulation that covers or surrounds conductors affects the rate of heat dissipation.

(4) Adjacent load-carrying conductors — adjacent conductors have the dual effect of raising the ambient temperature and impeding heat dissipation.

FPN No. 2: Conductors installed in conduit exposed to direct sunlight in close proximity to rooftops have been shown, under certain conditions, to experience a temperature rise of 17°C (30°F) above ambient temperature on which the ampacity is based.

Panel Meeting Action: Reject

Panel Statement: This proposal does not add any new requirement except for marking, which is already covered by the product standard and general directory.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: It seems appropriate that the NEC define the minimum temperature rating for conductors and cables installed in compliance with Article 725. Chapter 3 wiring methods are permitted for Class 2 or Class 3 circuits by 725.52, so the temperature rating requirements in Sections 300.2(B) and 310.10 would apply. However, if a Class 2 or Class 3 cable is installed, there are no requirements for a temperature rating on the cable. Right now, the user is dependent on whatever testing laboratories mark or do not mark on cable. As cable can be installed in a variety of areas having significantly different ambient temperatures, it makes sense to require a minimum temperature rating with that minimum temperature not required to be marked on the cable.

3-195 Log #3631 NEC-P03 **Final Action: Reject**
(725.82(G) (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Insert new section (G) and renumber existing sections (G) through (L) to (H) through (M).

(G) Concealed Space Cables. Class 2 and class 3 cables that meet the requirements for Types CL2 and CL3 that are also listed as having a low potential heat value, low flame spread characteristics, and low-smoke producing characteristics shall be permitted to be listed and marked as concealed space cables Type CL2-CS and CL3-CS.

FPN: One method of defining a low flame spread and low smoke-producing cable is that the cable exhibits a maximum flame spread distance of 1.52 m (5 ft), a maximum peak optical density of 0.5 and a maximum average optical density of 0.15 when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*

Substantiation: The purpose of this proposal is to provide listing and marking for a cable that will be suitable for use in concealed spaces where there are large quantities of cables. Users would have the option of using these cables to avoid establishing a fuel load above the threshold where the quantity of cables would be considered a combustible loading. Also, these cables provide a flame spread index and a smoke developed index that correlate with the requirements for exposed materials within concealed spaces in buildings.

Cables tested using NFPA 255 and 259 establish parameters commonly used in NFPA standards and building codes: smoke developed index, smoke developed index, and heat of combustion. This proposal uses the NFPA 262 test in place of NFPA 255. The Fire Protection Research Foundation's *International Limited Combustible Plenum Cable Fire Test Project* (copy attached) has shown that both of these tests are suitable and provided data (page 18 of the report) for setting equivalent criteria in the two tests. A maximum average optical density of 0.17 in NFPA 262 is equivalent to a smoke developed index of 450 in NFPA 255. This proposal sets the maximum optical density requirement at 0.15 to allow for a margin of error and to correlate with the existing requirements for plenum cable.

NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading. Combustible loading is a function of the density (number) of cables and their potential heat release determined by NFPA 259.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics*** . I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of this article need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or preferably avoid the buildup of combustible cables that would result in a combustible loading. Use of concealed space cables would be an option in a strategy to avoid establishing a combustible loading.

A flame spread index of 25 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

A smoke developed index of 450 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

The following requirements are from NFPA 5000-2003 identify heat of combustion, flame spread, and smoke as major concerns:

Chapter 4 General

4.4.7 Limiting Fire Spread.

4.4.7.1 Interior Finishes. The interior surfaces of the building shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.4.7.2 Concealed Spaces. The construction of concealed spaces shall not contribute to an unacceptable rate of the spread of fire, hot gases, and smoke to areas of the building remote from the fire source and shall limit their spread beyond the immediate area of the origin of the fire.

4.4.7.3 Compartmentation. The building shall be compartmented, as appropriate, by walls and floors, including their associated openings with proper closures, to limit the spread of fire, hot gases, and smoke to an acceptable area beyond the immediate area of fire origin.

Chapter 8 Fire-Resistive Materials and Construction

8.1 General.

8.1.1 The chapter addresses fire protection features intended to restrict or resist the spread of fire and smoke beyond the compartment of fire origin.

8.1.2 Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict or resist the movement of smoke.

8.1.2.1* Fire compartments shall be formed with fire barrier walls that comply with Section 8.4 or horizontal assemblies that comply with Section 8.6, or a combination of both.

8.1.2.2 Smoke compartments shall be formed with smoke barriers that comply with Section 8.11.

8.16 Insulating Materials.

8.16.7 Insulation and Covering on Pipe and Tubing. Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke developed index of not more than 450.

Chapter 10 Interior Finishes

10.3.2* Products required to be tested in accordance with NFPA 255 or ASTM E 84 shall be grouped in the classes described in 10.3.2(A) through 10.3.2(C) in accordance with their flame spread and smoke development, except as indicated in 10.3.3.

(A) Class A Interior Wall and Ceiling Finish. Class A interior wall and ceiling finishes shall be those finishes with a flame spread of 0–25 and smoke development of 0–450 and shall include any material classified at 25 or less on the flame spread test scale and 450 or less on the smoke test scale. Any element thereof, when so tested, shall not continue to propagate fire.

Panel Meeting Action: Reject

Panel Statement: The definition for "concealed" in Article 100 in the 2005 NEC does not apply to the proposed text. The reference to NFPA 13 in the substantiation does not seem appropriate at this time, since putting a sprinkler head in an inaccessible location inside the wall or above a drywall ceiling would not permit access for servicing. The area above a suspended ceiling is not considered by the NEC to be a concealed space.

The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-193.

3-196 Log #3288 NEC-P03 **Final Action: Accept in Principle**
(725.82(G) Exception and FPN (New))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 760.82(G), as shown.

(G) Class 2 and Class 3 Cable Voltage Ratings. Class 2 cables shall have a voltage rating of not less than 150 volts. Class 3 cables shall have a voltage rating of not less than 300 volts.

Exception: Bare Class 2 conductors shall be permitted.

FPN: Security systems may use bare copper wire (e.g. 26 AWG), to protect openings, which is referred to as "lacing.

Substantiation: The purpose of this proposal is to permit a commonly used security system practice, which is referred to as "lacing." Lacing may require the use of bare conductors, perhaps 26 AWG. During the 1999 code cycle, CMP 16 added a new requirement to this section: Class 2 conductors were required to have insulation rated at 150 volts.

This proposal is a result of a recent question from a nation-wide security company. The person asking the question wondered if it was permissible to install bare 26 AWG conductors on a Class 2 security system circuit. Because the NEC now requires all Class 2 conductors to be insulated to 150 volts, the answer to the question is, "No." Prior to the 1999 edition of the NEC, bare copper conductors were permissible. Prior to the 1999 NEC, there was no voltage requirement for insulation on a Class 2 conductor, because there was no requirement to have insulation on a Class 2 conductor. A change to the 1987 NEC required that if a Class 2 conductor was insulated, the insulation was required to be resistant to the spread of fire. Prior to the 1987 NEC there was no resistant to the spread of fire requirement related to the insulation on Class 2 conductors.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Add the following to 725.52(B) to read as follows:

Exception No. 3: Bare Class 2 conductors shall be permitted as part of a listed intrusion protection system where installed in accordance with the listing instructions for the system.

Panel Statement: The panel has accepted the exception but modified it to be more specific to the intended application. The FPN has been deleted, since the change to the exception addresses the information contained in the proposed FPN. The exception has been relocated to a more appropriate location in Article 725.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:

CASPARRO, P.: During the panel discussion the queston was raised "Why can't the same purpose be achieved by using an inslated wire?" There was no valid reason why not, and with this in mind I see no reason to expose persons to energized conductors.

3-197 Log #2387 NEC-P03 **Final Action: Reject**
(725.82(L))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Revise 725.82(L) as follows:

(L) Marking. Cables shall be marked in accordance with 310.11(A)(2), (A)(3), (A)(4), and (A)(5) and Table 725.82. Voltage ratings shall not be marked on the cables. The temperature rating shall be marked on the cable .

FPN: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1 electric light and power applications.

Exception: Voltage markings shall be permitted where the cable has multiple listings and a voltage marking is required for one or more of the listings.

Substantiation: The cables and conductors in this article do not have a temperature rating requirement. It is important for the system designer, installer, local authority, and building owners to know the temperature rating of cables and conductors for proper application.

Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-194.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-194.

3-198 Log #3233 NEC-P03 **Final Action: Reject**
(725.82(M))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Add new 725.82(M), as shown.

(M) Types CL2D and CL3D. Types CL2D and CL3D air duct cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant, very low smoke-producing characteristics, and very low potential heat release.

FPN No: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1:a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements of Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

The following is an example of air duct cable information from the UL Web Site:

OWKZ. GuideInfoLimited Combustible Cable
Guide Information for Electrical Equipment for Use in Ordinary Locations
GENERAL

This category covers electrical and optical fiber cable that meets the limited combustible and smoke developed requirements for cable in ceiling cavity and raised floor plenums in accordance with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems." This cable also meets the requirements for cable used in ducts, plenums and other spaces used for environmental air in accordance with Articles 725, 760, 770, 800, 820 and 830 of ANSI/NFPA 70, "National Electrical Code".

This cable has a maximum Potential Heat value of 3500 Btu/lb when tested in accordance with NFPA 259, "Standard Test Method for Potential Heat of Building Materials." This cable has a maximum smoke developed index of 50 and a maximum flame spread index of 25 when tested in accordance with UL 723 (NFPA 255), "Test for Surface Burning Characteristics of Building Materials" before and after exposure to elevated temperature and humidity. The cable also meets the requirements for plenum cable in one or more of the following product categories:

- Power-limited Circuit Cable (**QPTZ**) - Types CL2P or CL3P
- Communications Cable (**DUZX**) - Type CMP
- Power-limited Fire Alarm Cable (**HNIR**) - Type FPLP
- Nonpower-limited Fire Alarm Cable (**HNHT**) - Type NPLFP
- Optical Fiber Cable (**QAYK**) - Types OFNP or OFCP
- Community Antenna Television Cable (**DVCS**) - Type CATVP
- Network-powered Broadband Communications Cable (**PWIP**) - Type BLP

PRODUCT MARKINGS

This cable is identified by the marking "Limited Combustible FHC 25/50" on the surface of the jacket or on a marker tape under the jacket. This marking is immediately followed by one of the Type designations shown above. The cable also has the required markings including optional markings as indicated in the product categories referenced above. This cable may also be Verified for transmission performance if authorized in the product categories referenced above, and will bear the appropriate performance verification marking.

ADDITIONAL INFORMATION

For additional information, see Electrical Equipment for Use in Ordinary Locations (**AALZ**).

REQUIREMENTS

The basic requirements used to investigate products in this category are contained in Subject 2424, "Outline of Investigation for Cable Marked 'Limited Combustible.'"

UL MARK

The UL symbol on the product and the Listing Mark of Underwriters Laboratories Inc. on the attached tag, the reel, or the smallest unit container in which the product is packaged is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and the product name "Limited Combustible Cable."

Cable which is also Verified to the UL Data Transmission Performance Category Marking Program has the marking "Verified to UL Performance

Category Program," or the UL Verification Mark along with the words "Performance Category Program" together with the Listing Mark information on the tag, the reel, or the smallest unit container. Cable which is also Verified to another transmission performance specification has the marking "Verified in Accordance with [Specification name and/or number]" or the UL Verification Mark along with the applicable Specification name and/or number together with the Listing Mark information on the tag, the reel, or the smallest unit container.
Last Updated on 2004-03-24
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 727 — INSTRUMENTATION TRAY CABLE: TYPE ITC

3-199 Log #989 NEC-P03 **Final Action: Accept**
(727.3)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Delete "such as Articles 240, 250, 300, and 392".
Substantiation: To conform to Style Manual. Already covered in 90.3.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-200 Log #2004 NEC-P03 **Final Action: Reject**
(727.4)

Submitter: Richard Carswell, The Okonite Company
Recommendation: Revise as follows:
727.4 Uses Permitted. "Type ITC cable shall be permitted to be used on NON-POWER LIMITED CIRCUITS as follows in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation.
Substantiation: This was the original intent of ITC type cable when introduced by the NEC. Additionally, this also makes it clear that Type ITC cable can be used with a non-power limited system as long as the constraints of 150 volts or less and 5 amps or less are met.
Panel Meeting Action: Reject
Panel Statement: Section 727.5, last paragraph does not permit Type ITC cable to be installed with non-power-limited circuits, so it remains a power-limited cable of not more than 150 volts and 5 amps. This is a very special application cable for instrumentation and control circuits as stated in 727.1, and the scope of Article 727 restricts ITC to only this use. It cannot be used as a general-use cable.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-201 Log #2007 NEC-P03 **Final Action: Reject**
(727.4)

Submitter: H. R. Stewart, HRS Consulting
Recommendation: Revise as follows:
727.4 Uses Permitted. Type ITC cable shall be permitted to be used on both Power Limited and Non-Power Limited circuits and as follows in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installations.
Substantiation: ITC cable by definition can be used on circuits of 150 volts or less and 5 amps or less. This makes it clear that ITC cable and restrictions of its use are clear. Therefore, this type cable should be used on these applications.
Panel Meeting Action: Reject
Panel Statement: See the panel statement in Proposal 3-200.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-202 Log #3444 NEC-P03 **Final Action: Reject**
(727.4(11))

Submitter: David Wechsler, The Dow Chemical Company
Recommendation: Add the following new text:
Type ITC cable shall be permitted to be used as follows in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation:
(11) With Closed-Loop and Programmed Power Distribution in accordance with 780.6.
Substantiation: Action taken in the last code cycle provided that Class II and Class III cables could be used in accordance with 780.6(B). Type ITC cable is a robust cable having greater overall electrical insulation properties than a Class II cable and thus as a cable it can be used for the same conditions.
Panel Meeting Action: Reject
Panel Statement: Article 780 was the "Smart House" article, placed in the NEC to apply to a wiring system designed to control power to various outlets, such as appliances and similar applications. This system was never intended as an industrial application. Section 780.2(B) required all equipment and conductors to be listed and 780.3 requires the control equipment and all power switching devices operated by the control equipment to be listed and identified. The system is required to comply with four different subsections to ensure the outlets will not be energized unless the utilization equipment exhibits a characteristic electrical identification. Also, Type ITC cable is not a listed hybrid cable.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-203 Log #371 NEC-P03 **Final Action: Reject**
(727.4(5))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
Without a metallic sheath or armor between cable tray and equipment in lengths not to exceed 15 m (50 ft), where the cable is supported and protected against ~~physical~~ damage using mechanical protection, such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-204 Log #2003 NEC-P03 **Final Action: Accept in Principle**
(727.4(5))

Submitter: Richard Carswell, The Okonite Company
Recommendation: Delete subparagraph (5) in total.
Substantiation: Subparagraph (5), as currently written, allows unarmored Type ITC cable to be installed in an unsafe manner. This is consistent with the requirements for both Type PLTC and Type TC cables.
Panel Meeting Action: Accept in Principle
Panel Statement: Refer to the panel action and statement on Proposal 3-205. The panel does not agree with the submitter's substantiation that the current text permits an unsafe installation. The panel action in Proposal 3-205 recognizes a nonmetallic-sheathed cable with impact and crush tests with a designation of ITC-ER.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-205 Log #2721 NEC-P03 **Final Action: Accept in Principle**
(727.4(5) & (6))

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: Revise text of sections as follows:

(5) Without a metallic sheath or armor the cable shall be permitted to be installed exposed ~~between cable tray and equipment in lengths not to exceed 15 m (50 ft),~~ where the cable is supported and protected against physical damage using mechanical protection, such as struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).

(6) The cable shall be permitted to be installed exposed. ~~Between cable tray and equipment in lengths not to exceed 15 m (50 ft),~~ where the cable complies with the crush and impact requirements of Type MC cable and is identified for such use. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).

Substantiation: (5) By installing the cable in a way where it is protected from damage the limitations between cable tray and equipment and the limitations of 50 ft are not needed.

(6) There are three different installation methods for Type TC, Type PLTC and Type ITC. All of these cables are permitted to be installed as Exposed Routing (ER) when the cable is listed as ER. The installation requirements should be similar to reduce confusion in field. A similar proposal is being submitted for Articles 336 and 727 in an effort to align the installation methods.

Where cable listed as ER is used, there is no technical reason to limit this installation method to only between a cable tray and utilization equipment or device nor to limit the installation to 50 ft. Cables listed for ER installations are a stronger cable capable of withstanding more abuse than cables not listed for use in ER installations.

Panel Meeting Action: Accept in Principle

Delete current 727.4(5) and replace 727.4(6) in the existing code with this new 727.4(5) to read as follows:

(5) Cable, without a metallic sheath or armor, that complies with the crush and impact requirements of Type MC cable and is identified for such use with the marking ITC-ER, shall be permitted to be installed exposed. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be secured at intervals not exceeding 1.8 m (6ft).

[Renumber the remaining paragraphs accordingly.]

Panel Statement: The panel concurs that Types TC, PLTC, and ITC should have similar if not identical installation methods. The panel also recognizes that TC cable is primarily limited to installations in cable trays and raceways and that this limitation does not apply to PLTC and ITC cables. Also, Type TC cable is limited to constructions with a nonmetallic jacket and does not have metallic sheathed or armored designs. The revised wording accepts the submitter's position that this cable does not need to be limited to use from cable tray to equipment. The UL Standard for Instrumentation Tray Cable is being revised to replace the "open wiring" wording to "-ER".

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-206 Log #1291 NEC-P03 **Final Action: Accept in Principle in Part**
(727.4(5) and 727.4 (6))

TCC Action: The Technical Correlating Committee understands that the Panel Action should be "Accept in Principle in Part".
Submitter: Gerald Lee Dorna, Belden CDT. Inc.
Recommendation: Combine 727.4 (5) and 727.4 (6) into one statement 727.4 (5). Re-number the balance of the article. The new wording would be as follows.

(5) In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the cable is not subject to physical damage, Type ITC cable shall be permitted to be ~~exposed~~ run between the cable tray and utilization equipment or device. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be secured at intervals not exceeding 1.8 m (6 ft).

Substantiation: First, I removed the 50 ft limitation. There is no reason to limit the run to 50 ft especially since ITC has to be, in this application, "be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels". If the ITC is protected in this manor, why would there be a 50 ft limit? In addition PLTC in the same application (see Article 725.61(D)(4) does not have this 50 ft limit.

Secondly, I also removed the text about the ITC having to meet the requirements of crush and impact of Type MC. Again if the ITC is to "be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels", there is no need for the cable to additionally have to meet the crush and impact requirements of Type MC cable.

Thirdly, I also changed the word "exposed" to "run" because again if the cable is protected as stated above it really is not exposed.

I have also put in a proposal to Article 725.61(D)(4) to have the same wording. Therefore, ITC and PLTC will have the same wording.

Panel Meeting Action: Accept in Principle

The panel accepts in principle the revision to paragraph (6) but has deleted (5). The Panel accepts the elimination of the 50 ft limitation and has provided text to deal with the exposed portion of the ITC cable installation requirements.

Panel Statement: See the panel action and statement for Proposal 3-205. The panel considers this to be an exposed installation in accordance with the definition of Exposed in Article 100. There is no substantiation for eliminating the crush and impact tests for the non-armored cables

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-207 Log #3443 NEC-P03 **Final Action: Accept in Principle**
(727.4(6))

Submitter: David Wechsler, The Dow Chemical Company
Recommendation: Revise the text as follows:

Between cable tray and equipment ~~in lengths not to exceed 15 m (50 ft),~~ where the cable complies with the crush and impact requirements of Type MC cable and is identified for such use. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).

Substantiation: Type ITC cable was the former PLTC cable applied in Article 725 as a Class II - Class III wiring method that was moved into its own chapter due to limitations imposed by the "listed Class II/Class III" power source requirement that was clarified by earlier actions in the Code. Not such cable length restrictions were imposed upon the Type PLTC. As can be seen Type ITC, like PLTC is also permitted to be run on messenger without limitations to its length. The added conditions of crush and impact of Type MC that have been added to Type ITC, therefore make Type ITC even more enhanced for not needing a limitation as to its length as it will continue to be better protected than the same identical cable when it was a Type PLTC. To those that might suggest that the PLTC is perhaps a safer cable because of the voltage and current limitations afforded PLTC, the voltage and current limitations defined for Type ITC are exactly those same limitations for Type PLTC defined in Tables 11(A) and 11(B). The end points of those Table values are precisely those 150 volts and 5 amp maximums contained within the Article 727 requirements.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action and statement on Proposal 3-205.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-208 Log #2723 NEC-P03 **Final Action: Reject**
(727.5)

Submitter: Dorothy Kellogg, American Chemistry Council
Recommendation: 727.5 Uses Not Permitted. Type ITC cable shall not be installed on circuits operating at more than 150 volts or more than 5 amperes. Installation of Type ITC cable with other cables shall be subject to the stated provisions of the specific articles for the other cables. Where the governing articles do not contain stated provisions for installation with Type ITC cable, the installation of Type ITC cable with the other cables shall not be permitted.

Type ITC cable shall not be installed with power, lighting, Non-Power-Limited Class 1, or non–power-limited circuits.

Substantiation: The wording in the last sentence indicates that ITC circuits can be installed with Power Limited circuits. There are two types of Class 1 Circuits. Power-Limited and Non-Power-Limited. ITC circuits should not be installed with Non-Power-Limited Class 1 circuits. However, Power-Limited Class 1 Circuits should be allowed to be installed with ITC circuits. The revised wording would clarify the intent and allow installations to meet the intent.

Panel Meeting Action: Reject
Panel Statement: Article 725 does not differentiate between power-limited Class 1 and non-power-limited Class 1 with regard to separation of circuits. Both types of Class 1 circuits are a potential shock and fire hazard.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:

PACE, D.: The panel should have accepted this proposal.

The panel statement says "Article 725 does not differentiate between power-limited and non-power-limited Class I with regard to separation of circuits". I believe this is exactly the submitter's point. The submitter offered wording that was felt would provide this differentiation that is needed. Without it, the existing text can be interpreted as allowing ITC cables to be installed with non-power-limited circuits, in this case those being non-power-limited Class I. At the very least, the existing text can be interpreted as not prohibiting this.

3-209 Log #2006 NEC-P03 **Final Action: Reject**
(727.6)

Submitter: Richard Carswell, The Okonite Company
Recommendation: Revise as follows:
In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the cable is not subject to physical damage. Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use should be permitted to be exposed between the cable tray and utilization equipment or device. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles or channels. The cable shall be secured at intervals not exceeding 1.8 m (6 ft).
Substantiation: The present 50 foot limit and unsupported status is an unsafe condition.
Panel Meeting Action: Reject
Panel Statement: The proposal is for PLTC and not appropriate for 727.6. See the panel actions and statements for Proposals 3-204 and 3-205.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-210 Log #1420 NEC-P03 **Final Action: Accept**
(727.6, FPN 2)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
<u>FPN No 2: One method of defining "resistant to the spread of fire" is that the cables do not spread fire to the top of the tray in the " UL Flame Exposure, Vertical Tray Flame Test" in UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable. Another method of defining "resistant to the spread of fire" is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M- 2001, Test Methods for Electrical Wires and Cables.</u>
Substantiation: The FPN is proposed to make Article 727 consistent with Articles 725, 760, 770, 800, 820 and 830 all of which have FPNs for methods of defining "resistant to the spread of fire".
Panel Meeting Action: Accept
Designate the addition as FPN, not FPN No.2.
Panel Statement: The panel has made an editorial correction, since there is no current FPN.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

ARTICLE 760 — FIRE ALARM SYSTEMS

3-211 Log #842 NEC-P03 **Final Action: Accept**
(760)

Submitter: Richard P. Owen, St. Paul, MN
Recommendation: Renumber Article 760 to read as follows:
ARTICLE 760 Fire Alarm Systems
I. General
760.1 Scope.
760.2 Definitions.
760.3 Other Articles.
~~760.7~~ <u>760.21</u> Access to Electrical Equipment Behind Panels Designed to Allow Access.
~~760.8~~ <u>760.24</u> Mechanical Execution of Work.
~~760.9~~ <u>760.26</u> Fire Alarm Circuit and Equipment Grounding.
~~760.10~~ <u>760.30</u> Fire Alarm Circuit Identification.
~~760.11~~ <u>760.32</u> Fire Alarm Circuits Extending Beyond One Building.
~~760.15~~ <u>760.35</u> Fire Alarm Circuit Requirements.
II. Non–Power-Limited Fire Alarm (NPLFA) Circuits
~~760.21~~ <u>760.41</u> NPLFA Circuit Power Source Requirements.
~~760.23~~ <u>760.43</u> NPLFA Circuit Overcurrent Protection.
~~760.24~~ <u>760.45</u> NPLFA Circuit Overcurrent Device Location.
~~760.25~~ <u>760.46</u> NPLFA Circuit Wiring Methods.
~~760. 26~~ <u>760.48</u> Conductors of Different Circuits in Same Cable, Enclosure, or Raceway.
~~760.~~ 27 <u>760.49</u> NPLFA Circuit Conductors.
~~760.~~ 28 <u>760.51</u> Number of Conductors in Cable Trays and Raceways, and Derating.
~~760.30~~ <u>760.53</u> Multiconductor NPLFA Cables.
III. Power-Limited Fire Alarm (PLFA) Circuits
~~760.~~ 41 <u>760.121</u> Power Sources for PLFA Circuits.
~~760.~~ 42 <u>760.124</u> Circuit Marking.
~~760.~~ 51 <u>760.127</u> Wiring Methods on Supply Side of the PLFA Power Source.
~~760.~~ 52 <u>760.130</u> Wiring Methods and Materials on Load Side of the PLFA Power Source.
~~760.54~~ <u>760.133</u> Installation of Conductors and Equipment in Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways for Power-Limited Circuits.
~~760.~~ 55 <u>760.136</u> Separation from Electric Light, Power, Class 1, NPLFA, and Medium Power Network-Powered Broadband Communications Circuit Conductors.
~~760.~~ 56 <u>760.139</u> Installation of Conductors of Different PLFA Circuits, Class 2, Class 3, and Communications Circuits in the Same Cable, Enclosure, or Raceway.
~~760.57~~ <u>760.142</u> Conductor Size.
~~760.~~ 58 <u>760.143</u> Support of Conductors.
~~760.~~ 59 <u>760.145</u> Current-Carrying Continuous Line-Type Fire Detectors.
~~760.61~~ <u>760.154</u> Applications of Listed PLFA Cables.
Figure ~~760.61~~ <u>760.154</u> Cable Substitution Hierarchy.
Table ~~760.~~ 61 <u>760.154</u> Cable Substitutions
IV. Listing Requirements
~~760.~~ 81 <u>760.176</u> Listing and Marking of NPLFA Cables.
Table ~~760.81(G)~~ <u>760.176(G)</u> NPLFA Cable Markings
~~760.~~ 82 <u>760.179</u> Listing and Marking of PLFA Cables and Insulated Continuous Line-Type Fire Detectors.
Table ~~760.82(I)~~ <u>760.179(I)</u> Cable Markings
Substantiation: This proposal was developed by a Task Group consisting of CMP-3 members Ray Keden, Robert Walsh, Ron Maassen, Mark Ode, Tom Guida and Chair Richard Owen.
The Task Group was formed to look at held Comment 3-108, which suggested a new parallel numbering system for Articles 725 and 760. As a result of several conference calls and by work outside the calls, the Task Group unanimously approved the proposal as shown. The Task Group attempted as much as was possible to correlate the numbering of the two articles, as well as a similar numbering sequence for those related sections in Chapter 8 for overall correlation, while leaving adequate room between sections for future additions. It was impossible to renumber the two articles exactly, since some sections could not be moved without changing their intent. One example of this is newly renumbered Sections 725.52 covering Class 1 circuits extending beyond one building and 760.32 covering both power limited fire alarm and non-power-limited fire alarm circuits extending beyond one building, which both address the same thing, but the numbering could not be the same without changing the intent of these sections due to their location in their respective articles.
There is a companion proposal to this one for Article 725.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-212 Log #2362 NEC-P03 **Final Action: Reject**
(760.2.Abandoned Fire Alarm Cable)

Submitter: John H. Schmidt, ABC Television Network
Recommendation: In the definition for Abandoned Fire Alarm Cable, after the words "and not identified for future use with a tag" add the words "or in a database."
Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-139.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-213 Log #3029 NEC-P03 **Final Action: Reject**
(760.2. Abandoned Fire Alarm Cable)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Revise text to read as follows:
760.2 Definitions.
Abandoned Fire Alarm Cable. Installed fire alarm cable that is not terminated at equipment ~~other than a connector~~ and not identified for future use with a tag.
Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:
640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.
725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.
The additional wording in this definition causes confusion. Proposals are

being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100.
Panel Meeting Action: Reject
Panel Statement: Each article has different requirements for what constitutes an abandoned cable. Some applications require that a connector be installed along with an identification tag on the cable, whereas others, such as the one for Article 725, require only that the cable not be terminated at equipment and an identification tag be installed for it to not be considered to be abandoned. In this application for fire alarm systems, coaxial cables are often installed for cabling to "smart" systems or for interface units and would be tagged with a connector installed on the cable for quick connect at a future time.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-214 Log #2982 NEC-P03 **Final Action: Reject**
(760.2, FPN (New))

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add a FPN to 760.2 for fire alarm circuit integrity cable to indicate that the cable should be tested for the environment it is installed in as follows:
<u>FPN: Since CI Cables may be installed in a raceway or free air they must be tested for both these conditions.</u>
Substantiation: Some CI cables are not tested in conduit, with boxes, vertically, etc, but are installed this way.
Panel Meeting Action: Reject
Panel Statement: This proposed fine print note contains mandatory text by stating that circuit Integrity cables must be tested for free air and raceway installations and, as such, this fine print note does not comply with Section 3.1.3 of the NEC Style Manual. Section 760.2 contains the definition of the circuit integrity cable, and a definition cannot contain mandatory text, so the proposed text cannot be moved into the definition.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
EGESDAL, S.: Circuit integrity cables are required for certain notification appliance circuits to insure survivability of the circuit. Because it is standard practice for installing a typical fire alarm cable exposed or in raceway, installers may not be aware that a "-CI" must be installed in accordance with its listing requirements, which may or may not require or not permit installation in raceway. The information is on the data sheet provided, but so often not read in detail. The goal of the proposed Fine Print Note is an alert to system designers, installers, and enforcers to the critical nature of circuit integrity cable installation requirements. Improper installation has the potential to put lives at risk.
Additionally, the Panel Statement is unfair to the submitter of the proposal. To only indicate the proposal violates the style manual without giving a technical substantiation for rejecting. Or, the Panel could have taken the time to change the text in the proposal and "Accept in Principle."

3-215 Log #3107 NEC-P03 **Final Action: Reject**
(760.3)

Submitter: Donald Hall, Corning Cable Systems
Recommendation: Revise text to read as follows:
760.3 Other Articles.
Circuits and equipment shall comply with 760.3(A) through 760.3(F). Only those sections of Article 300 referenced in this article shall apply to fire alarm systems.
(A) Spread of Fire or Products of Combustion. 300.21 shall apply. ~~The accessible portion of a~~ Abandoned fire alarm cables shall be removed.
Also, add the following FPN to 760.3(A):
<u>FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.</u>
Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.
The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.
Panel Meeting Action: Reject
Panel Statement: Requiring inaccessible portions of a cable to be removed could mean damaging building finish and demolition or destruction of the building to remove abandoned cable, which is unrealistic to require. There is no added benefit to the user of the NEC in adding this fine print note since the removal of cable in accordance with 760.3(A) is already a requirement. The relevant portions of the suggested document in the FPN have not been provided for informational purposes. With regard to the addition of the FPN, the panel refers to 90.1(C): The Code is not for untrained personnel and is not an instruction manual.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-216 Log #1375 NEC-P03 **Final Action: Reject**
(760.3(A))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete text concerning abandoned cables
760.3 Other Articles.
Circuits and equipment shall comply with 760.3(A) through 760.3(F). Only those sections of Article 300 referenced in this article shall apply to fire alarm systems.
(A) Spread of Fire or Products of Combustion. Section 300.21. ~~The accessible portion of abandoned fire alarm cables shall be removed.~~
(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts or plenums or other spaces used for environmental air.
Exception: As permitted in 760.30(B)(1) and (B)(2) and 760.61(A).
(C) Hazardous (Classified) Locations. Articles 500 through 516 and Article 517, Part IV, where installed in hazardous (classified) locations.
(D) Corrosive, Damp, or Wet Locations. Sections 110.11, 300.6, and 310.9 where installed in corrosive, damp, or wet locations.
(E) Building Control Circuits. Article 725 where building control circuits (e.g., elevator capture, fan shutdown) are associated with the fire alarm system.
(F) Optical Fiber Cables. Where optical fiber cables are utilized for fire alarm circuits, the cables shall be installed in accordance with Article 770.
Substantiation: The NEC is an installation standard, not a maintenance standard. Because of this, this rule should not be a part of the NEC. Furthermore, this provision does not accomplish its intent, as the code is not a retroactive document. To require abandoned cables to be removed is similar to requiring facilities to update their receptacles to the new GFCI provision every three years. With that said, the only time this rule applies is when an installer creates an abandoned cable. Also, this provision does not fall within the purpose of the NEC 90.1(A). The NEC is concerned with the hazards created from the use of electricity…this rule seems to imply that a cable with a voltage applied to it is safe, but a cable with no voltage applied to it is dangerous.
This proposal is also being made to sections 725.3(B), 770.3(A), 800.3(C), 820.3(A) and 830.3(A).
Panel Meeting Action: Reject
Panel Statement: This is not a retroactive requirement, since the abandoned cable either must be marked at the time it is disconnected or must be removed. Removal of discontinued conductors is not new to the Code.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-217 Log #2806 NEC-P03 **Final Action: Reject**
(760.3(A))

Submitter: Harold C. Ohde, IBEW #134
Recommendation: 760.3 Other Articles. No change
(A) Spread of Fire or Products of Combustion. ~~Section~~ 300.21 <u>shall apply</u> . ~~The accessible portion of abandoned fire alarm cables shall be removed.~~
Substantiation: The requirements for removal of abandoned fire alarm cables would be better suited in appropriate code section within Article 760. I have submitted another proposal that would move the abandoned fire alarm cables requirements to 760.8 - Mechanical Execution of Work. The abandoned fire alarm cables requirements are out of place in 760.3 - Other Articles. The requirements are not part of another Article as they are part of Article 760 and are located within Article 760.
The addition of the words "shall apply" would incorporate language that is consistent with 800.3, 820.3 and 830.3.
Similar proposals have been submitted for 640.3, 725.3, 770.3, 800.3, 820.3, and 830.3 to revise these sections as well.
Panel Meeting Action: Reject
Panel Statement: The concern of 300.21 is the spread of fire and products of combustion in hollow spaces, vertical shafts, and ventilation and air-handling ducts caused by electrical installations. Removing the accessible portion of the cable seems to fit very well within 300.21 and should remain in Section 760.3(A) as a means of reducing unnecessary electrical products in these areas.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
CASPARRO, P.: This proposal should have been accepted. This proposal was submitted not to interfere with the intent of 300.21, but rather locate all abandoned cable requirements in one Code section located in Part 1 - General. Having the requirements in a central section in Part I - General, would eliminate confusion or concerns in regard to the removal of abandoned requirements.

3-218 Log #3004 NEC-P03 **Final Action: Reject**
(760.3(A))

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
760.2 Definitions.
Abandoned Fire Alarm Cable. Installed fire alarm cable that is not terminated at equipment other than a connector and not identified for future use with a tag.
760.3 Other Articles.
Circuits and equipment shall comply with 760.3(A) through 760.3(F). Only those sections of Article 300 referenced in this article shall apply to fire alarm systems.
(A) Spread of Fire or Products of Combustion. Section 300.21. ~~The accessible portion of abandoned~~ Abandoned fire alarm cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components.
Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in “inaccessible spaces”. This is not conducive to safe electrical practice; this the key change is the elimination of the words “the accessible portion of”.
If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.
Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.
For information, see the relevant definitions in the NEC.
Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.
Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.
Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.
Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.
Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.
Panel Meeting Action: Reject
Panel Statement: This proposed change would make it a requirement that removal of abandoned cable never damage the building finish or compromise adjacent wiring systems or components. This expectation is unrealistic. If the building owner wants to take a ceiling down to access and remove abandoned cables, the NEC should not and cannot restrict this action. In regard to the removal of accessible cable, the panel refers to the definition of accessible as it applies to wiring methods.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-219 Log #2389 NEC-P03 **Final Action: Reject**
(760.3(A) and 760.17 (new))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Move the abandoned cable requirement from 760.3(A) to new 760.17.
(A) Spread of Fire or Products of Combustion. Section 300.21. ~~The accessible portion of abandoned fire alarm cables shall be removed.~~
760.17. Abandoned Cables. The accessible portion of abandoned fire alarm cables shall be removed.
Substantiation: This change is editorial. The requirement to remove abandoned cables applies to Article 760, not other articles.
Panel Meeting Action: Reject
Panel Statement: Moving this text to a new section without this restriction would make this a requirement for every location within a building. There has been no substantiation provided to expand this requirement beyond hollow spaces, vertical shafts, and air-handling areas. The concern of 300.21 is the spread of fire and products of combustion in hollow spaces, vertical shafts, and ventilation and air-handling ducts caused by electrical installations. Removing the accessible portion of the cable seems to fit very well within 300.21 and should remain in Section 760.3(A) as a means of reducing unnecessary electrical products in these areas.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
EGESDAL, S.: This proposal should be accepted. The removal of abandoned cable should be in its own section to make it clear that the requirement applies to Parts I, II, and III of Article 760. Presently, the removal of abandoned cable in 760.3(C) applies when 300.21 is required to be referenced.
The 2002 NEC had the removal of abandoned cable requirement in Sections 760.3(B), 760.61(A), Plenums; 760.61(B), Risers; and 760.61(E), Other Wiring in Buildings. As 760.3(C) would supposedly cover all the Parts of Article 760; the requirements were removed from 760.61(A) and (B) in an effort to simplify the NEC. As a former member of Panel 16, I know the intent of the requirements in Article 760 (2002 edition) was to require removal of abandoned cable, regardless of where the cable was installed in a building. The Panel should reconsider the proposals that recommend moving the requirements for removal of abandoned cable to its own section in Part I of Article 760.

3-220 Log #894 NEC-P03 **Final Action: Reject**
(760.3(B) Exception)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Delete the Exception to 760.3(B) entirely.
Substantiation: These exceptions only confuse the issue. No special rule that violates 300.22 is found in 760.30(B)(1) or (B)(2). Ducts and plenums should not be used as raceways for FA cables, so the cables should not be installed there unless they connect to equipment that acts on the air. 300.22(B) with 760.61 is sufficient.
Panel Meeting Action: Reject
Panel Statement: The purpose of this exception is to point out that power-limited plenum cables are for ducts, plenums and other spaces used for environmental air. Non-power-limited plenum cables are for other spaces only. The exception needs to be retained for usability.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
AYER, L.: The NEC does not allow Class 2 or Class 3 plenum cables to be installed exposed inside ducts or plenums. This can be found in 725.3(C). Low-voltage and low-energy fire alarm cables which are found in Article 760 should be treated in the same fashion. While I agree with the submitter’s substantiation to delete the Exception to 760.3(B), 760.61(A) would also have to be reworded to add more clarity to the user of the code.
The panel should delete the Exception as recommended by the submitter. The panel should also delete the first sentence of 760.61(A) and rewrite the second sentence into mandatory code text.

3-221 Log #2184 NEC-P03 **Final Action: Accept**
(760.3(G))

Submitter: Dann Strube, Strube Consulting
Recommendation: Add text to read as follows:
(G) Installation of conductors with other systems. Installations shall comply with 300.8.
Substantiation: Fire alarm systems should not be mixed with water, air, etc. Without this change, 760.3 removes the 300.8 requirement.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-222 Log #2388 NEC-P03 **Final Action: Reject**
(760.3(G) (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add new 760.3(G), as follows:
760.3(G). Temperature Limitation of Conductors. See 310.10.
Substantiation: The cables and conductors in this article do not have a temperature rating requirement. It is important for the system designer, installer, local authority, and building owners to know the temperature rating of cables and conductors for proper application.
Section 310.10 from the 2002 NEC follows:
310.10 Temperature Limitation of Conductors.
No conductor shall be used in such a manner that its operating temperature exceeds that designated for the type of insulated conductor involved. In no case shall conductors be associated together in such a way, with respect to type of circuit, the wiring method employed, or the number of conductors, that the limiting temperature of any conductor is exceeded.
FPN No. 1: The temperature rating of a conductor (see Table 310.13 and Table 310.61) is the maximum temperature, at any location along its length, that the conductor can withstand over a prolonged time period without serious degradation. The allowable ampacity tables, the ampacity tables of Article 310 and the ampacity tables of Annex B, the correction factors at the bottom of these tables, and the notes to the tables provide guidance for coordinating conductor sizes, types, allowable ampacities, ampacities, ambient temperatures, and number of associated conductors.

The principal determinants of operating temperature are as follows:

(1) Ambient temperature — ambient temperature may vary along the conductor length as well as from time to time.

(2) Heat generated internally in the conductor as the result of load current flow, including fundamental and harmonic currents.

(3) The rate at which generated heat dissipates into the ambient medium. Thermal insulation that covers or surrounds conductors affects the rate of heat dissipation.

(4) Adjacent load-carrying conductors — adjacent conductors have the dual effect of raising the ambient temperature and impeding heat dissipation.

FPN No. 2: Conductors installed in conduit exposed to direct sunlight in close proximity to rooftops have been shown, under certain conditions, to experience a temperature rise of 17°C (30°F) above ambient temperature on which the ampacity is based.

Panel Meeting Action: Reject

Panel Statement: Adding this section to 760.3 is unnecessary since Article 310 already applies within Article 760 for fire alarm systems, wherever appropriate. For example, 760.27(A) references 310.15 for those conductors larger than 16 AWG.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: It seems appropriate that the NEC define the minimum temperature rating for conductors and cables installed in compliance with Article 760. Chapter 3 wiring methods are permitted for power-limited fire alarm circuits by 760.52, so the temperature rating requirements in Sections 300.2(B) and 310.10 would apply. However, if a power-limited cable is installed, there are no requirements for a temperature rating on the cable. Right now, the user is dependent on whatever testing laboratories mark or do not mark on cable. As cable can be installed in a variety of areas having significantly different ambient temperatures, it makes sense to require a minimum temperature rating for cables with that minimum temperature not required to be marked on the cable.

3-223 Log #895 NEC-P03 **Final Action: Reject**
(760.8)

Submitter: Noel Williams, Noel Williams Consulting

Recommendation: Revise 760.8 as follows:

"...Cables and conductors installed exposed ~~on the surface of ceilings and sidewalls~~ shall be supported in such a manner...The installation shall also conform to 300. 4 ~~(D)~~ and 300.11 ." (Other portions to remain unchanged.)

Substantiation: Current cable support rules apply only to cables exposed to view (on surfaces). Cables above ceilings are "exposed" as defined, but such cables are only required to be "neat and workmanlike." All of 300.4 should apply. 300.4(D) is only for cables run parallel to framing. 300.11 should apply as it does in 640.6.

Panel Meeting Action: Reject

Panel Statement: The use of the word "exposed" was to recognize that exposed cables that are installed horizontally on framing members are more apt to be damaged than those cables installed through framing members or otherwise protected inside a drop ceiling or similar application.

There is no substantiation provided that justifies requiring fire alarm cables of smaller sizes to be supported separate from the ceiling wires. This is a different issue from raceways containing power conductors being connected to ceiling wires.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

AYER, L.: The wording of 760.8 is a result of the 2002 code cycle. The text was changed to notify the user of the code that fire alarm cables are required to be supported and secured differently below ceilings and sidewalls as compared to cables installed in the void spaces above an accessible ceiling. To require low-energy low-hazard fire alarm cables to be supported above an accessible ceiling to the same requirements of exposed cables below the ceiling that could be damaged would not be appropriate.

The addition of 300.11 would also be considered excessive. Some installations may have 10 feet of space between the dropped ceiling and the structure above. To require an independent support wire when adding a few fire alarm cables would be costly and burdensome for this application. There has been no technical substantiation provided that low voltage cabling is causing a problem with existing or new ceiling grids. Power wiring was moved to independent support wires due to actual problems that were occurring.

3-224 Log #1376 NEC-P03 **Final Action: Reject**
(760.8)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete requirement to comply with 300.4(D)

760.8 Mechanical Execution of Work.

Fire alarm circuits shall be installed in a neat workmanlike manner. Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be supported by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. ~~The installation shall also conform with 300.4(D).~~

Substantiation: There is no reason to protect limited energy circuits from accidental contact with nails or screws. Limited energy circuits are considered to be inherently safe from a fire and electric shock perspective, hence the allowances of lesser wiring methods and allowances for open splicing with out boxes. The protection of these circuits is a design and/or performance issue, not a safety issue. The requirement found in the existing *Code* text does not fit into the purpose of the NEC, as addressed in 90.1(A).

Panel Meeting Action: Reject

Panel Statement: Even though fire alarm circuits can be limited energy circuits, these circuits are an integral part of the life safety protection for a building. Disruption of the system through a fault or an open in a circuit can have serious consequences for early warning fire-related systems. Communications circuits are often tied into the fire alarm panel to provide communications for emergency evacuation and relocation during a fire. This section and 725.8 provide a link for the connection of various critical circuits, such as door release, elevator capture, smoke door and damper controls, fresh air intake and exhaust fan shutdown, as well as other building safety control systems. Many of these control circuits are connected through normally open or closed contacts in the fire alarm cabinet, and damage of the conductors can have some devastating results for the occupants of the building.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-225 Log #1377 NEC-P03 **Final Action: Reject**
(760.8)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Add "Cable Ties" to the list of supporting methods.

760.8 Mechanical Execution of Work.

Fire alarm circuits shall be installed in a neat workmanlike manner. Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be supported by straps, staples, cable ties , hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D).

Substantiation: This is being proposed in an effort to create uniform language with the chapter three cable wiring method support sections, specifically, 230.30(A), 330.30(A) and 334.30. Similar proposals are also being made to 725.8, 640.6, 770.24, 800.24, 820.24 and 830.24

Panel Meeting Action: Reject

Panel Statement: It is not acceptable to use a cable tie to serve as a sole support for a fire alarm cable when there is no spacing requirement provided for the distance between supports.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 10 Negative: 3

Explanation of Negative:

AYER, L.: Cable ties should be added to 725.8 as proposed by the submitter. These support device have been used for years without hazard even though they are not mentioned in this section. Adding this wording is just to notify users of the code that Class 1, Class 2 and Class 3 cables can be supported by this device. The panel's substantiation that cable ties cannot be used since there is no spacing requirement provided between supports does not make sense. There has never been spacing requirements when supporting control cables on straps, staples and hangers. To allow a thermostat cable to be supported by a strap, but not a cable tie, is not logical. The rejection of this proposal will cause confusion since cable ties will be allowed to support low-energy cables above a dropped ceiling but not below.

EASTER, L.: Unspecified straps, staples, hangers and similar fittings are permitted in this section to provide required support without prescribe maximum spacing intervals. The codemaking panel has not seen it necessary to prescribe maximum spacing intervals for cables covered by Article 760. UL1565 provides requirements for listed cable ties intended for primary support of flexible conduits and cables in accordance with the NEC. Such cable ties must have a minimum loop tensile strength rating of 23 kg (50 lbs.) or greater. NEMA believes that the panel action should be changed to Accept in Principle. Accept the proposed addition in the third sentence but add the following new fourth sentence. "Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.)."

PACE, D.: The panel should have accepted the proposal.

The existing text says "or similar fittings" leaving the list of support means open to other methods other than those listed. The use of cable ties or other methods is not prohibited by the existing text. Other parts of the NEC contain adequate requirements relating to issues such as the items being suitable for the service, adequate support distances, and being such that the cable is not subject to damage. The panel statement is not sufficient justification to reject including cable ties to the list in the existing text. If properly selected and installed, cable ties are a suitable means of support.

Comment on Affirmative:

CASPARRO, P.: While the submitter is correct in stating that cable ties are allowed in the other articles that he cites; all of the other articles that allow the use of cable ties as a means of support also contain a requirement for spacing between supports. It was pointed out in the panel discussion that a 100 foot run of cable with a tie wrap at each end would be allowed by the proposed text, this is certainly not acceptable especially since this cable contains a life safety circuit.

EGESDAL, S.: See my Explanation of Affirmative for Proposal 3-155.

3-226 Log #3051 NEC-P03 **Final Action: Reject**
(760.8)

Submitter: Harold C. Ohde, IBEW #134
Recommendation: Revise 760.8 as follows:

760.8 Mechanical Execution of Work

(A) **Neat and Workmanlike Manner.** Fire alarm equipment, cables and circuits shall be installed in a neat and workmanlike manner.

(B) Installation of Fire Alarm Cables . Fire alarm cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the fire alarm cables will not be damaged by normal building use. Such cables shall be secured by listed straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D) and 300.11 .

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunication Cabling,* and other ANSI-approved installation standards.

(C) **Abandoned Fire Alarm Cables.** Abandoned fire alarm cables shall be removed.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved standards which provide cable installation that facilitates the removal of abandoned optical fiber cables.

Substantiation: This proposal revises this section into a practical working tool which will assist in making 760.8 a clear, usable and enforceable code. Each first level subdivision contains a code rule that requires action and the required action has been presented in clear, usable and enforceable manner.

In the electrical industry, the electrician, contractor and AHJ have been taught the importance and significance of the concept of mechanical execution of work. I am an electrical instructor who teaches this important concept to the people involved. This is one of the basis for 90.1(A) which serves as the purpose of this Code. The Code's purpose is to provide a safe installation from hazards arising from the use of electricity.

The revised text in 760.8(A) will require all fire alarm equipment, cables and circuits to be installed in a neat and workmanlike manner.

760.8(B) is an editorial change with additional language to require the means of securing and supporting to be listed for the purpose. The inclusion of "and 300.11" will provide the same installation requirements that can be found be in 640.3, 770.24, 800.24, 820.24 and 830.24. The wording "and 300.11" was accepted by both CMP 12 and CMP 16 for the 2005 NEC edition.

The addition of 760.8(C) would replace the requirement that was in 760.3(A). It makes sense to have the requirements of both the installation of cable and the removal of cable in the same Code section. This would provide the proper guidance to everyone involved. The installer, contractor and the AHJ would gain from this revised section as the rules are centrally located in one Code section. If fire alarm cable is installed properly then the removal of fire alarm cable should be no problem if it is not needed anymore or abandoned. The proposed FPN will provide useful guidance and information to everyone involved regarding correct installation practices which would facilitate the removal of the cable as well.

Similar proposals have been submitted for 640.6, 725.8, 770.24, 800.24, 820.24, and 830.24.

Panel Meeting Action: Reject

Panel Statement: Fire alarm equipment is already required specifically to be installed in a neat and workmanlike manner by 110.12, so inserting it here is unnecessary.

Requiring listed straps, staples, and other supporting means for power-limited fire alarm cable is not necessary as long as the support mechanism can be accomplished without harming the cable. Section 760.25 already provides the link to the appropriate wiring methods used for the non-power-limited fire alarm circuits.

The requirement in Section 760.8 to apply Section 300.11 to fire alarm circuits is not necessary since Section 760.25 requires non-power-limited fire alarm circuits to have wiring methods comply with 300.11 and the small cables for power-limited fire alarm cables will not cause a problem for ceiling grid installations.

In Section 760.3(A), the concern of 300.21 is the spread of fire and products of combustion in hollow spaces, vertical shafts, and ventilation and air handling ducts caused by electrical installations. Removing the accessible portion of the cable seems to fit very well within 300.21 and should remain in Section 760.3(A) as a means of reducing unnecessary electrical products in these areas. There is no added benefit to the user of the NEC in adding this Fine Print Note since the removal of cable in accordance with 760.3(A) is already a requirement.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

CASPARRO, P.: This proposal should have been accepted in part. In the submitter's substantiation, he revised and restructured 760.8 into a practical working tool for all involved. This would have significant impact and provide guidance for the contractor, the installer and the AHJ. This would provide good and sound code that is easy to enforce. The FPNs that follow 760.8(B) and 760.8(C) provide no guidance nor any added benefit to the user of the code therefore, should be deleted.

3-227 Log #3625 NEC-P03 **Final Action: Reject**
(760.8)

Submitter: Christopher R. Pharo, Marlton, NJ
Recommendation: 760.8 after the second sentence to read:

Cables shall be supported from the building structure every 1.8m (6ft.)and 300mm (12in.) from a box or cabinet. Cables and conductors...".

Substantiation: There are currently no guidelines for distances between supports for the type of cabling used in this article. 5ft, 30ft, or even 100ft between supports is acceptable now in the 2005 NEC because it is not addressed. MC cable, a stiffer, more robust wiring method addressed in Chapter3, Article 330, dictates securing the cable at intervals not exceeding 1.8m (6ft.)

The previous code panel stated as the reason for rejecting this change was "The support of this cable should be based upon the size of the cable. Other wiring methods from Chapter 3 must follow the support requirements in that particular wiring method article." I agree with the panel that wiring methods listed in Chapter 3 have specific requirements with regards to distances beteen supports. This cable is not addressed in Chapter 3 therefore no requirements exist. It must be addressed in this article.

I am merely asking that this cable, the backbone of a fire alarm system, be supported at intervals that are consistent with wiring methods in Chapter 3.

Panel Meeting Action: Reject

Panel Statement: The recommendation to require a small four-conductor fire alarm cable to be supported every 6 feet and within 12 inches of a box or cabinet is more restrictive than the support requirements for rigid metal conduit or IMC. The support of this cable should be based on the size of the cable and the ability to adequately provide support so the cable is not damaged. Building construction methods will differ enough to affect the support requirements for fire alarm cables, so providing specific support requirements would be unrealistic. The submitter has not provided any industry-wide job problems to support this additional requirement.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

CASPARRO, P.: I agree that the panel statement that these requirements are more restrictive for a four pair cable than for rigid metal conduit, or IMC, but the tensile strength of these conduits is substantially greater to allow for this increased allowable spacing between supports. There may need to be different spacing requirements for four pair cable as compared to 600 pair cable, but this proposal is a step in the right direction. Currently, there is no requirement for the spacing of supports for these cables; this is clearly not in accordance with 90.1; especially since this cable contains a life safety circuit.

3-228 Log #2883 NEC-P03 **Final Action: Reject**
(760.8, FPN)

Submitter: Ron Alley, ELECTRICO
Recommendation: Delete the following FPN:

~~FPN: One source for information describing industry practices is ANSI/NECA 305-2001, Standard for Fire Alarm System Job Practices.~~

Substantiation: Numerous consensus standards from organizations such as National Fire Protection Association, Inc. (NFPA), Underwriters Laboratories Inc. (UL), NEMA and IEEE could be added as a Fine Print Note throughout the Code to assist the reader of the NEC as the existing FPN note does. There are just as many publications such as NFPA Pocket Guide to Fire Alarm System Installation and Fire Alarm Systems, and many others that could be listed in a FPN that would benefit the reader. Also, there are safety regulations, pertaining to fire alarm systems such as OSHA 1910 and OSHA 1926 that could be added as a Fine Print Note to assist readers to make their companies and workers safer. Adding a Fine Print Note for the purpose of informing the reader of all related standard and publications would be cumbersome. The NEC should list all prominent standards and Publications in a FPN or it should list none.

The particular standard mentioned in the FPN, (ANSI/NECA/305-2001 (Standard for Fire Alarm Systems Job Practices) is generic. In fact the document requires the manufacturer's instructions and a copy of NFPA 72. The standard does not contain enough information to be used as a stand alone document without the use of other material that is not mentioned in the FPN. In my opinion the ANSI standard listed in the FPN adds very little to the manufacturers instructions and should never be used instead of manufacturer's instructions.

Manufacturer's instructions are sometimes required to be included as a condition of listing or labeling of telecommunications equipment and are sent with the listed or labeled products or can be requested from the manufacturer

prior to installation. Manufacturers instructions are updated as needed to keep up with product improvements. The FPN in the 2005 Code most likely will not be as up to date as the manufacturer's instructions.
Panel Meeting Action: Reject
Panel Statement: The Code contains many fine print note references to ANSI-approved industry standards that provide explanatory information to Code users. Far from being generic, ANSI/NECA 305-2001 applies specifically to NEC 760.8; it provides additional information to explain what is meant by installing fire alarm circuits in a "neat and workmanlike manner".
Other documents mentioned in the submitter's substantiation such as OSHA 1910 and 1926 truly are generic. Others, such as the NFPA Pocket Guide to Fire Alarm Installation, are not appropriate to include in FPNs because they are not industry consensus standards developed with broad participation by Code users. The scope of ANSI/NECA 305-2001 states that "Installers should always follow the National Fire Alarm Code... and manufacturers, instruction when installing fire alarm equipment and systems".
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
AYER, L.: The ANSI/NECA-305 Fire Alarm Standard is simply extracted material from NFPA 72. Listing this document in a fine print note is inappropriate since users of the code may be led to believe this is a valuable standard when in fact 95% of the material is found within the NFPA 72 document. This may lead individuals to purchase both the ANSI and NFPA 72 material when this is not necessary. The fine print note should be deleted.

3-229 Log #3368 NEC-P03 **Final Action: Reject**
(760.8, FPN)

Submitter: Mark Miller, Plumechtrics Consulting Engineering
Recommendation: Revise text to read:
~~FPN: One source for information describing industry practices is ANSI/NECA 305-2001, Standard for Fire Alarm System Job Practice.~~ Installation practices and instructions for specific fire alarm equipment should be obtained from the manufacturer.
Substantiation: The fine print note should be revised. The ANSI/NECA standard is general in nature and is intended for any and all fire alarm systems. As a result, it is not specific enough to be helpful for the installer on any given system. We are fortunate to have numerous manufacturers in the marketplace which publish high quality installation instructions, technical notes and diagrams specific to their particular product. In the interest of safety and quality, the user of the code should be directed to the most accurate and most up-to-date information. This information should be orientated to the brand system that is being installed. The user should not be misdirected to general information.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 3-228. Section 110.3(B) already covers installation instructions of listed equipment. Installation practices are already provided in the NEC.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 2
Explanation of Negative:
AYER, L.: See my explanation of negative vote on Proposal 3-228.
CASPARRO, P.: See my explanation of negative vote on Proposal 3-228.

3-230 Log #2981 NEC-P03 **Final Action: Reject**
(760.8, FPN 2 (New))

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add text to read as follows:
<u>FPN No 2: Fire alarm circuit integrity cables require special precautions of installation to maintain circuit integrity ratings. UL Guide information for category FHIT contains information on proper installation requirements to maintain the fire rating, including raceway support, vertical support testing of boxes, compatibility of pulling lubricants and ground wires, and whether splices are allowable.</u>
Substantiation: There has been some confusion on installation of circuit integrity cables to maintain fire ratings. UL Guide information has been updated to provide useful information to clarify installation requirements.
Panel Meeting Action: Reject
Panel Statement: There are many more requirements located in category FHIT covering electrical circuit protective systems than have been proposed, but there are multiple UL standards for listing of this cable. UL 2196 provides testing requirements for fire-resistive cables and Subject 1724 provides the outline of investigation for fire-protective systems. This information is more appropriate for Annex A, since the user will be provided with both the outline of investigation reference number as well as the UL standard for testing these cables. The information provided by this proposal may be good information for the NEC Handbook.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
EGESDAL, S.: See my Explanation of Negative for Proposal 3-214.

3-231 Log #896 NEC-P03 **Final Action: Accept**
(760.9)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Delete 760.9 entirely.
Substantiation: Most similar statements were deleted in the last code cycle. This section was left even though it adds no additional information or requirements - making it completely redundant. Most fire alarm equipment and circuits are not required to be grounded [per 250.112(I)], but that fact is obscured by this section.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
EGESDAL, S.: While the present text is a violation of the NEC Style Manual, it seems reasonable to provide NEC users a clue that grounding rules may or may not apply to Article 760 circuits. Deletion of the 760.9 creates a conflict with Table 250.3, which points to 760.9.

3-232 Log #3023 NEC-P03 **Final Action: Reject**
(760.10)

Submitter: Barry F. O'Connell, Tyco Thermal Controls
Recommendation: Add to 760.10:
760.10 Fire Alarm Circuit Identification.
Fire alarm circuits shall be identified at terminal and junction locations, in a manner that will prevent unintentional interference with the signaling circuit during testing and servicing. <u>Raceways containing survivable circuits shall also be identified to facilitate inspection.</u>
Substantiation: Survivable circuits in fire alarm systems are not consistently inspected for compliance with the requirements in NFPA 72. The reason for this is that in many cases the onus for inspection rests with the fire department, who may inspect functionality, but not wiring; while the Electrical Inspector often will not inspect the fire alarm wiring given that the system is inspected by the fire department.
Panel Meeting Action: Reject
Panel Statement: The issue in this section is to ensure that the fire alarm circuits are identified at terminals and at junction locations so maintenance personnel are not required to disconnect fire alarm circuits to determine the function of the circuits and, in doing so, inadvertently cause problems with the fire alarm. There are several different methods for ensuring survivability for fire alarm circuits. One of the methods is to install these conductors in a metal raceway and by routing the raceway through a particular area of a building. Requiring identification of these raceways based on the survivability required in NFPA 72, the National Fire Alarm Code, would be difficult at best, if not impossible. Knowledgeable fire alarm inspectors, using NFPA 72, should be able to make the determination how these circuits must be installed to meet the survivability requirements in NFPA 72.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 2
Explanation of Negative:
CASPARRO, P.: The panel statement correctly points out that the proposal is trying to eliminate inadvertent problems with the Fire Alarm circuit. But, the statement that the enforcement would be next to impossible is a little far fetched. The marking of the conduits would actually make it very easy for the inspector to identify the raceway without the need for close proximity. Also, fire alarm inspectors do not usually check for wiring issues, this is usually left to the electrical inspector so should be included in the NEC.
EGESDAL, S.: See my Explanation of Negative for Proposal 3-234.

3-233 Log #3251 NEC-P03 **Final Action: Reject**
(760.10)

Submitter: David Filipiak, Sky Electric, Inc.
Recommendation: Add text to read as follows:
...shall be identified at terminal, <u>junction and pull</u> locations in a manner... testing and servicing.
Identification shall be by permanent marking with the color red at terminal, junction and, pull locations.
Substantiation: Pull locations are points of conduit intersections and are referenced in Article 314.
How identification is to be accomplished is not defined and a hand written note on a napkin would satisfy the code as it is currently written. The color red is universal with fire alarms and associated equipment.
Panel Meeting Action: Reject
Panel Statement: The issue in this section is to ensure that the fire alarm circuits are identified at terminals and at junction locations. The intent of the section is not to paint the connections red, but to provide actual identification at the terminals for ease of troubleshooting. Identifying conductors in a pull box where there are no terminations is not necessary since the purpose of the identification is to ensure ease of troubleshooting at terminal points.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-234 Log #3287 NEC-P03 **Final Action: Reject**
(760.10)

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 760.10, as shown.

760.10 Fire Alarm Circuit Identification and Marking .

(A) Circuit Identification. Fire alarm circuits shall be identified at terminal and junction locations ~~in a manner that wil~~ l to prevent unintentional ~~interference with the signaling circuit~~ faults on initiating device(IDC), notification appliance (NAC), and signaling line (SLC) circuits during testing and servicing.

(B) Circuit Marking. Initiating device (IDC), notification appliance (NAC), and signaling line (SLC) circuits shall be marked with tags or other appropriate means as follows: IDC, NAC, or SLC

FPN: Additional marking; if used; shall indicate the style of circuit (Class A or Class B) with the suffix letter "-A" or "-B".

Substantiation: The proposed marking provides specific instructions to the installer on how to provide critical fire alarm circuit identification and marking. In the fire alarm industry, the terms IDC, NAC, and SLC are commonly used, and coincide with text in the National Fire Alarm Code, NFPA 72-2002.

Panel Meeting Action: Reject

Panel Statement: The issue in this section is to ensure that the fire alarm circuits are identified at terminals and at junction locations so maintenance personnel are not required to disconnect fire alarm circuits to determine the function of the circuits and, in doing so, inadvertently cause problems with the fire alarm. Circuit identification can be accomplished by a variety of different methods, obviously tagging being one method but color-coding of the circuit conductors can be another method. Specific methods of identification should be limited to the requirements in NFPA 72 or the local facility. Many facilities have their own method for identification of initiating device circuits and notification appliance circuits. For example, a facility may require all pull stations be installed on a particular zone for all their buildings with a particular wire color for the pull station wiring and different colored wire for the smoke detectors. The fine print note contains mandatory text and is unnecessary, since this information is already contained in NFPA 72, which must be used in conjunction with the NEC for any fire alarm installation.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 11 Negative: 2
Explanation of Negative:

CASPARRO, P.: The panel statement says that circuit identification can be accomplished in a variety of methods, but this does not address the problem that is being pointed out by the proposal. If the scenario that is spelled out in the panel statement were used, the installer still would not have any way to identify exactly what type of circuit that exists in a junction box without prior knowledge of the specific facilities protocol as to identification of fire alarm circuits.

EGESDAL, S.: It is important to provide detailed and accurate identification of fire alarm circuits. Fire alarm circuits are permitted to be installed with circuits of other systems. If the fire alarm circuits are identified as requried in the proposal, inadvertent interruption of fire alarm service is minimized. Also, for systems additions or changes, as well as testing and servicing, detailed identification of circuits helps assure protection of life and property.
Many buildings do not have responsible staff in proximity of the fire alarm panel on a 24/7 basis. Even though a fire alarm panel will detect an inadvertent open circuit or ground fault, the trougle signal may go unnoticed for an unknown period of time.

3-235 Log #1202 NEC-P03 **Final Action: Reject**
(760.11)

Submitter: Merton W. Bunker, Jr., Ivan Rockwell, US Department of State
Recommendation: Add the following as a new last sentence to 760.11:

"Copper conductors run aerially or underground between buildings shall be protected with primary protection in accordance with Article 800."

Substantiation: The reference to 800.50 is not clear nor is it well enforced in the field and Article 225 does not require primary protection. A lightning strike raises ground plane potential sufficiently to cause severe damage unless primary protection is installed. This change makes it clear that protection is needed in all cases.

Panel Meeting Action: Reject

Panel Statement: Adding this sentence to 760.11 for power-limited fire alarm circuits is unnecessary since the section's reference to Part III of Article 800 would already require primary protectors in accordance with 800.90. Non-power-limited fire alarm circuits would be treated the same as branch circuits in accordance with Part I of Article 225 with the output voltage not greater than 600 volts. Primary and secondary protectors are rated to protect communications circuits (low voltages) against exposure to line voltages, so protectors are not rated for connection to non-power-limited circuits. The submitter has referenced an entire article, which is not permitted by Section 4.1.1 of the NEC Style Manual.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-236 Log #3596 NEC-P03 **Final Action: Reject**
(760.12 (New))

Submitter: Robert Hagarty, RANDL Industries, Inc.
Recommendation: Add new text to read:

760.12 Device or Equipment Fill. Where fire alarm devices or equipment are installed in outlet or device boxes their volume shall be deducted from the box volume and shall not be greater than 35 percent of the box volume. the remaining volume will be used to calculate the number of conductors in accordance with Table 314.16(B).

Substantiation: Observation

The proposed code changes are necessary to meet the intent of NEC 314.16 where it states:

Boxes shall be of sufficient size to provide free space for all enclosed conductors.

It has been observed repeatedly during 12 years tracking projects that for many modern devices the required free space is not available for conductors in the device box.

Goal

Demonstrate mathematically that a code change is necessary and essential to meet the intent of the code for box fill when using modern devices and equipment.

Problem and Solution

The volume allowance for device(s) and equipment in electrical boxes that is based upon the largest size of conductor terminated to the device(s) or equipment does not achieve the conductor free space required in Table 314.16(B) when modern devices and equipment that are larger than traditional receptacles and switches are installed.

The proposed method is based upon the actual device and equipment volume. Research indicates 35 percent of box fill for devices and equipment provides adequate free space for conductors.

To calculate box fill using this proposed method:

1. Check the volume of the device or equipment and deduct that volume from the box volume and verify it is no more than 35 percent of the box volume.

2. The remaining volume is then used to determine the maximum number of conductors allowable per Table 314.16(B).

Mathematical Demonstration

The representative few examples below are actual and commonly used in industry today.

Example A – Fire Alarm Device

1. Current Code: When a 13 in. 3 device is installed in a 21 in 3 box as specified by the manufacturer the device fills 62 percent of the box volume and leaves only 8 in. 3 of space for conductors. Per existing code 10 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus 8 conductors in 8 in. 3 of free space yields a ratio of 1.0 in. 3 of free space per conductor. This is only 50 percent of the free space required by Table 314.16(B).

2. Proposed Code. A 13 in. 3 device wold require a minimum of 37 in. 3 at 35 percent fill. 37 less 13 equals 24 in. 3 free space available for up to 12 #14 AWG conductors with 2.0 in. 3 of free space for each conductor, thus meeting the 2.0 in. 3 requirement of Table 314.16(B).

Example B – Fire Alarm Device

1. Current Code: When a 14 in. 3 device is installed in a 30 in. 3 box as specified by the manufacturer the device fills 47 percent of the box volume and leaves only 16 in. 3 of free space for conductors. Per existing code 15 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). Thus, 13 conductors in 16 in. 3 of free space yields a ratio of 1.23 in. 3 of free space per conductor. This is only 62 percent of the free space required by Table 314.16(B).

2. Proposed Code: A 14 in. 3 device would require a minimum of 40 in. 3 at 35 percent fill. 40 less 14 equals 26 in. 3 free space available for up to 13 #14 AWG conductors with 2.0 in. 3 free space for each conductor, thus meeting the 2.0 in. 3 requirements of Table 314.16(B).

Example C – Fire Alarm Device

1. Current Code: When a 27 in. 3 device is installed in a 51 in.3 box it consumes 53 percent of the box volume and leaves 24 in. 3 of space for conductors. Per existing Code 25 #14 AWG conductors may be installed in this box less 2 conductors for a double volume allowance terminated on the device per 314.16(B)(4). thus 23 conductors in 24 in. 3 of free space yields a ratio of 1.04 in. 3 of free space per conductor. This is only 52 percent of the free space required by Table 314.16(B).

2. Some suggest a quadruple conductor allowance to resolve this problem. If we install a 27 in. 3 device in a 51 in. 3 box existing code allows 25 #14 AWG conductors less 4 conductors still leaving 21 conductors. The device only requires 8 conductors; therefore a quadruple deduction has no real impact. The only thing that does alleviate these problems is limiting the volume that a device or equipment may consume in a box.

Response to Alternatives

1. If a box has conductors only and the maximum fill by actual volume of those conductors does not exceed 5 percent, why would we then allow a device to fill 65 percent the box volume and yet only reduce the number of conductors

by two? Why not fill a conductor only box up to 65 percent? The hazards become very obvious and so should the hazards of allowing devices and equipment with this same level of fill.

2. Some suggest a quadruple conductor allowance to resolve this problem. If we install a 27 in. 3 device in a 51 in. 3 box existing code allows 25 #14 AWG conductors less 4 conductors, still leaving 21 conductors. The device only requires 8 conductors; therefore a quadruple deduction has no real impact. The only thing that does alleviate these problems is limiting the volume that a device or equipment may consume in a box.

Impact of Proposed Code Change

The previous cycle of the code making panel expressed concern that manufacturers may be forced to stop making some products and be forced out of business. Our research indicates that this is unlikely because a larger box size is all that will be required for a product to meet the revised code. More importantly, these products will be installed more safely and with fewer wiring problems. As a result, even with the marginal cost increase for larger boxes, the overall costs will be less due to reduced installation and troubleshooting time.

It is our contention that if implemented the industry will see a marked decrease in the number of box related fires and fire related injuries and equipment damage.

Conclusion

The mathematical calculations using actual modern device volumes and the existing code fill allowances demonstrate unequivocally that the proposed code change is necessary to meet the spirit and safety intent of the code.

Panel Meeting Action: Reject

Panel Statement: The submitter provided very impressive mathematical calculations in his substantiation but did not provide actual fire alarm device dimensions to provide real box fill examples. Smoke detectors, for instance, have very small, if any, box intrusion, whereas pull stations have slightly more box intrusion. The dimensions provided in the mathematical demonstration portion of the substantiation only related to fictitious “fire alarm devices.” One volume deduction may not be reflective for all fire alarm devices, since some have more box intrusion than others.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-237 Log #3286 NEC-P03 **Final Action: Reject**
(760.15)

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Revise 760.15, as shown:

760.15 Fire Alarm Circuit Requirements.

Fire alarm circuits shall comply with 760.15(A) and 760.15(B).

(A) Non–Power-Limited Fire Alarm (NPLFA) Circuits. See Parts I and II.

(B) Power-Limited Fire Alarm (PLFA) Circuits. See Parts I and III.

FPN to (A) and (B): Fire alarm wiring methodology for installing Class A and Class B fire alarm circuits can be found in NFPA 72, National Fire Alarm Code.

Substantiation: Class A and Class B wiring methodology is not addressed in the NEC and it will be helpful to provide guidance for installers on where to go to find that information. This will go a long way towards improving quality of fire alarm installations. Job issues exist today because installers are not using NFPA 72 for application specific wiring requirements. This will be similar to directing individuals to Article 250 for grounding requirements.

Panel Meeting Action: Reject

Panel Statement: Section 760.1 already has a fine print note that states for further information on the installation and monitoring for integrity requirements in fire alarm systems, refer the reader to NFPA 72. As involved as fire alarm system wiring is for modern fire protection, understanding the fire alarm system performance and integrity requirements for Class and style is very important but is more complex than can be provided in a fine print note in the NEC.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-234. Additionally, Class A circuits have physical separation installation requirements. Unless the system designer and installer is alerted, the outbound and inbound fire alarm circuit conductors may be installed in the same cable or raceway, thereby defeating the purpose of requiring a Class A circuit. NFPA 72, National Fire Alarm Code is not directly adopted in many jurisdictions. It is imperative that the NEC “assist” the fire alarm industry by providing guidance on key fire alarm system functionality.

3-238 Log #2651 NEC-P03 **Final Action: Reject**
(760.16)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Move to a new section:

760.16 Abandoned Cables. The accessible portion of abandoned fire alarm cables shall be removed.

Remove wording in 760.3(A) “The accessible portion of abandoned fire alarm cables shall be removed.”

Substantiation: The title of Section 760.3 is “Other Articles”. The requirement for the removal of abandoned cables is not in another article; it is in Article 760. It is out of place in section 760.3. This proposal will move it to a new section of Article 760.

Panel Meeting Action: Reject

Panel Statement: The concern of 300.21 is the spread of fire and products of combustion in hollow spaces, vertical shafts, and ventilation and air-handling ducts caused by electrical installations. Removing the accessible portion of the cable seems to fit very well within 300.21 and should remain in Section 760.3(A) as a means of reducing unnecessary electrical products in these areas. Location of the requirement would mean that the requirement would apply more extensively than is currently required.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

CASPARRO, P.: The last sentence of the panel statement states that if accepted “...the requirement would apply more extensively than is currently required.” I think this is exactly what needs to happen because cables that are not in an area designated by 300.21 are being left abandoned in the rest of the building. While one abandoned cable left in a building poses no real threat; several hundred or even more certainly does add some unintended fire load to the building.

EGESDAL, S.: See my Explanation of Negative for Proposal 3-219.

3-239 Log #1909 NEC-P03 **Final Action: Accept**
(760.21)

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Recommendation: Revise 760.21 to read as follows:

760.21 NPLFA Circuit Power Source Requirements.

(A) Power Source. The power source of non-power-limited fire alarm circuits shall comply with Chapters 1 through 4, and the output voltage shall not be more than 600 volts, nominal.

(B) Branch Circuit. An individual branch circuit shall be required for the supply of the power source. This branch circuit ~~These circuits~~ shall not be supplied through ground-fault circuit interrupters or arc-fault circuit interrupters.

FPN: See 210.8(A)(5), Exception No. 3, for receptacles in dwelling-unit unfinished basements that supply power for fire alarm systems.

Substantiation: This revision editorially splits up the paragraph and adds titles. The technical revision is to bring the requirements into alignment with NFPA 72, 4.4.1.4.1 which requires a dedicated branch circuit to supply the fire alarm power supply. The addition to the NEC will make it known what the proper circuit configuration is for the fire alarm supply. In addition, the term “individual branch circuit” is proposed to make the language consistent with the NEC definitions.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-240 Log #1201 NEC-P03 **Final Action: Accept**
(760.25)

Submitter: Merton W. Bunker, Jr., Ivan Rockwell, US Department of State

Recommendation: Add the following reference to 300.7 as follows:

“...110.3(B), 300.7 , 300.11...”.

Substantiation: Conduit installed in humid climates is often routed through air-conditioned spaces, which causes condensation in the conduit and equipment. This condensation has caused damage and failure of fire alarm systems on a frequent basis. A specific reference to 300.7 would remedy this problem

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-241 Log #904 NEC-P03 **Final Action: Reject**
(760.25 Exception No. 2)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

Where other articles of this Code require or permit other methods.

Substantiation: Edit. Overhead open wiring is permitted between buildings and structures as permitted in Article 225 and 553.13(B) and wiring methods of 553.13(A)(2) are permitted, but not required.

Panel Meeting Action: Reject

Panel Statement: The provisions of Article 225 are requirements for outside branch circuits and feeders and are not primarily permissive type rules but rather are mandatory rules when these circuits are installed outside a building. The other two references provided in the substantiation do not exist.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-242 Log #369 NEC-P03 **Final Action: Reject**
(760.30(A)(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
Where installed exposed, cables shall be adequately supported and installed in such a way that maximum protection against ~~physical~~ damage is afforded by building construction such as baseboards, door frames, ledges, and so forth.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-177.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-243 Log #2372 NEC-P03 **Final Action: Reject**
(760.30(B)(2), FPN)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add the following Fine Print Note to 760.30(B)(2).
<u>FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.</u>
Substantiation: The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).
NFPA 13, Installation of Sprinkler Systems, requires installation of a sprinkler system where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:
"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:
(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.
(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."
"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."
The definition of combustible, from NFPA 5000 is:
"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."
During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because Type CMP cable is permitted to substitute for Type CL2P and Type CL3P cables, it is important to have parallel requirements in both NEC Sections.
In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied in Standards Council Decision 04-7-1-z-cc, copy provided.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The definition for "concealed" in Article 100 in the 2005 NEC does not apply to the proposed fine print note. The area above a suspended ceiling is not considered by the NEC to be a concealed space. The definition of concealed does not exist in NFPA 13, but they allude to the area above a drop ceiling as being concealed which does not match the definition used in Article 100. The reference to NFPA 13 does not seem appropriate in 760.30(B)(2) at this time, since putting a sprinkler head in an inaccessible location inside the wall or above a drywall ceiling would not permit access for servicing.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-244 Log #2373 NEC-P03 **Final Action: Reject**
(760.30(B)(4), FPN)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add the following Fine Print Note to 760.30(B)(4).
<u>FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.</u>
Substantiation: The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).
NFPA 13, Installation of Sprinkler Systems, requires installation of a sprinkler system where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:
"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:
(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.
(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."
"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."
The definition of combustible, from NFPA 5000 is:
"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."
During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because Type CMP cable is permitted to substitute for Type CL2P and Type CL3P cables, it is important to have parallel requirements in both NEC Sections.
In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied in Standards Council Decision 04-7-1-z-cc, copy provided.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-243.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-245 Log #1910 NEC-P03 **Final Action: Accept**
(760.41)

Submitter: James W. Carpenter, International Association of Electrical Inspectors
Recommendation: Revise 760.41 to read as follows:
760.41 Power Sources for PLFA Circuits.
<u>(A) Power Source.</u> The power source for a power-limited fire alarm circuit shall be as specified in 760.41 ~~(1), (2), or (3). (A), (B), or (C). These circuits shall not be supplied through ground fault circuit interrupters or arc fault circuit interrupters.~~
FPN No. 1: Tables 12(A) and 12(B) in Chapter 9 provide the listing requirements for power-limited fire alarm circuit sources.
FPN No. 2: See 210.8(A)(5), Exception No. 3, for receptacles in dwelling-unit unfinished basements that supply power for fire alarm systems.
~~(A)~~ <u>(1)</u> ~~Transformers.~~ A listed PLFA or Class 3 transformer.
~~(B)~~ <u>(2)</u> ~~Power Supplies.~~ A listed PLFA or Class 3 power supply.
~~(C)~~ <u>(3)</u> <u>Listed Equipment.</u> Listed equipment marked to identify the PLFA power source.

FPN: Examples of listed equipment are a fire alarm control panel with integral power source; a circuit card listed for use as a PLFA source, where used as part of a listed assembly; a current-limiting impedance, listed for the purpose or part of a listed product, used in conjunction with a non-power-limited transformer or a stored energy source, for example, storage battery, to limit the output current.

<u>(B) Branch Circuit. An individual branch circuit shall be required for the supply of the power source. This branch circuit shall not be supplied through ground-fault circuit interrupters or arc-fault circuit interrupters.</u>

Substantiation: This revision editorially splits up the paragraph and adds titles. The technical revision is to bring the requirements into alignment with NFPA 72, 4.4.1.4.1 which requires a dedicated branch circuit to supply the fire alarm power supply. The addition to the NEC will make it known what the proper circuit configuration is for the fire alarm supply. In addition, the term "individual branch circuit" is proposed to make the language consistent with the NEC definitions.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-246 Log #1200 NEC-P03 **Final Action: Accept**

(760.52(B))

Submitter: Merton W. Bunker, Jr., Ivan Rockwell, US Department of State

Recommendation: Add the following reference to 300.7 as follows:

"...110.3(B), <u>300.7</u> , 300.11(A)...".

Substantiation: Conduit installed in humid climates is often routed through air-conditioned spaces, which causes condensation in the conduit and equipment. This condensation has caused damage and failure of fire alarm systems on a frequent basis. A specific reference to 300.7 would remedy this problem.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-247 Log #370 NEC-P03 **Final Action: Reject**

(760.52(B)(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise text as follows:

"...Where installed exposed, cables shall be adequately supported and installed in such a way that maximum protection against ~~physical~~ damage is afforded by building construction such as baseboards, door frames, ledges, and so forth...".

Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")

Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-177.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-248 Log #1289 NEC-P03 **Final Action: Accept**

(760.56)

Submitter: Gerald Lee Dorna, Belden CDT. Inc.

Recommendation: Revise text to read:

760.56 Installation of Conductors of Different PLFA Circuits, Class 2, Class 3, and Communications Circuits in the Same Cable, Enclosure, <u>Cable Tray</u> or Raceway.

(A) Two or More PLFA Circuits. Cable and conductors of two or more power-limited fire alarm circuits, communications circuits, or Class 3 circuits shall be permitted within the same cable, enclosure, <u>cable tray</u> or raceway.

(B) Class 2 Circuits with PLFA Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure, <u>cable tray</u> or raceway with conductors of power-limited fire alarm circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure, or raceway is at least that required by the power-limited fire alarm circuits.

(C) Low-Power Network-Powered Broadband Communications Cables and PLFA Cables. Low-power network-powered broadband communications circuits shall be permitted in the same enclosure <u>, cable tray</u> or raceway with PLFA cables.

(D) Audio System Circuits and PLFA Circuits. Audio system circuits described in 640.9(C) and installed using Class 2 or Class 3 wiring methods in compliance with 725.54 and 725.61 shall not be permitted to be installed in the same cable <u>, cable tray,</u> or raceway with power-limited conductors or cables.

Substantiation: Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray. Stating that these cables are allowed "in the same cable tray" will avoid having the user assume that they are not permitted to be installed together in the same cable tray. It clarifies the use in the Code. Article 770, in section 770.133(B), has text similar to that proposed here. This is one of five similar proposals that are being submitted for Articles 725, 760, 800, 820 and 830.

Conversely thinking, I therefore also added "cable tray" to 760.56(D).

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

SANDERS, M.: IEEE agrees that all cables listed for the application should be allowed to be installed in cable trays under 650.56(A), (B), and (C). IEEE further agrees that adding "cable trays" to 760.56(D) is necessary and will then prevent installation of Audio System Circuits and PLFA Circuits within the same cable trays.

However, IEEE disagrees with the submitter's assertion, "Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray."

Only cable listed for installation in cable trays can be installed in cable trays.

3-249 Log #1837 NEC-P03 **Final Action: Reject**

(760.56(D))

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician

Recommendation: Revise as follows:

(D) Audio system circuits described in 640.9(C) and installed using Class 2 or Class 3 wiring methods in compliance with 725.4 and 725.61 shall not be permitted to be installed on the same cable or raceway with power-limited connections or cables. <u>Separation in enclosures shall be required by dividers or equivalent.</u>

Substantiation: The same requirement is needed for protection of terminal boxes, enclosures, and the like. Same dangers are present in cables or raceways.

Panel Meeting Action: Reject

Panel Statement: The reason for restricting power-limited fire alarm circuits from being in the same cable or raceway with audio circuits is the possibility of power noise inductively coupling into the audio circuit and affecting fire alarm audio communication circuits used for emergency evacuation. The small amount of exposure within a box or an enclosure is negligible.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-250 Log #2524 NEC-P03 **Final Action: Reject**

(760.61)

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Add the following sentence to 760.61, to read as follows:

PLFA cables shall comply with the requirements described in either 760.61(A), (B), or (C) or where cable substitutions are made as shown in 760.61(D). <u>Type FPL50 fire alarm very-low-smoke cable shall be permitted to be installed meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.</u>

Substantiation: NFPA 13-2002 has requirements for installation of sprinklers where a concealed space has combustible loading. The proposed very-low-smoke producing cable has a heat release that is significantly lower than combustible plenum cable listed using NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces* .

The 2003 International Mechanical Code (IMC), 602.2.1 requires a smoke developed index less than 25 and a smoke developed index less than 50 for materials in plenums.

The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).

NFPA 13-2002, Installation of Sprinkler Systems, requires installation of a sprinkler system in concealed spaces where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:

"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:

(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.

(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."

"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."

The definition of combustible, from NFPA 5000 is:

"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."

During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because communications cables are permitted to substitute for Class 2 and Class 3 circuit cables, it is important to have parallel requirements in both NEC Sections. Additionally, the Fine Print Note applies to all concealed spaces.

In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied.

There is a companion proposal for the listing and marking of Type FPL50.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Proposal 3-171.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

EGESDAL, S.: As submitter of this proposal, I agree with the part of the Panel Statement indicating the proposed text would have been more appropriate in another section, such as 760.61(C), Other Wiring Within Buildings.

However, the Panel is in error by stating that the proposed Type FPL50 could be used in a plenum. Section 760.61(A) requires a Type FPLP cable. The proposed cable does not have a "P" in the marking. So, clearly, referencing the NFPA 90A directive on NFPA 90A is in error.

3-251 Log #2199 NEC-P03 **Final Action: Reject**
(760.61,760.82)

Submitter: Frank Peri, Communications Design Corporation

Recommendation: In 760.61 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Also revise (I) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Air Ducts. Cables installed in air ducts shall be Type FPLD and shall be associated with the air distribution system and shall be as short as practicable. Types FPLD, FPLP and FPL cables installed in raceway that is installed in compliance with 300.22(B) shall also be permitted.

(B~~A~~) Plenum. Cables installed in ~~ducts,~~ plenums~~,~~ and other space~~s~~ used for environmental air shall be Type FPLD or FPLP. Types FPLD, FPLP, FPLR, and FPL cables installed in compliance with 300.22 shall be permitted. Types FPLD-CI and FPLP-CI cables shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.

(E~~D~~) Fire Alarm Cable Substitutions. The substitutions for fire alarm cables listed in Table 760.61 shall be permitted. Where substitute cables are installed, the wiring requirements of Article 760, Parts I and III shall apply.

FPN: For information on communications cables (CMD, CMP, CMR, CMG, CM), see 800.179.

Table 760.61 Cable Substitutions

Cable Type	References	Permitted Substitutions
FPLP	760.61(A)	CMD, CMP
FPLR	760.61(B)	CMD, CMP, FPLP, CMR
FPL	760.61(C)	CMD, CMP, FPLP, CMR, FPLR, CMG, CM

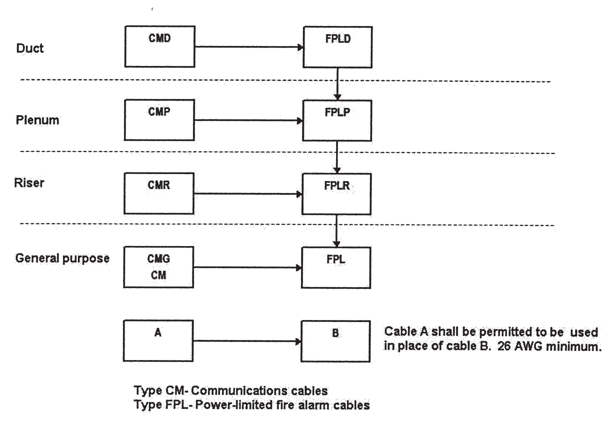

Figure 760-61 Cable substitution hierarchy.

In 760.82 revise and re-letter the existing section (D) to (E) and introduce a new (D) as shown below. Revise section (I) as show. Re-letter the remaining sections, (E) to (F), (F) to (G) etc.

(D)Types CL2D and CL3D. Type FPLD power-limited fire alarm air duct cable shall be listed as suitable for use in air ducts and shall be rated for continuous use at 121ºC. Type FPLD power-limited fire alarm air duct cable shall also be listed as having a low potential heat value, low flame spread characteristics, and very low smoke-producing characteristics.

FPN: One method of defining a low potential heat cable is establishing an acceptable value of potential heat when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, to a maximum potential heat value not exceeding 8141 kJ/kg (3500 BTU/lb). One method of defining low flame spread cable is establishing an acceptable value of flame spread when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to a maximum flame spread index of 25, with the cable unslit (intact) and slit. Similarly, one method of defining very low smoke-producing cable is establishing an acceptable value when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to maximum smoke developed index of 50, with the cable unslit (intact) and slit. These test methods and resultant values correlate with the requirements of NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems* for materials installed in ducts and plenums. *For additional testing information see Underwriters Laboratories Subject 2424, Outline of Investigation For Cable Marked Limited Combustible.*

(E~~D~~) Type FPLP. Type FPLP power-limited fire alarm plenum cable shall be listed as being suitable for use in ~~ducts,~~ plenums~~,~~ and other space used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining low smoke-producing cable is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces*, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.

(J~~I~~) Cable Marking. The cable shall be marked in accordance with Table 760.82(I). The voltage rating shall not be marked on the cable. Cables that are listed for circuit integrity shall be identified with the suffix CI as defined in 760.82(G).

FPN: Voltage ratings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1, electric light, and power applications.

Exception: Voltage markings shall be permitted where the cable has multiple listings and voltage marking is required for one or more of the listings.

Table 760.82(I) Cable Markings	
Cable Marking	**Type**
FPLD	Power-limited fire air duct cable
FPLP	Power-limited fire alarm plenum cable
FPLR	Power-limited fire alarm riser cable
FPL	Power-limited fire alarm cable
Note: Cables identified in 760.82(D), (E), and (F) as meeting the requirements for circuit integrity shall have the additional classification using the suffix "CI" (for example, FPLD-CI, FPLP-CI, FPLR-CI, and FPL-CI).	

FPN: Cable types are listed in descending order of fire-resistance rating.

Substantiation: Summary

This proposal is submitted to accomplish four things:

1.) Change the code to not allow the dangerous practice of using air ducts as a cable pathway.

2.)Code recognition that there may be instances where a small amount of in-duct cable is necessary for air handling equipment, dampers, security, temperature control, fire protection, etc.

3.)Establish minimum requirements for flame spread, smoke, and potential heat for in-duct (CL2D, CL3D, FPLP, OFND, OFCD, CMD and CATVD) cables used in this special hazard space.

4.)Include air duct "D" cables as permissible substitute for plenum "P" cables for installation in ceiling cavity and raised floor plenums (other space used for environmental air).

This proposal correlates with a TIA that I submitted for NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems.* Similar proposals have been submitted for Articles 725, 760, 770, 800 and 820.

The substantiation for the TIA is shown below:

"This TIA is being submitted in accordance with Section 5 of the *2005 NFPA REGULATIONS GOVERNING COMMITTEE PROJECTS.* In particular, it addresses a hazard meeting the criteria of section 5-2(d), which states:

(d) The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

The purpose of this TIA is to address the dangerous practice of installing combustible communications/data cables in air ducts.

NFPA 90A-2002 does not have explicit requirements for electrical wiring in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cable into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This TIA would greatly reduce the amount of wiring in air ducts by only permitting wiring and raceways associated with the air distribution system and also requiring that they be as short as practicable. It would require that the wiring and nonmetallic raceway in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A permits the supplied air to be at 121° C (250 ° F). The permitted wiring and nonmetallic raceway would be required to have initial flame spread and smoke requirements identical to those for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). In addition to these initial requirements, there are slitting and ageing requirements to assure that the cables installed in air ducts meet the flame spread, smoke and potential heat requirements equivalent to those for limited combustible materials. Essentially they would be required to be listed to the UL 2424.

Combustible plenum cable is unsuitable and dangerous for this application. Typically, combustible plenum cable has a temperature rating of 60° C, which is significantly less that the 121° C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests, these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

It is essential that these requirements be adopted now in NFPA 90A."

Section 760.61(A) in the 2005 NEC permits unlimited amounts of Type FPLP cable in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of an air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cables into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This proposal would greatly reduce the amount of wiring in air ducts by only permitting wiring associated with the air duct and as short as practicable. It would require that the wiring in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, permits the supplied air to be at 121° C (250° F). The permitted wiring would be required to have flame spread and smoke requirements identical to those in NFPA 90A-2002 section 4.3.3.1 for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). Essentially they would be required to be listed to the UL 2424, *Outline of Investigation For Cable Marked Limited Combustible* (copy attached) .

"P" type plenum cables are unsuitable and dangerous for this application. Typically, they have a temperature rating of 60° C, which is significantly less that the 121° C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests (copy attached), these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

"D" type air duct cables will meet the NFPA 90A listing requirements for use in ceiling cavity and raised floor plenums (other space used for environmental air) and therefore will be able to safely substitute for "P" type plenum cables. "D" type air duct cables have approximately 1/20 the smoke production of "P" type plenum cables.

In order to be consistent with the applications of plenum cable, this proposal will also prohibit the installation of plenum communications raceways in air ducts.

The cable substitution table and figure have been revised to permit air duct cables to substitute for plenum cables since air duct cables are superior cables. "D" type air duct cables also meet the requirements in NFPA 90A for use in ceiling cavity plenums and raised floor plenums (other space used for environmental air).

Some of the applications that require the installation of cables in air ducts are fire alarm (Article 760), temperature sensing and control (Article 725), security (Articles 725 and 820) and communications (Article 800). Optical fiber cables (Article 770) could be used in place of copper conductor cables. Communications cables are permitted to substitute for Class 2 & 3, fire alarm and CATV cables. I am submitting similar proposals for each of these articles.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Proposal 3-252.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-252 Log #3234 NEC-P03 **Final Action: Reject**

(760.61(A))

Submitter: Frank Peri, Communications Design Corporation

Recommendation: Revise 760.61(A), as shown.

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type FPLD, or FPLP. Types FPLD, FPLP, FPLR, and FPL cables installed in compliance with 300.22 shall be permitted. Type FPLP-CI cable shall be permitted to be installed to provide a 2-hour circuit integrity rated cable.

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1: a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements in Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to

plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-253 Log #2375 NEC-P03 **Final Action: Reject**
(760.61(A), FPN)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add the following Fine Print Note to 760.61(A).
FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation: The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).
NFPA 13, Installation of Sprinkler Systems, requires installation of a sprinkler system where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:
"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:
(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.
(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."
"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."
The definition of combustible, from NFPA 5000 is:
"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."
During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because Type CMP cable is permitted to substitute for Type CL2P and Type CL3P cables, it is important to have parallel requirements in both NEC Sections.
In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied in Standards Council Decision 04-7-1-z-cc, copy provided.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 3-243.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-254 Log #3283 NEC-P03 **Final Action: Accept**
(760.61(C)(1) through (C)(4))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise text to read as follows:
Add titles, as shown:
(C) Other Wiring Within Buildings. Cables installed in building locations other than those covered in 760.61(A) or 760.61(B) shall be as described in either (1), (2), (3), or (4). Type FPL-CI cable shall be permitted to be installed as described in either (1), (2), (3), or (4) to provide a 2-hour circuit integrity rated cable.
(1) **General.** Type FPL shall be permitted.
(2) **In Raceways.** Cables shall be permitted to be installed in raceways.
(3) **Nonconcealed Spaces.** Cables specified in Chapter 3 and meeting the requirements of 760.82(A) and 760.82(B) shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).
(4) **Portable Fire Alarm System.** A portable fire alarm system provided to protect a stage or set when not in use shall be permitted to use wiring methods in accordance with 530.12.
Substantiation: This proposal is editorial. This proposal adds titles to subsections in accordance with the NEC Style Manual. Additionally, the titles are parallel to titles in 800.154(E).
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-255 Log #2525 NEC-P03 **Final Action: Reject**
(760.61(D) and FPN to 760.61D)

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 760.61(D). Table 760.61(D) does not change.
(D) Fire Alarm Cable Substitutions. The substitutions for fire alarm cables listed in Table 760.61 shall be permitted. Type FPL50 fire alarm very-low-smoke cable shall be permitted to substitute for all PLFA cables in Table 760.61(D) to meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics. Where substitute cables are installed, the wiring requirements of Article 760, Parts I and III shall apply.
FPN No. 1 : For information on communications cable (CMP, CMR, CMG, CM), see 800.179.
FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation: This proposal correlates with the proposal to add Type FPL50 to 760.61.
There is a companion proposal for the listing and marking of Type FPL50.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 3-252.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-256 Log #3235 NEC-P03 **Final Action: Reject**
(760.62(D))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Revise 760.61(D), as shown.
(D) Fire Alarm Cable Substitutions. The substitutions for fire alarm cables listed in Table 760.61 shall be permitted. Type FPLD shall be permitted to substitute for all fire alarm cables in Table 760.61 and Figure 760.61. Where substitute cables are installed, the wiring requirements of Article 760, Parts I and III shall apply.
FPN: For information on communications cables (CMD, CMP, CMR, CMG, CM), see 800.179.
Substantiation: This proposal correlates the substitution table and figure with the listing and application requirements for air duct cable.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 3-252.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-257 Log #2980 NEC-P03 **Final Action: Reject**
(760.81, FPN)

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Update NFPA 72 reference from 72-2002 to 72-2006.
Substantiation: This will be the latest date of NFPA 72 when the NEC goes to print.
Panel Meeting Action: Reject
Panel Statement: The referenced edition does not exist.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-258 Log #2978 NEC-P03 **Final Action: Accept in Principle**
(760.81(B)(1) (New))

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Add text to read as follows:
(1) Wet Locations: Cable used in a wet locations shall be listed for use in wet locations or have a moisture impervious metal sheath.
Substantiation: Fire alarm cables, type NPLF is used outdoors (such between buildings per 760.11) or in wet locations. The new wording paraphrased from 310.8 clarifies that NPLF cable used in wet locations shall be listed for this use, or protected from the wet location by a moisture impervious metal sheath. UL has an optional listing for wet ratings of NPLF cable.
Panel Meeting Action: Accept in Principle
Add the following sentence at the end of the 760.81 main rule to read as follows:
Cable used in a wet location shall be listed for use in wet locations or have a moisture impervious metal sheath.

Panel Statement: The panel has accepted the recommendation but provided more appropriate direction for the location of this text.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-259 Log #3034 NEC-P03 **Final Action: Reject**
(760.81(C), FPN)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Revise text to read as follows:
760.81 Listing and Marking of NPLFA Cables.
Non–power-limited fire alarm cables installed as wiring within buildings shall be listed in accordance with 760.81(A) and 760.81(B) and as being resistant to the spread of fire in accordance with 760.81(C) through 760.81(F), and shall be marked in accordance with 760.81(G).
(A) NPLFA Conductor Materials. Conductors shall be 18 AWG or larger solid or stranded copper.
(B) Insulated Conductors. Insulated conductors shall be suitable for 600 volts. Insulated conductors 14 AWG and larger shall be one of the types listed in Table 310.13 or one that is identified for this use. Insulated conductors 18 AWG and 16 AWG shall be in accordance with 760.27.
(C) Type NPLFP. Type NPLFP non–power-limited fire alarm cable for use in other space used for environmental air shall be listed as being suitable for use in other space used for environmental air as described in 300.22(C) and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.
FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces. ~~is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-1999, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.~~
No change for 760.81 (D) through 760.81 (G)
Substantiation: This comment recommends a slight change in wording for the existing Fine Print Note, by recognizing that listing of plenum cable by NFPA 262 represents listing to both low smoke and low flame spread, and that cables cannot be listed separately to either property. This is basically an editorial change, as a clarification, to the existing Fine Print Note.
The same change is being proposed to the other corresponding Fine Print Note in article 760 and to that in article 725. The new language is consistent with the language in the corresponding fine print notes in articles 770, 800, 820 and 830, all of which deal with the same type of cables.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Proposal 3-252.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
GUIDA, T.: This proposal should have been accepted. With reference to the Panel Statement, this proposal does not change the “status quo” with regard to plenum cables. The proposal is essentially editorial. The proposed revised FPN actually aligns the wording of the FPN with the existing wording in NFPA 90A for cables in ceiling cavity and raised floor plenums.

3-260 Log #1421 NEC-P03 **Final Action: Accept**
(760.81(E) and 760.82(F) FPNs)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
FPN: One method of defining “resistant to the spread of fire” is that the cables do not spread fire to the top of the tray in the “ UL Flame Exposure , Vertical Tray Flame Test” in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords~~ . UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.
Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA “Vertical Flame Test - Cables in Cable Trays,” as described in CSA C22.2 No. 0.3-M- ~~1985~~ 2001 , Test Methods for Electrical Wires and Cables.
Substantiation: The revised wording is an update of the standard references and not a change in the test methods. UL 1581 now references UL 1685 for the text of the test method.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-261 Log #3054 NEC-P03 **Final Action: Reject**
(760.82, FPN 1)

Submitter: Robert Konnik, Rockbestos-Suprenant
Recommendation: Update NFPA 72 reference from 72-2002 to 72-2006.
Substantiation: This will be the latest date of NFPA 72 at the time of the next printing of the NEC.
Panel Meeting Action: Reject
Panel Statement: The referenced edition does not exist.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-262 Log #2390 NEC-P03 **Final Action: Reject**
(760.82(C))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Revise 760.82(C) as follows:
(C) Ratings. The cable shall have a voltage rating of not less than 300 volts and a temperature rating of not less that 60ºC .

Substantiation: The cables and conductors in this article do not have a temperature rating requirement. It is important for the system designer, installer, local authority, and building owners to know the temperature rating of cables and conductors for proper application.
The following is from Underwriters Laboratories HNIR. GuideInfo for Power-limited Fire Alarm Cable.
“Unless a higher temperature rating is marked on the cable, power-limited fire alarm cable is intended for use where operating temperature does not exceed 60°C. The voltage rating is 300 V but is not marked.”
There are applications where ambient temperature or job specifications require cable with a temperature rating higher than 60ºC. For example, a cable could contact the outside of an air duct. The 2003 International Mechanical Code, 604.3 requires material that covers the outside of an air duct to be tested at a temperature no less than 121C (250F), and in addition requires the test temperature to match the planned application.
Where there is electrical wiring to a smoke control system, a cable with higher than a 60C rating may be required. IMC; “ **607.3.2 Smoke damper ratings.** Smoke damper leakage ratings shall not be less than Class II. Elevated temperature ratings shall be not less than 250ºF (121ºC).
Panel Meeting Action: Reject
Panel Statement: This proposal does not add any new requirement except for marking, which is already covered by the product standard and general directory.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
EGESDAL, S.: See my Explanation of Negative for Proposal 3-222.

3-263 Log #3284 NEC-P03 **Final Action: Reject**
(760.82(C))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 760.82(C) and reformat as shown.
(C) Ratings.
Voltage. The cable shall have a voltage rating of not less than 300 volts.
Temperature. Conductor insulation shall have a rating of not less than 60ºC. Fire alarm cables shall be marked with the temperature rating of the insulation immediately following the Type designation.
FPN No. 1: For more information, see 310.10 Temperature Limitation of Conductors.
FPN No. 2: Building codes may have a cable insulation temperature requirement as high as 200ºC.
FPN No. 3: An example of the marking is FPLP 200ºC indicating a plenum cable rated at 200ºC.
Substantiation: Presently, this article does not have a temperature rating requirement on conductor insulation.
Power-limited fire alarm cable on the market today are typically listed with a 60ºC temperature rating on the conductors. Some building codes require a temperature rating as high as 200ºC. The following is from a cable supplier specification sheet: **Plenum Fire Alarm Cable, New York City Certified, (UL) FPLP, Low Capacitance 200°C.**
By referencing to 310.10, users will be aware that a cable with a temperature rating higher than 60ºC is required to meet a high temperature application. For information 310.10 follows:
310.10 Temperature Limitation of Conductors.
No conductor shall be used in such a manner that its operating temperature exceeds that designated for the type of insulated conductor involved. In no case shall conductors be associated together in such a way, with respect to type of circuit, the wiring method employed, or the number of conductors, that the limiting temperature of any conductor is exceeded.
FPN No. 1: The temperature rating of a conductor (see Table 310.13 and Table 310.61) is the maximum temperature, at any location along its length, that the conductor can withstand over a prolonged time period without serious degradation. The allowable ampacity tables, the ampacity tables of Article 310

and the ampacity tables of Annex B, the correction factors at the bottom of these tables, and the notes to the tables provide guidance for coordinating conductor sizes, types, allowable ampacities, ampacities, ambient temperatures, and number of associated conductors.

The principal determinants of operating temperature are as follows:

(1) Ambient temperature — ambient temperature may vary along the conductor length as well as from time to time.

(2) Heat generated internally in the conductor as the result of load current flow, including fundamental and harmonic currents.

(3) The rate at which generated heat dissipates into the ambient medium. Thermal insulation that covers or surrounds conductors affects the rate of heat dissipation.

(4) Adjacent load-carrying conductors — adjacent conductors have the dual effect of raising the ambient temperature and impeding heat dissipation.

FPN No. 2: Conductors installed in conduit exposed to direct sunlight in close proximity to rooftops have been shown, under certain conditions, to experience a temperature rise of 17°C (30°F) above ambient temperature on which the ampacity is based.

Panel Meeting Action: Reject

Panel Statement: This proposal does not add any new requirement except for marking, which is already covered by the product standard and general directory.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-222.

3-264 Log #3057 NEC-P03 **Final Action: Accept in Principle**

(760.82(C)(1))

Submitter: Robert Konnik, Rockbestos-Suprenant

Recommendation: Add a new Section 760.82(C)(1) for FPL cable for use in wet locations as follows:

<u>(1) Wet Locations. Cable used in a wet location shall be listed for use in wet locations, or have a moisture impervious metal sheath.</u>

Substantiation: Fire Alarm cables, type FPL is used outdoors (such as between buildings per 760.11) or in wet locations. The new wording paraphrased from 310.8 clarifies that FPL cable used in wet locations shall be listed for this use, or protected from the wet location by a moisture impervious metal sheath. UL has an optional listing for wet rated FPL cable.

Panel Meeting Action: Accept in Principle

Add the following sentence at the end of the 760.82 main rule to read as follows:

Cable used in a wet location shall be listed for use in wet locations or have a moisture impervious metal sheath.

Panel Statement: The Panel has accepted the recommendation but provided more appropriate direction for the location of this text.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-265 Log #3035 NEC-P03 **Final Action: Reject**

(760.82(D), FPN)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council

Recommendation: Revise text to read as follows:

760.82 Listing and Marking of PLFA Cables and Insulated Continuous Line-Type Fire Detectors.

Type FPL cables installed as wiring within buildings shall be listed as being resistant to the spread of fire and other criteria in accordance with 760.82(A) through 760.82(H) and shall be marked in accordance with 760.82(I). Insulated continuous line-type fire detectors shall be listed in accordance with 760.82(J).

(A) Conductor Materials. Conductors shall be solid or stranded copper.

(B) Conductor Size. The size of conductors in a multiconductor cable shall not be smaller than 26 AWG. Single conductors shall not be smaller than 18 AWG.

(C) Ratings. The cable shall have a voltage rating of not less than 300 volts.

(D) Type FPLP. Type FPLP power-limited fire alarm plenum cable shall be listed as being suitable for use in ducts, plenums, and other space used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining <u>a cable that is</u> low smoke-producing cable <u>and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.</u> ~~is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-1999, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.~~

No change for 760.82 (E) through 760.82 (J)

Substantiation: This comment recommends a slight change in wording for the existing Fine Print Note, by recognizing that listing of plenum cable by NFPA 262 represents listing to both low smoke and low flame spread, and that cables cannot be listed separately to either property. This is basically an editorial change, as a clarification, to the existing Fine Print Note.

The same change is being proposed to the other corresponding Fine Print Note in article 760 and to that in article 725. The new language is consistent with the language in the corresponding fine print notes in articles 770, 800, 820 and 830, all of which deal with the same type of cables.

Panel Meeting Action: Reject

Panel Statement: See the panel statement on Proposal 3-252.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

3-266 Log #3248 NEC-P03 **Final Action: Reject**

(760.82(H) (New))

Submitter: Richard J. Rockosi, ARKEMA Chemicals

Recommendation: Insert new section (H) and renumber existing sections (H) through (J) to (I) through (K). Also, renumber Table 760.82(I) to Table 760.82(J).

<u>**(H) Concealed Space Cables.** Power-limited fire alarm cables that meet the requirements for Type FPL that are also listed as having a low potential heat value, low flame spread characteristics, and low-smoke producing characteristics shall be permitted to be listed and marked as concealed space cables Type FPL-CS.</u>

<u>FPN: One method of defining a low flame spread and low smoke-producing cable is that the cable exhibits a maximum flame spread distance of 1.52 m (5 ft), a maximum peak optical density of 0.03 and a maximum average optical density of 0.01 when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*</u>

Substantiation: The purpose of this proposal is to provide listing and marking for a cable that will be suitable for use in concealed spaces where there are large quantities of cables. Users would have the option of using these cables to avoid establishing a fuel load above the threshold where the quantity of cables would be considered a combustible loading. Also, these cables provide a flame spread index and a smoke developed index that correlate with the requirements for exposed materials within concealed spaces in buildings.

Cables tested using NFPA 255 and 259 establish parameters commonly used in NFPA standards and building codes: Flame spread, smoke developed index, and heat of combustion. This proposal uses the NFPA 262 test in place of NFPA 255. The Fire Protection Research Foundation's *International Limited Combustible Plenum Cable Fire Test Project* (copy attached) has shown that both of these tests are suitable and provided data (page 18 of the report) for setting equivalent criteria in the two tests. A maximum average optical density of 0.01 in NFPA 262 is equivalent to a smoke developed index of 50 in NFPA 255. Additional data is incorporated in the 3 other documents provided which demonstrate the applicability of the limits proposed for the peak and average smoke generation when using the 262 test.

NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading. Combustible loading is a function of the density (number) of cables and their potential heat release determined by NFPA 259.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics*** . I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of this article need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or preferably avoid the buildup of combustible cables that would result in a combustible loading. Use of concealed space cables would be an option in a strategy to avoid establishing a combustible loading.

A flame-spread index of 25 is a typical requirement for materials permitted in concealed spaces or exposed in buildings. A smoke developed index of 50 is typical of material not requiring additional protection. These values exist in several NFPA documents and Building codes and define the requirements for materials not requiring additional fire protection.

The following requirements are from NFPA 5000-2003 identify heat of combustion, flame spread, and smoke as major concerns:

Chapter 4 General

4.4.7 Limiting Fire Spread.

4.4.7.1 Interior Finishes. The interior surfaces of the building shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.4.7.2 Concealed Spaces. The construction of concealed spaces shall not contribute to an unacceptable rate of the spread of fire, hot gases, and smoke to areas of the building remote from the fire source and shall limit their spread beyond the immediate area of the origin of the fire.

4.4.7.3 Compartmentation. The building shall be compartmented, as appropriate, by walls and floors, including their associated openings with proper closures, to limit the spread of fire, hot gases, and smoke to an acceptable area beyond the immediate area of fire origin.

Chapter 7 Construction Types and Area Requirements

Chapter 8 Fire-Resistive Materials and Construction

8.1 General.

8.1.1 The chapter addresses fire protection features intended to restrict or resist the spread of fire and smoke beyond the compartment of fire origin.

8.1.2 Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict or resist the movement of smoke.

8.1.2.1* Fire compartments shall be formed with fire barrier walls that comply with Section 8.4 or horizontal assemblies that comply with Section 8.6, or a combination of both.

8.1.2.2 Smoke compartments shall be formed with smoke barriers that comply with Section 8.11.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The definition for “concealed” in Article 100 in the 2005 NEC does not apply to the proposed text. The reference to NFPA 13 in the substantiation does not seem appropriate at this time, since putting a sprinkler head in an inaccessible location inside the wall or above a drywall ceiling would not permit access for servicing. The area above a suspended ceiling is not considered by the NEC to be a concealed space.

The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

“[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A.”

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-269.

3-267 Log #3374 NEC-P03 **Final Action: Reject**
(760.82(H) (New))

Submitter: Ron Patridge, Arkema Inc.

Recommendation: Insert new section (H) and renumber existing sections (H) through (J) to (I) through (K). Also, renumber Table 760.82(I) to Table 760.82(J).

<u>**(H) Concealed Space Cables.** Power-limited fire alarm cables that meet the requirements for Type FPL that are also listed as having a low potential heat value, low flame spread characteristics, and low-smoke producing characteristics shall be permitted to be listed and marked as concealed space cables Type FPL-CS.</u>

<u>FPN: One method of defining a low flame spread and low smoke-producing cable is that the cable exhibits a maximum flame spread distance of 1.52 m (5 ft), a maximum peak optical density of 0.03 and a maximum average optical density of 0.01 when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*</u>

Substantiation: This is an identical submittal to the one provided by Richard J. Rockosi on behalf of Arkema dated Nov. 3, 2005, but it includes additional references necessary to help substantiate the requirements proposed for a 262 Concealed Space cable.

The purpose of this proposal is to provide listing and marking for a cable that will be suitable for use in concealed spaces where there are large quantities of cables. Users would have the option of using these cables to avoid establishing a fuel load above the threshold where the quantity of cables would be considered a combustible loading. Also, these cables provide a flame spread index and a smoke developed index that correlate with the requirements for exposed materials within concealed spaces in buildings.

Cables tested using NFPA 255 and 259 establish parameters commonly used in NFPA standards and building codes: Flame spread, smoke developed index, and heat of combustion. This proposal uses the NFPA 262 test in place of NFPA 255. The Fire Protection Research Foundation’s *International Limited Combustible Plenum Cable Fire Test Project* (copy attached) has shown that both of these tests are suitable and provided data (page 18 of the report) for setting equivalent criteria in the two tests. A maximum average optical density of 0.01 in NFPA 262 is equivalent to a smoke developed index of 50 in NFPA 255. There is not an equivalent measure to peak optical density in NFPA 255, therefore the proposal given shows a peak optical density of three times the average optical density, which is similar to the existing NFPA 262 requirements. Additional data is incorporated in the other documents provided which demonstrate the applicability of the limits proposed for the peak and average smoke generation when using the 262 test. In addition, the ASHRAE initiated research project conducted by the NRCC “Full-scale fire tests for cables in plenums” demonstrates that even within the NFPA 262 cable requirements hazards exist where some cables can ignite at lower temperatures which increases smoke production due to the involvement of the cables in the fire. Also, increased smoke can occur even if some cables are not ignited but exposed to a high temperature environment. In addition some 262 cables produce much greater levels of smoke depending on the fire scenario and their materials of construction. From the ASHRAE report “The tests conducted in this study indicate that the smoke produced from the CMP cables in plenums when exposed to fire could reduce visibility for occupants restricting their ability to evacuate”. This is of particular concern for cables used in concealed spaces because these spaces can provide an unabated passage for fire-spread throughout a building.

NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading. Combustible loading is a function of the density (number) of cables and their potential heat release determined by NFPA 259.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics*** . I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of this article need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or preferably avoid the buildup of combustible cables that would result in a combustible loading. Use of concealed space cables would be an option in a strategy to avoid establishing a combustible loading.

A flame-spread index of 25 is a typical requirement for materials permitted in concealed spaces or exposed in buildings. A smoke developed index of 50 is typical of material not requiring additional protection. These values exist in several NFPA documents and Building codes and define the requirements for materials not requiring additional fire protection.

The following requirements are from NFPA 5000-2003 identify heat of combustion, flame spread, and smoke as major concerns:

C hapter 4 General

4.4.7 Limiting Fire Spread.

4.4.7.1 Interior Finishes. The interior surfaces of the building shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.4.7.2 Concealed Spaces. The construction of concealed spaces shall not contribute to an unacceptable rate of the spread of fire, hot gases, and smoke to areas of the building remote from the fire source and shall limit their spread beyond the immediate area of the origin of the fire.

4.4.7.3 Compartmentation. The building shall be compartmented, as appropriate, by walls and floors, including their associated openings with proper closures, to limit the spread of fire, hot gases, and smoke to an acceptable area beyond the immediate area of fire origin.

Chapter 7 Construction Types and Area Requirements

Chapter 8 Fire-Resistive Materials and Construction

8.1 General.

8.1.1 The chapter addresses fire protection features intended to restrict or resist the spread of fire and smoke beyond the compartment of fire origin.

8.1.2 Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict or resist the movement of smoke.

8.1.2.1* Fire compartments shall be formed with fire barrier walls that comply with Section 8.4 or horizontal assemblies that comply with Section 8.6, or a combination of both.

8.1.2.2 Smoke compartments shall be formed with smoke barriers that comply with Section 8.11.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 3-266.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-269.

3-268 Log #3632 NEC-P03 **Final Action: Reject**

(760.82(H) (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Insert new section (H) and renumber existing sections (H) through (J) to (I) through (K). Also, renumber Table 760.82(I) to Table 760.82(J).

<u>**(H) Concealed Space Cables.** Power-limited fire alarm cables that meet the requirements for Type FPL that are also listed as having a low potential heat value, low flame spread characteristics, and low-smoke producing characteristics shall be permitted to be listed and marked as concealed space cables Type FPL-CS.</u>

<u>FPN: One method of defining a low flame spread and low smoke-producing cable is that the cable exhibits a maximum flame spread distance of 1.52 m (5 ft), a maximum peak optical density of 0.5 and a maximum average optical density of 0.15 when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*</u>

Substantiation: The purpose of this proposal is to provide listing and marking for a cable that will be suitable for use in concealed spaces where there are large quantities of cables. Users would have the option of using these cables to avoid establishing a fuel load above the threshold where the quantity of cables would be considered a combustible loading. Also, these cables provide a flame spread index and a smoke developed index that correlate with the requirements for exposed materials within concealed spaces in buildings.

Cables tested using NFPA 255 and 259 establish parameters commonly used in NFPA standards and building codes: smoke developed index, smoke developed index, and heat of combustion. This proposal uses the NFPA 262 test in place of NFPA 255. The Fire Protection Research Foundation's *International Limited Combustible Plenum Cable Fire Test Project* (copy attached) has shown that both of these tests are suitable and provided data (page 18 of the report) for setting equivalent criteria in the two tests. A maximum average optical density of 0.17 in NFPA 262 is equivalent to a smoke developed index of 450 in NFPA 255. This proposal sets the maximum optical density requirement at 0.15 to allow for a margin of error and to correlate with the existing requirements for plenum cable.

NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading. Combustible loading is a function of the density (number) of cables and their potential heat release determined by NFPA 259.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics*** . I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of this article need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or preferably avoid the buildup of combustible cables that would result in a combustible loading. Use of concealed space cables would be an option in a strategy to avoid establishing a combustible loading.

A flame spread index of 25 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

A smoke developed index of 450 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

The following requirements are from NFPA 5000-2003 identify heat of combustion, flame spread, and smoke as major concerns:

Chapter 4 General

4.4.7 Limiting Fire Spread.

4.4.7.1 Interior Finishes. The interior surfaces of the building shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.4.7.2 Concealed Spaces. The construction of concealed spaces shall not contribute to an unacceptable rate of the spread of fire, hot gases, and smoke to areas of the building remote from the fire source and shall limit their spread beyond the immediate area of the origin of the fire.

4.4.7.3 Compartmentation. The building shall be compartmented, as appropriate, by walls and floors, including their associated openings with proper closures, to limit the spread of fire, hot gases, and smoke to an acceptable area beyond the immediate area of fire origin.

Chapter 8 Fire-Resistive Materials and Construction

8.1 General.

8.1.1 The chapter addresses fire protection features intended to restrict or resist the spread of fire and smoke beyond the compartment of fire origin.

8.1.2 Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict or resist the movement of smoke.

8.1.2.1* Fire compartments shall be formed with fire barrier walls that comply with Section 8.4 or horizontal assemblies that comply with Section 8.6, or a combination of both.

8.1.2.2 Smoke compartments shall be formed with smoke barriers that comply with Section 8.11.

8.16 Insulating Materials.

8.16.7 Insulation and Covering on Pipe and Tubing. Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke developed index of not more than 450.

Chapter 10 Interior Finishes

10.3.2* Products required to be tested in accordance with NFPA 255 or ASTM E 84 shall be grouped in the classes described in 10.3.2(A) through 10.3.2(C) in accordance with their flame spread and smoke development, except as indicated in 10.3.3.

(A) Class A Interior Wall and Ceiling Finish. Class A interior wall and ceiling finishes shall be those finishes with a flame spread of 0–25 and smoke development of 0–450 and shall include any material classified at 25 or less on the flame spread test scale and 450 or less on the smoke test scale. Any element thereof, when so tested, shall not continue to propagate fire.

Panel Meeting Action: Reject

Panel Statement: See the panel action and statement on Proposal 3-266.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-269.

3-269 Log #2526 NEC-P03 **Final Action: Reject**
(760.82(H) and Table 760.82(i))

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Revise Section 760.82 as shown below.

Sections 760.82(A), through (G) do not change.

Insert new 760.82(H), renumber existing subsections as follows: “H” to “I”; and “I” to “J”, “J” to “K”,and renumber “Table 760.82(I) Cable Markings” to “Table 760.82(J) Cable Markings”.

(H) Type FPL50. Type FPL50 cables shall be listed as suitable for installation in concealed spaces having restrictive requirements for smoke generation, combustible loading, and flame spread and shall be listed as having very-low-smoke producing characteristics, a low potential heat release value, and low flame spread characteristics.

FPN No 1: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*

FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

FPN No. 3: Building codes adopted by code jurisdictions may contain restrictions on permissible flame spread index and smoke developed index.

Revise renumbered Table 760.82(J) to add a new first line in the cable markings, as follows:

FPL50

power-limited fire alarm very low-smoke cable

Substantiation: This proposal establishes a listing and marking for cable permitted as an electrical wiring option in concealed spaces where a smoke developed index no greater than 50 is required or large quantities of cable may cause combustible loading. The proposed cable has very-low-smoke-producing characteristics, a low potential heat release value, and low flame spread characteristics. Presently, a number of manufacturers have cables listed to the proposed requirements.

The testing criteria are based on the requirements found in NFPA 13-2003 and the 2003 International Mechanical Code, as revised.

NFPA 13, Section 8.14.1.2.1 follows: “Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.” The proposed cable has a very low heat of combustion. While the term “combustible loading” is not defined, the fuel load can be calculated to determine the potential hazard from large quantities of cable.

The 2003 International Mechanical Code, 602.2.1, requires materials in plenums to be noncombustible or have a flame spread index no greater 25 and a smoke index no greater than 50. At the recent ICC meeting in Detroit, exception #5 to 602.2.1 was revised to include “combustible material (electrical wiring) installed in noncombustible raceways or enclosures.” The requirements in IMC 602.2.1.1 permits cables meeting NFPA 262 test requirements. Cables meeting NFPA 262 requirements, according to Fire Protection Research Foundation testing using NFPA 255, have a smoke developed index that varies between 450 and 850. The proposed cable meets the requirements of the base paragraph, 602.2.1.

The following (change is underlined) shows the result of action on IMC public comment on M 77 (floor actions in Detroit, September 2005).

602.2.1 Materials exposed within plenums. Except as required by Sections 602.2.1.1 through 602.2.1.5, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84.

Exceptions:

1. Rigid and flexible ducts and connectors shall conform to Section 603.
2. Duct coverings, linings, tape and connectors shall conform to Sections 603 and 604.
3. This section shall not apply to materials exposed within plenums in one- and two-family dwellings.
4. This section shall not apply to smoke detectors.
5. Combustible materials enclosed in noncombustible raceways or enclosures, approved gypsum board assemblies or enclosed in materials listed and labeled for such application.

602.2.1.1 Wiring. Combustible electrical or electronic wiring methods and materials, optical fiber cable, and optical fiber raceway exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread not greater than 5 feet (1524 mm) when tested in accordance with NFPA 262. Only type OFNP (plenum rated nonconductive optical fiber cable) shall be installed in plenum-rated optical fiber raceways. Wiring, cable, and raceways addressed in this section shall be listed and labeled as plenum rated and shall be installed in accordance with ICC *Electrical Code* .

The Fire Protection Research Foundation report demonstrated that NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* , provides a suitable test method for establishing the cable characteristics (flame spread index & smoke developed index) specified in the FPN.

Establishing a listing and marking for a Type FPL50 cable provides a wiring option for complying with requirements of other standards and building codes. The NEC has previously established listings and markings for cable to correlate with other codes and standards. Additionally, the listing and marking may or may not have a specific application. Specific examples follow:

1. Type CMG cable was included in the 1993 NEC to correlate with the Canadian Electrical Code. The change was proposed by the Chair of NEC TCC, Harold Ware and Roy Hicks from Canada. Type CMG has a listing and marking in the NEC. Article 800 permits “Type CM or Type CMG” to be installed as a general purpose cable. Note: Type CMG does not have a unique application, and neither cable is considered a minimum requirement.
2. Types MP, MPR, and MPP cable was included in the 1990 NEC. The cables had a listing and marking. The multiple-purpose cables were permitted to substitute for similar cables in Articles 725, 760, & 800. Note: Types MP, MPR, and MPP cables do not have a unique application, just a listing and marking.
3. A change to the 1999 NEC permitted Types NPLF, NPLFR, NPLFP, FPL, FPLR, and FPLP to have a “-CI” suffix. The change included only listing and marking requirements. This change to the NEC correlated with NFPA 72, National Fire Alarm Code, requirements for a circuit integrity cable. Note: Cables with a “-CI” suffix did not have an application, until changes were made to the 2005 NEC.
4. A change to the 2005 NEC permitted Types CM, CMR and CMP to have a “-CI” suffix. As of today, no company has a listed circuit integrity using the permitted markings. Note: Types CM-CI, CMR-CI, and CMP-CI do not have an application, just a listing and marking.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-266.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

EGESDAL, S.: Referencing the NFPA 90A directive on NFPA 90A as a reason to reject this proposal is in error. The proposed cable marking clearly indicates the cable could not be installed in a plenum, and could only be installed in spaces permitted by 760.61(C), Other Wiring Within Buildings. Section 760.82 provides for listing and marking requirements for cables referenced in Seciton 760.61. The marking requirements in the various 760.82 sections correlate with the various applications in the various 760.61 sections. For example 760.82(A) provides the listing and marking requirements for plenum cable that correlates with the application requirements in 760.61(A).

The Panel is in error by stating that the proposed Type FPL50 cable could be used in a plenum. Again, Section 760.61(A) requires a Type CL2P or CL3P cable. The proposed cable does not have a "P" in the marking. Likewise, the proposed cable does not have an "R" in the marking, so could not be installed in a riser.

3-270 Log #2391 NEC-P03 **Final Action: Reject**
(760.82(I))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Revise 760.82(I) as follows:

(I) Cable Marking. The cable type shall be marked in accordance with Table 760.82(I). The voltage rating shall not be marked on the cable. The temperature rating shall be marked on the cable . Cables that are listed for circuit integrity shall be identified with the suffix CI as defined in 760.82(G).

FPN: Voltage ratings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1, electric light, and power applications.

Exception: Voltage markings shall be permitted where the cable has multiple listings and voltage marking is required for one or more of the listings.

Substantiation: The cables and conductors in this article do not have a temperature rating requirement. It is important for the system designer, installer, local authority, and building owners to know the temperature rating of cables and conductors for proper application.
Panel Meeting Action: Reject
Panel Statement: This proposal does not add any new requirement except for marking, which is already covered by the product standard and general directory.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:

EGESDAL, S.: See my Explanation of Negative for Proposal 3-222.

3-271 Log #3236 NEC-P03 **Final Action: Reject**
(760.82(I))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Add FPLD to the top of the cable list in Table 760.82(I), preceding FPLP, as shown.

Type FPLD
Power-limited air duct cable

Substantiation: This addition to the table correlates with the listing and marking of air duct cable.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 3-252.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-272 Log #78 NEC-P03 **Final Action: Reject**
(760.82(J))

Submitter: Brian Cummins, Proline Protection Systems LTD
Recommendation: Add new text to read:

Digital Line Type Heat Detection. Acceptable for wiring similar switching alarm devices on the same fire detection zone. Typically, conventional two wire (Class B) point type heat detectors and manual call point devices.

Substantiation: Unfavorable airflows (i.e., point type heat detectors affected) and unmanned buildings (i.e., no call point operation). Wiring of these Class B switching alarm devices by another similar device - digital line type heat sensor cable - will provide additional detection/protection at little extra cost to end users.
Panel Meeting Action: Reject
Panel Statement: There was no technical substantiation provided in the proposal for this new type of heat detector. A fact finding study would provide the information necessary for possible insertion into the NEC.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-273 Log #3237 NEC-P03 **Final Action: Reject**
(760.82(K))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Add new 760.82(K), as shown.

(K) Type FPLD. Type FPLD air duct cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant, very low smoke-producing characteristics, and very low potential heat release.

FPN No: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1:a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements of Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

The following is an example of air duct cable information from the UL Web Site:

OWKZ.GuideInfoLimited Combustible Cable
Guide Information for Electrical Equipment for Use in Ordinary Locations
GENERAL

This category covers electrical and optical fiber cable that meets the limited combustible and smoke developed requirements for cable in ceiling cavity and raised floor plenums in accordance with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems." This cable also meets the requirements for cable used in ducts, plenums and other spaces used for environmental air in accordance with Articles 725, 760, 770, 800, 820 and 830 of ANSI/NFPA 70, "National Electrical Code".

This cable has a maximum Potential Heat value of 3500 Btu/lb when tested in accordance with NFPA 259, "Standard Test Method for Potential Heat of Building Materials." This cable has a maximum smoke developed index of 50 and a maximum flame spread index of 25 when tested in accordance with UL 723 (NFPA 255), "Test for Surface Burning Characteristics of Building Materials" before and after exposure to elevated temperature and humidity. The cable also meets the requirements for plenum cable in one or more of the following product categories:

- Power-limited Circuit Cable (**QPTZ**) - Types CL2P or CL3P
- Communications Cable (**DUZX**) - Type CMP
- Power-limited Fire Alarm Cable (**HNIR**) - Type FPLP
- Nonpower-limited Fire Alarm Cable (**HNHT**) - Type NPLFP
- Optical Fiber Cable (**QAYK**) - Types OFNP or OFCP
- Community Antenna Television Cable (**DVCS**) - Type CATVP
- Network-powered Broadband Communications Cable (**PWIP**) - Type BLP

PRODUCT MARKINGS

This cable is identified by the marking "Limited Combustible FHC 25/50" on the surface of the jacket or on a marker tape under the jacket. This marking is immediately followed by one of the Type designations shown above. The cable also has the required markings including optional markings as indicated in the product categories referenced above. This cable may also be Verified for transmission performance if authorized in the product categories referenced above, and will bear the appropriate performance verification marking.

ADDITIONAL INFORMATION

For additional information, see Electrical Equipment for Use in Ordinary Locations (**AALZ**).

REQUIREMENTS

The basic requirements used to investigate products in this category are contained in Subject 2424, "Outline of Investigation for Cable Marked 'Limited Combustible.'"

UL MARK

The UL symbol on the product and the Listing Mark of Underwriters Laboratories Inc. on the attached tag, the reel, or the smallest unit container in which the product is packaged is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and the product name "Limited Combustible Cable."

Cable which is also Verified to the UL Data Transmission Performance Category Marking Program has the marking "Verified to UL Performance Category Program," or the UL Verification Mark along with the words "Performance Category Program" together with the Listing Mark information on the tag, the reel, or the smallest unit container. Cable which is also Verified to another transmission performance specification has the marking "Verified in Accordance with [Specification name and/or number]" or the UL Verification Mark along with the applicable Specification name and/or number together with the Listing Mark information on the tag, the reel, or the smallest unit container.

Last Updated on 2004-03-24

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Proposal 3-252.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

ARTICLE 770 — OPTICAL FIBER CABLES AND RACEWAYS

16-2 Log #695 NEC-P16 **Final Action: Accept in Principle**
(770)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Revise the numbering of the parts of Article 700 as shown in the table below:

Article 770- 2005 NEC	Proposal for 2008 NEC
I. General	I. General
	II. Cables Outside and Entering Buildings
II. Protection	III. Protection
	IV. Grounding Methods
III. Cables Within Buildings	V. Cables Within Buildings
IV. Listing Requirements	VI. Listing Requirements

Substantiation: This is an editorial proposal. (Task Group No.770-01)

The task group has submitted many proposals to improve the parallelism between articles 770, 800, 820 and 830. Several of these proposals introduce text for the new parts; "II. Cables Outside and Entering Buildings" and "IV. Grounding Methods". Renumbering of the parts of the article is necessary to accommodate the new parts.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

In the submittter's recommendation, change 700 to 770.

Part V to be titled Installation Methods Within Buildings.

Panel Statement: The panel notes a typo in the Proposal; change 700 to 770.

See panel Action on Proposal 16-58.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-3 Log #1864 NEC-P16 **Final Action: Reject**
(770)

TCC Action: The Technical Correlating Committee advises that Article locations are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: Relocate Article 770 to Chapter 8 and renumber appropriately.

Substantiation: A number of telecommunications utilities have either begun, or are contemplating, a "fiber-to-the-home" program whereby they will be bringing optical fiber directly to the customer's premises. The optical fiber cable will be attached to, and possibly installed within the customer's building. Although optical fiber cable may also be used in signaling and remote control applications, the preponderance of applications today are in the area of telecommunications. Where the optical fibers are associated with power conductors (i.e., in composite cables) they are presently required to be classified as electrical cables in accordance with the type of electrical conductors contained in the composite cable [see 770.9(C)]. It is therefore appropriate that Article 770 be incorporated in Chapter 8. Relocation of Article 770 to Chapter 8 will facilitate usability of the NEC and have no impact on existing requirements.

Panel Meeting Action: Reject

Panel Statement: It is more appropriate to remain in Chapter 7. Optical fiber cable is also used for applications other than communications (e.g. control).

Number Eligible to Vote: 15

Ballot Results: Affirmative: 12 Negative: 3

Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. The preponderance of optical fiber cable applications today is in the telecommunications industry. A number of telecommunications utilities have either begun, or are contemplating, a "fiber-to-the-home" program whereby optical fiber will be provided directly to the customer's premises. The optical fiber cable will be attached to, and possibly installed within the customer's building. While optical fiber cable is also used for data and control circuits, many of these circuits are similar in nature to communications circuits with respect to their installation and safety requirements. It is therefore appropriate that Article 770 be incorporated in Chapter 8. Relocation of Article 770 to Chapter 8 will facilitate usability of the NEC and have no impact on existing requirements.

JOHNSON, S.: I agree with the submitter's points in his proposal. Optical fibers, when not associated with power conductors, more closely resemble the wiring methods of telecommunications and CATV than wiring methods of power circuits. Moving this article into Chapter 8 with telecommunications and CATV, therefore appear to be the appropriate location. I vote against the Panel's action to reject.

JONES, R.: Cables that carry optical fiber are classified according to their usage – Article 770 covers optical fiber cables that are more like communications cables than electrical. The applications in article 770 are the same as Chapter 8 applications, therefore the panel erred by not voting to move the Article to Chapter 8.

16-4 Log #1527 NEC-P16 **Final Action: Accept in Principle**
(770, 800, 810, 820 and 830)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to the Technical Correlating Committee Grounding and Bonding Task Group for comment. The Technical Correlating Committee understands that the Panel Action on this Proposal should be "Accept in Principle" and further understands the Panel Action text in Proposal 16-4a and Proposal 16-25 provides the additional accepted and modified text. It is also the action of the Technical Correlating Committee that further consideration be given to the comments on the affirmative vote. This action will be considered by the panel as a public comment.

Submitter: Technical Correlating Committee on National Electrical Code,

Recommendation: Revise Articles 770, 800, 810, 820 and 830 as described in the following, relative to the terms bonding and grounding.

Article 770 In 770.2 Definition change:

Point of Entrance. The point at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit ~~grounded~~ connected by a grounding conductor to an electrode in accordance with 800.100(B).

In 770.93 Grounding of Entrance Cables change:

Where exposed to contact with electric light or power conductors, the non–current-carrying metallic members of optical fiber cables entering buildings shall be ~~grounded~~ connected to an electrode by a grounding conductor as close to the point of entrance as practicable or shall be interrupted as close to the point of entrance as practicable by an insulating joint or equivalent device.

Article 800 In 800.93 Cable Grounding change:

The metallic sheath of communications cables entering buildings shall be grounded as specified in 800.100 as close as practicable to the point of entrance or shall be interrupted as close to the point of entrance as practicable by an insulating joint or equivalent device.

FPN: See 800.2 for the definition of point of entrance.

In 800.100(A)(4) Exception change:

Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum primary protector grounding conductor length of 6.0 m (20 ft), a separate communications ground rod meeting the minimum dimensional criteria of 800.100(B)(2)(2) shall be driven, the primary protector shall be ~~grounded~~ connected to the communications ground rod in accordance with 800.100(C), and the communications ground rod shall be bonded to the power grounding electrode system in accordance with 800.100(D).

In 800.90(A)(2) change:

(2) Interbuilding cable runs of 42 m (140 ft) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is ~~bonded~~ connected to each building grounding electrode system.

In 800.100(A)(4) Exception change:

Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum primary protector grounding conductor length of 6.0 m (20 ft), a separate communications ground rod meeting the minimum *dimensional criteria of 800.100(B)(2)(2) shall be driven, the primary protector shall be grounded to the communications ground rod in accordance with 800.100(C), and the communications ground rod shall be ~~bonded~~ connected to the power grounding electrode system in accordance with 800.100(D).*

In 800.106(B) change:

(B) Bonding. The primary protector grounding terminal or grounding electrode shall be ~~bonded~~ connected to the metal frame or available grounding terminal of the mobile home with a copper grounding conductor not smaller than 12 AWG under either of the following conditions:

(1) Where there is no mobile home service equipment or disconnecting means as in 800.106(A)

(2) Where the mobile home is supplied by cord and plug

Article 810 In 810.71(A) change:

(A) Enclosing. The transmitter shall be enclosed in a metal frame or grille, or separated from the operating space by a barrier or other equivalent means, all metallic parts of which are effectively connected to ~~ground~~ a grounding conductor .

Article 820 In 820.93 change where first appears:

820.93 Grounding of Outer Conductive Shield of a Coaxial Cable. The outer conductive shield of the coaxial cable shall be grounded as specified by 820.100 at the building premises as close to the point of cable entrance or attachment as practicable …

In 820.100(A)(4) Exception change:

Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum grounding conductor length of 6.0 m (20 ft), a separate ground ing electrode as specified in 250.52(A)(5), (A)(6), or (A)(7) shall be used, the grounding conductor shall be ~~grounded~~ connected to the separate ground ing electrode in accordance with 250.70, and the separate ground ing electrode shall be bonded to the power grounding electrode system in accordance with 820.100(D).

In 820.100(B)(1)(7) change:

The grounding conductor or the grounding electrode of a building or structure disconnecting means that is ~~grounded~~ connected to an electrode as covered in 250.32

In 820.106(A) change:

(A) Grounding. Where there is no mobile home service equipment located in sight from, and not more than 9.0 m (30 ft) from, the exterior wall of the mobile home it serves or there is no mobile home disconnecting means grounded in accordance with 250.32 and located within sight from, and not more than 9.0 m (30 ft) from, the exterior wall of the mobile home it serves, the coaxial cable shield ground, or surge arrester ground, shall be connected to a grounding conductor in accordance with 820.100(B)(2).

In 820.100(A)(4) Exception change:

Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum grounding conductor length of 6.0 m (20 ft), a separate ground as specified in 250.52(A)(5), (A)(6), or (A)(7) shall be used, the grounding conductor shall be grounded to the separate ground in accordance with 250.70, and the separate ground ~~bonded~~ connected to the power grounding electrode system in accordance with 820.100(D).

In 820.106(B) change:

(B) Bonding. The coaxial cable shield grounding terminal, surge arrester grounding terminal, or grounding electrode shall be ~~bonded~~ connected to the metal frame or available grounding terminal of the mobile home with a copper grounding conductor not smaller than 12 AWG under any of the following conditions:

(1) Where there is no mobile home service equipment or disconnecting means as in 820.106(A)

(2) Where the mobile home is supplied by cord and plug

Article 830 In 830.93 change:

830.93 Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables. The shields of network-powered broadband communications cables used for communications or powering shall be grounded at the building as specified by 830.100 as close as practicable to the point of entrance or attachment of the NIU. Metallic cable members not used for communications or powering shall be grounded as specified by 830.100 or interrupted by an insulating joint or equivalent device as close as practicable to the point of entrance or attachment of the NIU.

In 830.151(C) Exception change:

Exception: Type BMU cable where the cable enters the building from the outside and is run in rigid metal conduit or intermediate metal conduit, and such conduits are ~~grounded~~ connected by a grounding conductor to an electrode in accordance with 830.100(B).

In 830.154(D)(3) change:

(3) Type BLU Cable Type BLU cable entering the building from outside shall be permitted to be run in rigid metal conduit or intermediate metal conduit. Such conduits shall be ~~grounded~~ connected by a grounding conductor to an electrode in accordance with 830.100(B).

Substantiation: Article 770: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 800: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 800.90(A)(2): These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

Article 810: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 820: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of grounded (grounding) and equipment grounding conductor.

Article 820.100(A)(4) Exception: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

Article 830: These changes clarify the present requirement in more prescriptive language and to clarify the connection referred to in the section. Connected is proposed to work cooperatively with the proposed revision of the definition of bonded (bonding).

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to the proposed revision to the terms "bonded", "grounded", and "equipment grounding conductor" in Article 100 relative to this Task Group's recommendations. These changes clarify the present requirement in more prescriptive language.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Revise 770.2, Point of Entrance as follows:

Point of Entrance. The point within a building at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) grounded connected by a grounding conductor to an electrode in accordance with 800.100(B).

FPN No 1: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).

FPN No.2: See 344.4 for a definition of Rigid Metal Conduit (Type RMC).

Revise 800.93 as follows:

800.93 Cable Grounding or Interruption of Metallic Sheath Members of Communications Cables. The metallic sheath members of communications cables entering or attached to buildings shall be grounded as specified in 800.100 as close as practicable to the point of entrance as practicable or shall be interrupted as close to the point of entrance or attachment as practicable by an insulating joint or equivalent device.

FPN: See 800.2 for definition of Point of Entrance.

Revise 820.93 as follows:

820.93 Grounding of the Outer Conductive Shield of a Coaxial Cable Cables. The outer conductive shield of the coaxial cable cables entering or attached to buildings shall be grounded as specified by 820.100 at the building premises as close to the point of cable entrance or attachment as practicable.

For purposes of this section, grounding located at mobile home service equipment located in sight from, and not more than within 9.0 m (30 ft) from, the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with 250.32 and located in sight from and not more than within 9.0 m (30 ft) from the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.

FPN No. 1: See 820.2 for definition of Point of Entrance.

FPN No. 2: Selecting a grounding location to achieve the shortest practicable grounding conductor helps limit potential differences between CATV and other metallic systems.

Revise 820.100(B)(1)7 as follows: (7) The grounding conductor or the grounding electrode of a building or structure disconnecting means that is grounded connected to an electrode as covered in 250.32.

For purposes of this section, the mobile home service equipment or the mobile home disconnecting means, as described in 820.93, shall be considered accessible.

Revise 820.106(A) as follows:

(A) Grounding. Grounding shall comply with 820.106(A)(1) and (A)(2).

(1) Where there is no mobile home service equipment located in sight from, and not more than within 9.0 m (30 ft) from, of the exterior wall of the mobile home it serves, the coaxial cable shield around, or surge arrester around, shall be connected to a grounding conductor in accordance with 820.100(B)(2).

(2) Where there is no mobile home disconnecting means grounded in accordance with 250.32 and located within sight from, and not more than 9.0 m (30 ft) from, the exterior wall of the mobile home it serves, the coaxial cable

shield ground, or surge arrester ground, shall be connected to a grounding conductor in accordance with 820.100(B)(2).

Panel Statement: The panel accepts the direction of the TCC to review 770, 800, 810, 820, and 830.

The panel developed a harmonized proposal and coordinated across all articles.

See panel action on Proposal 16-25. The revised text provides editorial consistency across Articles 770, 800, 820, and 830 as proposed by the Panel 16 Editorial Task Group.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: The panel action does not reflect what the panel action should indicate. The panel revised this proposal therefore the action should be other than accept.

Comment on Affirmative:

BRUNSSEN, J.: The Panel Action should be "Accept in Principle" as the Panel made a number of changes to the submitter's text. There are also typographical errors in the Panel Meeting Action text as follows:

1. Under "Revise 770.2, Point of Entrance as follows:", delete the word "grounded" in the proposed revised definition as follows: "…. metal conduit (Type IMC) ~~grounded~~ connected by a grounding conductor ….".

2. Under "Revise 800.93 as follows:", revise the text as follows: " **800.93 ~~Cable~~ Grounding or Interruption of Metallic Sheath Members of Communications Cables.** The metallic sheath members of communications cables entering or attached to buildings shall be grounded as specified in 800.100 as close ~~as practicable~~ to the point of entrance as practicable or shall be interrupted …..."

3. Under "Revise 820.93 as follows:", revise the text as follows: " **820.93 Grounding of the Outer Conductive Shield of ~~a~~ Coaxial ~~Cable~~ Cables.** The outer conductive shield of ~~the~~ coaxial ~~cable~~ cables entering or attached …." Also revise the text concerning mobile homes as follows: "For purposes of this section, grounding located at mobile home service equipment located ~~in sight from, and not more than~~ within 9.0 m (30 ft) from, the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with 250.32 and located ~~in sight from and not more than~~ within 9.0 m (30 ft) from …."

4. Under "Revise 820.100(B)(7) as follows:", delete the word "grounded" as follows: "…. disconnecting means that is ~~grounded~~ connected to an electrode as covered in 250.32."

5. Under "Revise 820.106(A) as follows:", revise the text as follows: "(1) Where there is no mobile home service equipment located ~~in sight from, and not more than~~ within 9.0 m (30 ft) from ~~,~~ ~~of~~ the exterior wall of the mobile home it serves , the coaxial cable shield ground, or surge arrester ground , shall be connected to a grounding conductor in accordance with 820.100(B)(2).

(2) Where there is no mobile home disconnecting means grounded in accordance with 250.32 and located within ~~sight from, and not more than~~ 9.0 m (30 ft) from ~~,~~ the exterior wall of the mobile home it serves, the coaxial cable shield ground, or surge arrester ground, shall be connected to a grounding conductor in accordance with 820.100(B)(2).

DORNA, G.: The panel action on this proposal should have been accept in principle.

KAHN, S.: This proposal should have been reported as "accept in principle". The proposal included a number of individual items, some of which were modified by other proposals accepted by the panel on the same items.

16-4a Log #701 NEC-P16 **Final Action: Accept in Principle**
(770.2)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Add the phrase as shown:

Point of Entrance. The point within a building at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode in accordance with 800.100(B).

Substantiation: This proposal is a clarification. (Task Group No. 770-07)

Adopting this change will make the definition of point of entrance editorially consistent with the definitions in articles 820 and 830. A corollary proposal has been submitted for article 800.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Change Point of Entrance in 770.2 to read as follows:

Point of Entrance. The point within a building at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) ~~grounded~~ connected by a grounding conductor to an electrode in accordance with 800.100(B).

FPN No 1: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).

FPN No.2: See 344.4 for a definition of Rigid Metal Conduit (Type RMC).

Panel Statement: The text inserted by the panel "connected by a grounding conductor" provides for editorial consistency across Articles 770, 800, 820, and 830. See panel action on Proposals 16-4 (770.2) and 16-21.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." The addition of the two FPN's referencing the definitions of IMC raceway in 342.2 and RMC raceway in 344.4 is not needed nor warranted. In the submitter's substantiation he states these Fine Print Notes will help installers who are not Code experts. A trained installer will know the Code content and how the Code book is to be used.

16-5 Log #700 NEC-P16 **Final Action: Accept**
(770.2)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Add the wording as shown:

770.2 Definitions. See Article 100. For purposes of this article, the following additional definitions apply.

Substantiation: This is an editorial change. (Task Group No. 770-06)

Adopting this change will make Article 770 editorially consistent with Articles 800, 820 and 830, which read:

800.2 Definitions. See Article 100. For purposes of this article, the following additional definitions apply.

820.2 Definitions. See Article 100. For the purposes of this article, the following additional definitions apply.

830.2 Definitions. See Article 100. For purposes of this article, the following additional definitions apply.

This change will alert optical fiber cable installers to refer to Article 100. Also, if Article 770 is moved to Chapter 8, this change will be required.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be rejected. 4.1 – References to Other NEC Rules of the 2003 NEC Style Manual states to avoid redundant use of references and do not use a reference if it already covered by 90.3. 90.3 - Code Arrangement states that Chapter 8 covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8. This is the reason why in those Chapter 8 Articles that Article 100 is referenced for additional definitions. There is no reason for this to be indicated in Article 770 as Chapters 1-4 apply generally.

16-6 Log #43 NEC-P16 **Final Action: Accept**
(770.2.Abandoned Fiber Optical Cable)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Add a fine print note to the definition of Abandoned Optical Fiber Cable

Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

FPN: See Article 100 for a definition of equipment.

Substantiation: The addition of a fine print note alerting installers that equipment is defined in Article 100 will help installers who are not Code experts.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: Propose to remove the FPN from the definition and to clarify the term being defined, thereby making the committee action "Accept in Principle" rather than an "Accept".

The title section of the proposal states "(770.2, Abandoned Fiber Optical Cable)" while the recommendation stated "Abandoned Optical Fiber Cable". "Abandoned Optical Fiber Cable" is the proper term to be defined.

CMP 16 accepted proposal 16-5 which will harmonize 770.2, 800.2, 820.2, and 830.2 by including a normative reference to "See Article 100". Adding a FPN to again "See Article 100" is redundant, especially since this FPN will be two lines down from the identical wording in normative text. Additionally the 2003 NEC Style Guide specifically states to avoid redundant use of references.

OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing Article 100 for the definition of equipment is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-7 Log #2363 NEC-P16 **Final Action: Reject**
(770.2.Abandoned Optical Fiber Cable)

Submitter: John H. Schmidt, ABC Television Network
Recommendation: In the definition for Abandoned Optical Fiber Cable, after the words "and not identified for future use with a tag" add the words "or in a database."
Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-1.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

BRUNSSEN, J.: The Panel Statement, "See panel action on Proposal 16-1" does not address the submitter's concern, i.e., establishing a data base identifying abandoned cables. A more appropriate panel statement might be: "Panel Statement: An AHJ is unlikely to have access to the database for every building under their jurisdiction. The majority of communications technicians (installation/repair) work at multiplicity of locations. Database administrative responsibility is not identified in the proposal. Maintaining and referencing a database for every location is cumbersome, unwieldy and impractical." This is the Panel Statement that was used for similar Proposals 16-101, -102, -240 and –347.

16-8 Log #3031 NEC-P16 **Final Action: Reject**
(770.2.Abandoned Optical Fiber Cable)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Revise text to read as follows:

770.2 Definitions.

Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment ~~other than a connecto~~ r and not identified for future use with a tag.

Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:

640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.

725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.

The additional wording in this definition causes confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100

Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-1.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

OHDE, H.: This proposal should be accepted as submitted. The submitter substantiates that the definitions of abandoned cables in Articles 640, 645, 725, 760, 770, 800, 820, and 830 should be identical. This proposal deletes unnecessary language in the present definitions and provides consistent language throughout the above articles mentioned. The panel statement does not explain the reason for rejecting this proposal other than to see panel action on Proposal 16-1.

16-9 Log #52 NEC-P16 **Final Action: Reject**
(770.2.Air Duct)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Add a definition to read as follows:

Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum. [NFPA 97:1.2.6]

Substantiation: The definition of air duct is in the definitions section of Articles 800 and 820. Add it to this article for editorial consistency.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

JENSEN, R.: We agree with rejecting this as it was evidently an oversight to be removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 770 even though the substantiation says it is. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

16-10 Log #697 NEC-P16 **Final Action: Reject**
(770.2.Air Duct (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the definition of "Air Duct" to Section 770.2 as follows: <u>Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning,</u>
<u>or ventilating equipment, but not including the plenum. [NFPA 97:1.2.6]</u>

Substantiation: This is a technical proposal. (Task Group No. 770-03)

The tem "air duct" is now used in 770.113 Exception No. 1 and should be defined. This is a companion proposal to that for 770.113 Exception No 1.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

JENSEN, R.: We agree with rejecting this as it was evidently an oversight to be removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 770. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

16-11 Log #1860 NEC-P16 **Final Action: Reject**
(770.2.Air Duct (New))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Add the definition of "Air Duct" to Section 770.2 as follows:
Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning,
or ventilating equipment, but not including the plenum.
Substantiation: The term "air duct" is now used in 770.113 *Exception No. 1* and should be defined. This is a companion proposal to that for 770.113 *Exception No 1* .
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
JENSEN, R.: We agree with rejecting this as it was evidently an oversight to be removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 770. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

16-12 Log #699 NEC-P16 **Final Action: Accept**
(770.2. Cable Sheath (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the following definition:
<u>Cable Sheath. A covering over the optical fiber assembly that includes one or more jackets and may include one or more metallic members or strength members.</u>
Substantiation: This is a technical proposal. (Task Group No. 770-05)
The term "sheath" is used in Article 770. It should be defined.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-13 Log #26 NEC-P16 **Final Action: Reject**
(770.2.Concealed Space)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
Concealed Space. That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and in whose size might normally range from 44.45 mm (1 3/4 in.) stud spaces to 2.44 m (8 ft) interstitial truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting. <u>[NFPA 96:3.3.42.1]</u>
Substantiation: The term concealed space is used in 770.154(A). This definition is an extract from NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. It is the only definition of concealed space in the NFPA Glossary.
Panel Meeting Action: Reject
Panel Statement: The definition may involve combustible material in environmental air spaces and, therefore, may fall under the Standards Council Decision 05-24 (SC #05-7-4).
The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions since the submitter is trying to define the term "concealed spaces". We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.
This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."
In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-14 Log #4 NEC-P16 **Final Action: Reject**
(770.2.Exposed)

Submitter: Stanley Kaufman, CableSafe, Inc.
Recommendation: Delete as follows:
~~**Exposed.** The circuit is in such a position that, in case of failure of supports and insulation, contact with another circuit may result.~~
~~FPN: See Article 100 for two other definitions of *Exposed* .~~
Substantiation: There are no optical fiber circuits in Article 770. The term "exposed" used three times in Article 770. See below:
770.24 Mechanical Execution of Work. Optical fiber cables shall be installed in a neat and workmanlike manner. <u>Cables installed exposed</u> on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.
770.93 Grounding of Entrance Cables. <u>Where exposed to contact with electric light or power conductors</u> , the non-current-carrying metallic members of optical fiber cables entering buildings shall be grounded as close to the point of entrance as practicable or shall be interrupted as close to the point of entrance as practicable by an insulating joint or equivalent device.
770.154(A)
FPN: See 8.14.1 of NFPA 13 (2002), *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces <u>containing exposed combustibles</u> .
The above text is clear without any additional definition. Furthermore, the definition only applies to 770.93. It clearly dos not apply to 770.24 and 770.154(A)
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-17.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-15 Log #702 NEC-P16 **Final Action: Accept in Principle**
(770.2.Exposed)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise the definition of "Exposed" as follows:
" **Exposed <u>(to Accidental Contact)</u> .** ~~The circuit is~~ <u>A conductive optical fiber cable</u> in such a position that, in case of failure of supports ~~and~~ <u>or</u> insulation, contact <u>between the cable's non-current-carrying conductive members</u> ~~with another~~ <u>and an</u> electrical circuit may resultThis proposal is a clarification. (Task Group No. 770-08)
Substantiation: It clarifies the term "Exposed" as used in Article 770 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. Replacing of the phrase "The circuit is" with the phrase "A circuit"

provides a consistent definition throughout Articles 770, 800, 820 and 830. This is a companion proposal to 800.2, 820.2 and 830.2.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-17.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-16 Log #1861 NEC-P16 **Final Action: Accept in Principle**

(770.2.Exposed (to Accidental Contact))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: Revise the definition of "Exposed" as follows:

" **Exposed** **(to Accidental Contact)** **.** ~~The~~ A circuit ~~is~~ in such a position that, in case of failure of supports ~~and~~ or insulation, contact with another circuit may result."

Substantiation: The proposed revision clarifies the term "Exposed" as used in Article 770 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. Replacing of the phrase "The circuit is" with the phrase "A circuit" provides a consistent definition throughout Articles 770, 800, 820 and 830. This is a companion proposal to 800.2, 820.2 and 830.2.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-17.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-17 Log #1940 NEC-P16 **Final Action: Accept**

(770.2.Exposed (to Accidental Contact))

Submitter: Stanley D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Revise the definition of "Exposed" as follows:

"Exposed (to Accidental Contact). ~~The circuit is~~ A conductive optical fiber cable in such a position that, in case of failure of supports ~~and~~ or insulation, contact between the cable's noncurrent-carrying conductive members ~~with another~~ and an electrical circuit may result."

FPN: See Article 100 for two other definitions of Exposed.

Substantiation: This proposal is clarification. (Task Group No. 770-08A)

It clarifies the term "Exposed" as used in Article 770 to indicate possible contact with an electrical circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of conditions, failure of supports or failure of insulation, may result in accidental contact. Replacing of the phrase "The circuit is" with the phrase "A conductive optical fiber cable" is appropriate as: 1) contact between an optical fiber cable and an electrical circuit is only of concern for a conductive optical fiber cable (i.e., one having non-current-carrying conductive members) and 2) the term "circuit" is typically associated with electrically conductive metallic media and not with optical (light) media. This is a companion proposal to 800.2, 820.2 and 830.2 and provides consistency and correlation in the definition of "exposed" across 770, 800, 820 and 830.

This is one of a group of proposals prepared by the CMP 16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related articles such that similar requirements are stated the same way in each article;

3) make the articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

JENSEN, R.: Propose to remove the FPN from the definition, thereby making the committee action "Accept in Principle" rather than an "Accept".

CMP 16 accepted proposal 16-5 which will harmonize 770.2, 800.2, 820.2, and 830.2 by including a normative reference to "See Article 100". Adding a FPN to again "See Article 100" is redundant, especially since this FPN will be four lines down from the identical wording in normative text. Additionally, the 2003 NEC Style Manual specifically states to avoid redundant use of references.

16-18 Log #698 NEC-P16 **Final Action: Accept**

(770.2.Optical Fiber Cable (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Add the following new definition:

Optical Fiber Cable. A factory assembly of one or more optical fibers having an overall covering.

Substantiation: This is a technical proposal. (Task Group No. 770-04)

The term "optical fiber cable" is used throughout Article 770. It should be defined. The proposed definition is similar to the definition of cable in Article 800

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-19 Log #1378 NEC-P16 **Final Action: Accept in Principle**

(770.2.Optical Fiber Cables)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Move definition of optical fiber cables from 770.6 to 770.2

Optical Fiber Cables. Optical fiber cables transmit light for control, signaling, and communications through an optical fiber.

Substantiation: This proposal is being made to supplement my proposed deletion of section 770.6. Because the language of the existing section 770.6 is in fact a definition, it belongs in 770.2, not 770.6

Panel Meeting Action: Accept in Principle

Panel Statement: The panel agrees that a definition belongs in 770.2.

The panel does not agree that "Optical Fiber Cables" as described 770.6 is a definition.

The panel accepted the definition that was submitted in Proposal 16-18. See panel action on Proposal 16-18.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-20 Log #44 NEC-P16 **Final Action: Accept in Principle**

(770.2.Optical Fiber Raceway)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment. It is the intention of Fine Print Notes to provide explanatory information and they are not intended as a vehicle to provide unnecessary cross-references.

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Add a fine print note to the definition of Optical Fiber Raceway.

Optical Fiber Raceway. A raceway designed for enclosing and routing listed optical fiber cables.

FPN: See Article 100 for a definition of raceway.

Substantiation: The addition of a fine print note alerting installers that raceway is defined in Article 100 will help installers who are not Code experts.

Panel Meeting Action: Accept in Principle

Revise the definition of Optical Fiber Raceway as follows:

Optical Fiber Raceway. A raceway for enclosing and routing optical fiber cables.

Add a fine print note following the definition of Optical Fiber Raceway as follows:

FPN: See Article 100 for a definition of Raceway.

Panel Statement: The panel removed "design," as specification does not belong in a definition.

The panel moved "listed," as specification does not belong in a definition per NEC Manual of Style.

The change meets the submitter's intent.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: Propose to remove the FPN from the definition, thereby expanding the committee action of "Accept in Principle".

CMP 16 accepted proposal 16-5 which will harmonize 770.2, 800.2, 820.2, and 830.2 by including a normative reference to "See Article 100". Adding a

FPN to again "See Article 100" is redundant, especially since this FPN will be six lines down from the identical wording in normative text. Additionally, the 2003 NEC Style Manual specifically states to avoid redundant use of references.

OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing Article 100 for the definition of a raceway is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-21 Log #45 NEC-P16 **Final Action: Accept in Principle**
(770.2.Point of Entrance)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action with respect to the panel action on Proposal 16-4a.

In addition, it was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. It is the intention of Fine Print Notes to provide explanatory information and they are not intended as a vehicle to provide unnecessary cross-references.

This action will be considered by the Panel as a Public Comment.

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise to read as follows:

Point of Entrance. The point at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) grounded to an electrode in accordance with 800.100(B).

FPN: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).

FPN: See 344.4 for a definition of Rigid Metal Conduit (Type RMC).

Substantiation: The addition of a fine print notes pointing installers to the definitions of intermediate metal conduit and rigid metal conduit will help installers who are not Code experts. Use of the type designations will promote consistency throughout the code.

Panel Meeting Action: Accept in Principle

The panel accepts the submitter's proposal with the following revisions:
Number the FPNs.

Panel Statement: Multiple FPNs are required to be numbered per NEC Manual of Style.

See Action on Proposal 16-4.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." The addition of the two FPN's referencing the definitions of IMC raceway in 342.2 and RMC raceway in 344.4 is not needed nor warranted. In the submitter's substantiation he states these Fine Print Notes will help installers who are not Code experts. A trained installer will know the Code content and how the Code book is to be used.

Comment on Affirmative:

JENSEN, R.: The panel action accepts the FPNs to be renumbered. The FPN for Rigid Metal Conduit should refer to 344.2, not 344.4.

16-22 Log #5 NEC-P16 **Final Action: Reject**
(770.3)

Submitter: Stanley Kaufman, CableSafe, Inc.

Recommendation: Revise as follows:

770.3 Other Articles. ~~Circuits and equipment shall comply with 770.3(A) and 770.3(B).~~ Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.

Substantiation: The scope of Article 770 does not cover circuits and equipment.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-23 Log #704 NEC-P16 **Final Action: Reject**
(770.3)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the following changes:

770.3 Other Articles.

Installations of optical fiber cables and raceways ~~Circuits and equipment~~ shall comply with 770.3(A) ~~and~~ 770.3(B) . Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.

Substantiation: This proposal is a clarification. (Task Group No. 770-10)

There are no circuits and equipment in Article 770 which only covers optical fiber cables and raceways. The proposed wording is more accurate. Reference to 770.3(B) has been deleted to correlate with other proposals from the task group.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-24 Log #3106 NEC-P16 **Final Action: Reject**
(770.3)

Submitter: Donald Hall, Corning Cable Systems

Recommendation: Revise text to read as follows:

770.3 Other Articles.

Circuits and equipment shall comply with 770.3(A) and 770.3(B). Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.

(A) Spread of Fire or Products of Combustion. The requirements of 300.21 for electrical installations shall also apply to optical fiber cables and raceways. ~~The accessible portion of a~~ Abandoned audio distribution cables shall be removed.

Also, add the following FPN to 770.3(A):

FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.

Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.

The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.

Panel Meeting Action: Reject

Panel Statement: The proposal would require all abandoned cable to be removed, irrespective of accessibility, presenting a compliance conundrum to installers. Without access, it is impossible to remove cables that are securely fastened without damaging the building or adjacent cables. The submitter's substantiation states: "It is not reasonable or necessary to install cables in a manner that prevents their eventual removal." However, the panel previously imposed additional securing and supporting requirements by referencing 300.11 in 770.24. Gaining access may sometimes require disassembly of part of the building. This is not the intent of the panel. The current requirement to remove only the accessible portion is reasonable. The submitter further proposes to add an FPN following 770.3(A) that is already contained in 770.24.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article. The FPN that the submitter submitted is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.

16-25 Log #713 NEC-P16 **Final Action: Accept in Principle**
(770.3, 770.133(C) and 770.100 (new))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the use of the word "and" in the sentence "The grounding conductor shall be connected in accordance with 770.100(B)(1), (B)(2), and (B)(3)."

It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-20. This action will be considered by the Panel as a Public Comment.

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:

770.3 Other Articles.
Circuits and equipment shall comply with 770.3(A) and 770.3(B). Only those sections of Chapter 2 and Article 300 referenced in this article shall apply to optical fiber cables and raceways.

770.101 ~~133(C)~~ Grounding of Cables Within Buildings . NonÐcurrent-carrying conductive members of optical fiber cables within buildings shall be grounded in accordance with Article 250.

770.133(C) Support of Cables. Raceways shall be used for their intended purpose. Optical fiber cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.
Exception: Overhead (aerial) spans of optical fiber cables shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such cables .

IV. Grounding Methods

770.100 Entrance Cable Grounding.
Where required by 770.93, the non-current-carrying metallic members of optical fiber cables entering buildings shall be grounded as specified in 770.100(A) through 770.100(D).

(A) Grounding Conductor.

(1) Insulation. The grounding conductor shall be insulated and shall be listed as suitable for the purpose.

(2) Material. The grounding conductor shall be copper or other corrosion-resistant conductive material, stranded or solid.

(3) Size. The grounding conductor shall not be smaller than 14 AWG.

(4) Length. The grounding conductor shall be as short as practicable.

(5) Run in Straight Line. The grounding conductor shall be run to the grounding electrode in as straight a line as practicable.

(6) Physical Protection. Where necessary, the grounding conductor shall be guarded from physical damage. Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or the same terminal or electrode to which the grounding conductor is connected.

(B) Electrode. The grounding conductor shall be connected in accordance with 770.100(B)(1) and (B)(2).

(1) In Buildings or Structures with Grounding Means. To the nearest accessible location on the following:

(1) The building or structure grounding electrode system as covered in 250.50
(2) The grounded interior metal water piping system, within 1.5 m (5 ft) from its point of entrance to the building, as covered in 250.52
(3) The power service accessible means external to enclosures as covered in 250.94
(4) The metallic power service raceway
(5) The service equipment enclosure
(6) The grounding electrode conductor or the grounding electrode conductor metal enclosure
(7) The grounding conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in 250.32

(2) In Buildings or Structures Without Grounding Means. If the building or structure served has no grounding means, as described in 770.100(B)(1), the grounding conductor shall be connected to either of the following:

(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)
(2) If the building or structure served has no grounding means, as described in 770.100(B)(1) or (B)(2)(1), to an effectively grounded metal structure or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or air terminal conductors (lightning-rod conductors) shall not be employed as electrodes for optical fiber cables.

(C) Electrode Connection. Connections to grounding electrodes shall comply with 250.70.

(D) Bonding of Electrodes. A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the optical fiber cable grounding electrode and power grounding electrode system at the building or structure served where separate electrodes are used.

FPN No. 1: See 250.60 for use of air terminals (lightning rods).

FPN No. 2: Bonding together of all separate electrodes limits potential differences between them and between their associated wiring systems.

Substantiation: This proposal contains technical as well as editorial changes. (Task Group No. 770-19)

Section 770.93 requires the grounding or interruption of the non-current-carrying metallic members of optical fiber entrance cables. However, Article 770 does not provide any guidance on how to carry out the grounding. Proposed new section 770.100 provides that guidance; it is based on 800.100. It is technically sound to treat fiber optics cables similarly to communications cables, with the exception of the "20-foot rule" as contained in 800.100(A)(4) that is appropriate where there is a metallic (electrically conductive) communications circuit and the electrical conductors connect to the utilization equipment. In the case of OF cable, it is unlikely that the metallic member will be electrically connected to the utilization equipment. Hence, this added restriction (requirement) is unnecessary for OF cables.

The current 770.133(C) has been renumbered to move the grounding requirement into the new Part IV, Grounding Methods. Article 250, which is referenced in Article 770, is the only part of Chapter 2 that is relevant to optical fiber cable, so this proposal states that only those sections of Chapter 2 that are referenced in Article 770 shall apply to Article 770. Chapter 2 deals with electrical installation wiring and protection, while Article 770 is nonelectrical.

The new text for 770.133(C) provides guidance on support of conductors that was missing from Article 770 but present in Articles 800, 820 and 830.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Accept the submitter's proposed revisions to 770.3.

Relocate current 770.133(C) Grounding to new Section 770.101 as follows:

770.101 Grounding. Non–current-carrying conductive members of optical fiber cables shall be grounded according to the grounding methods specified by 770.100.

Replace current 770.133(C) with new text to 770.133(C) Support of Cables.

Accept proposed text to 770.100 (new) in principle.

Change 770.93 as follows:

770.93 Grounding or Interruption of Non-Current-Carrying Metallic Members of Optical Fiber Cables. Where exposed to contact with electric light or power conductors, the non–current-carrying metallic members of optical fiber cables entering or attached to buildings shall be connected to an electrode by a grounding conductor as close to the point of entrance or attachment as practicable or shall be interrupted as close to the point of entrance or attachment as practicable by an insulating joint or equivalent device.

Add new Part IV as follows:

Part IV. Grounding Methods.

770.100 Entrance Cable Grounding. Where grounded, the non–current-carrying metallic members of optical fiber cables entering buildings shall be grounded as specified in 770.100(A) through 770.100(D).

(A) Grounding Conductor.

(1) Insulation. The grounding conductor shall be insulated and shall be listed.

(2) Material. The grounding conductor shall be copper or other corrosion-resistant conductive material, stranded or solid.

(3) Size. The grounding conductor shall not be smaller than 14 AWG. It shall have a current-carrying capacity approximately equal to or greater than that of the metallic member(s). The grounding conductor shall not be required to exceed 6 AWG.

(4) Run in Straight Line. The grounding conductor shall be run to the grounding electrode in as straight a line as practicable.

(5) Physical Damage. Where necessary, the grounding conductor shall be guarded from physical damage. Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or the same terminal or electrode to which the grounding conductor is connected.

(B) Electrode. The grounding conductor shall be connected in accordance with 770.100(B)(1), (B)(2), and (B)(3).

(1) In Buildings or Structures with an Intersystem Grounding Termination. If the building or structure served has an intersystem grounding termination, the grounding conductor shall be connected to the intersystem grounding termination.

(2) In Buildings or Structures with Grounding Means. If the building or structure served has no intersystem grounding termination, the grounding conductor shall be connected to the nearest accessible location on the following:

(1) The building or structure grounding electrode system as covered in 250.50

(2) The grounded interior metal water piping system, within 1.5 m (5 ft) from its point of entrance to the building, as covered in 250.52

(3) The power service accessible means external to enclosures as covered in 250.94

(4) The metallic power service raceway

(5) The service equipment enclosure

(6) The grounding electrode conductor or the grounding electrode conductor metal enclosure

(7) The grounding conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in 250.32

(3) In Buildings or Structures Without Intersystem Grounding Termination or Grounding Means. If the building or structure served has no intersystem grounding termination or grounding means, as described in 770.100(B)(2), the grounding conductor shall be connected to either of the following:

(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)

(2) If the building or structure served has no grounding means, as described in 770.100(B)(2) or (B)(3)(1), to an effectively grounded metal structure or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or air terminal conductors (lightning-rod conductors) shall not be employed as electrodes for protectors.

(C) Electrode Connection. Connections to grounding electrodes shall comply with 250.70.

(D) Bonding of Electrodes. A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the grounding electrode and power grounding electrode system at the building or structure served where separate electrodes are used.

Exception: At mobile homes as covered in 770.106.

FPN No. 1: See 250.60 for use of air terminals (lightning rods).

FPN No. 2: Bonding together of all separate electrodes limits potential differences between them and between their associated wiring systems.

Add new section 770.106 as follows:

770.106 Grounding of Entrance Cables at Mobile Homes.

Where grounded as required by 770.100 at a mobile home, the non–current-carrying metallic members of optical fiber cables entering buildings shall be grounded as specified in 770.106(A) and (B).

(A) Grounding. Where there is no mobile home service equipment located within 9.0 m (30 ft) from the exterior wall of the mobile home it serves, or there is no mobile home disconnecting means grounded in accordance with 250.32 and located within 9.0 m (30 ft) from the exterior wall of the mobile home it serves, the ground for non–current-carrying metallic members of optical fiber cables entering buildings shall be in accordance with 770.100(B)(3).

(B) Bonding. The primary protector grounding terminal or grounding electrode shall be bonded to the metal frame or available grounding terminal of the mobile home with a copper grounding conductor not smaller than 12 AWG under either of the following conditions:

(1) Where there is no mobile home service equipment or disconnecting means as in 770.106(A)

(2) Where the mobile home is supplied by cord and plug

Panel Statement: The panel incorporated into the proposal material from Proposals 16-55 and 16-66. The changes clarified the submitter's intent.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-26 Log #1379 NEC-P16 **Final Action: Reject**
(770.3(A))

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete text concerning abandoned cables

770.3 Other Articles.

Circuits and equipment shall comply with 770.3(A) and 770.3(B). Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.

(A) Spread of Fire or Products of Combustion. The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. ~~The accessible portion of abandoned optical fiber cables shall be removed.~~

(B) Ducts, Plenums, and Other Air-Handling Spaces. The requirements of 300.22 for electric wiring shall also apply to installations of optical fiber cables and raceways where they are installed in ducts or plenums or other space used for environmental air.

Exception: As permitted in 770.154(A).

Substantiation: The NEC is an installation standard, not a maintenance standard. Because of this, this rule should not be a part of the NEC. Furthermore, this provision does not accomplish its intent, as the code is not a retroactive document. To require abandoned cables to be removed is similar to requiring facilities to update their receptacles to the new GFCI provision every three years. With that said, the only time this rule applies is when an installer creates an abandoned cable. Also, this provision does not fall within the purpose of the NEC 90.1(A). The NEC is concerned with the hazards created from the use of electricity…this rule seems to imply that a cable with a voltage applied to it is safe, but a cable with no voltage applied to it is dangerous.

This proposal is also being made to 725.3(B), 760.3(A), 800.3(C), 820.3(A) and 830.3(A).

Panel Meeting Action: Reject

Panel Statement: Abandoned cable removal requirements do belong in the NEC. Removal of abandoned cables is a difficult and somewhat controversial issue. The concern is not for a cable with no voltage applied, but for the accumulation of combustible material in concealed spaces should a fire be initiated by electrical or other means.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-27 Log #2807 NEC-P16 **Final Action: Accept in Part**
(770.3(A))

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Revise text to read as follows:

770.3 Other Articles. No change.

(A) Spread of Fire or Products of Combustion. ~~The requirements of~~ 300.21 ~~for electrical installations shall also apply to installations of optical fiber cables and raceways~~ shall apply . ~~The accessible portion of abandoned optical fiber cables shall be removed.~~

Substantiation: The requirements for removal of abandoned optical fiber cables would be better suited in appropriate code section within Article 770. I have submitted another proposal that would move the abandoned optical fiber cables requirements to 770.24 - Mechanical Execution of Work. The abandoned optical fiber cables requirements are out of place in 770.3 - Other Articles. The requirements are not part of another Article as they are part of Article 770 and are located within Article 770.

The addition of the words “shall apply” would incorporate language that is consistent with 800.3, 820.3 and 830.3.

Similar proposals have been submitted for 640.3, 725.3, 760.3, 800.3, 820.3, and 830.3 to revise these sections as well.

Panel Meeting Action: Accept in Part

The panel accepts the part that deletes the second sentence of 770.3(A) concerning abandoned cables. The Panel rejects the proposed revisions to the first sentence.

Panel Statement: The panel agrees that the requirement to remove abandoned cable does not belong in 770.3 and should be relocated. A direct reference to Section 300.21 is inappropriate, as it applies to electrical installations; optical fiber cables are not electrical cables. See panel action on Proposal 16-31 that relocates the requirement to remove abandoned cable to 770.25 (new) and restates the spread of fire requirements in optical fiber terms in 770.26 (new).

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should have been accepted as originally submitted. The panel statement seems to be in conflict as it states the provisions of 300.21 will work well in the new proposed section 770.26 but not in 770.3(A) where it has always been properly located. The panel accepted the same 300.21 requirements whose concern is the spread of fire and products of combustion in hollow spaces, vertical shafts and ventilation and air- handling ducts caused by electrical installations and located them in 770.26.

16-28 Log #3006 NEC-P16 **Final Action: Reject**
(770.3(A))

Submitter: Marcelo M. Hirschler, GBH International

Recommendation: Revise text to read as follows:

770.2 Definitions.

Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

770.3 Other Articles.

Circuits and equipment shall comply with 770.3(A) and 770.3(B). Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.

(A) Spread of Fire or Products of Combustion. The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. ~~The accessible portion of abandoned~~ Abandoned optical fiber cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components.

Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in "inaccessible spaces". This is not conducive to safe electrical practice; this the key change is the elimination of the words "the accessible portion of".

If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.

Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.

For information, see the relevant definitions in the NEC.

Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.

Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.

Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.

Panel Meeting Action: Reject

Panel Statement: The proposal neither enhances nor clarifies the existing requirements. The submitter basically would expand the text of 770.3(A) by repeating much of the text of the Article 100 definition of "Accessible (as applied to wiring methods)". The proposed requirement presents a compliance conundrum to installers. Without access, it is impossible to remove cables that are securely fastened without damaging the building or adjacent cables. Gaining access may sometimes require disassembly of part of the building. This is not the intent of the panel. The current requirement to remove only the accessible portion is reasonable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article.

16-29 Log #2774 NEC-P16 **Final Action: Accept in Principle in Part (770.3(A), 770.25 (new) & 770.26 (new))**

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with the Panel Action in Proposal 16-25 since there was accepted text for 770.3(A) in Proposal 16-25 and this Proposal 16-29 deletes 770.3(A). This action will be considered by the Panel as a Public Comment.

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Delete 770.3(A) and relocate material in new 770.25 and 770.26 as shown:

~~**770.3(A) Spread of Fire or Products of Combustion.** The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. The accessible portion of abandoned optical fiber cables shall be removed.~~

770.25. Abandoned Cables. The accessible portion of abandoned optical fiber cables shall be removed.

770.26 Spread of Fire or Products of Combustion. Installations of optical fiber cables and raceways in hollow spaces, concealed spaces, vertical shafts, and air ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of optical fiber cables and raceways through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 770.26 can be found in building codes, fire resistance directories, and product listings.

FPN No. 2: FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The title of Section 770.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 770. It is out of place in section 770.3. This proposal will move it to a new section of Article 770. The reference to section 300.21 for optical fiber cables and raceways is awkward because section 300.21 deals with electrical installations. The text of proposed section 770.26 is based on section 300.21 but modified to apply to optical fiber cables and raceways. For clarity, "ventilation or air-handling ducts" has been simplified by replacing it with "air ducts". Also, "concealed spaces" have been added to the list of areas requiring fire protection vigilance (hollow spaces, vertical shafts, and air ducts) to correlate with NFPA 13, *Installation of Sprinkler Systems,* which has requirements for protecting concealed spaces. A FPN is included to refer users to the NFPA 13 requirements.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: The panel accepts the submitter's deletion of 770.3(A), the addition of 770.25 (new), and the addition of 770.26 (new), but revises "air ducts" to "ventilation or air handling ducts" in keeping with the existing NEC text. The panel accepts FPN No. 1.

See panel action and panel statement on Proposal 16-31.

The panel rejects the addition of FPN No. 2 because it introduces undefined terminology. "Concealed spaces" should be adequately defined. See panel action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 770.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.

The substantiation provided to delete 770.3(A) which contains the requirements of 300.21 is unclear. Substantiation indicated the reference of 300.21 for optical fiber cables and raceways was awkward because 300.21 deal with electrical installation. Yet with the submitter's new 770.26 (which is the language of 300.21 in its entirety) talks about installations of electrical equipment such as optical fiber cables and raceways. In addition there is no need for the FPN No.1 to be mentioned as the language in 770.3(A) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.

We believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-30 Log #3312 NEC-P16 **Final Action: Accept in Principle in Part (770.3(A), 770.25 (new) & 770.26 (new))**

Submitter: William E. Koffel, Koffel Assoc., Inc. / Rep. Society of the Plastics Industry

Recommendation: Delete 770.3(A) and relocate material in new 770.25 and 770.26 as shown:

~~**770.3(A) Spread of Fire or Products of Combustion.** The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. The accessible portion of abandoned optical fiber cables shall be removed.~~

770.25 Abandoned Cables. The accessible portion of abandoned optical fiber cables shall be removed.

770.26 Spread of Fire or Products of Combustion. Installations of optical fiber cables and raceways in hollow spaces, concealed spaces, vertical shafts, and air ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of optical fiber cables and raceways through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 770.26 can be found in building codes, fire resistance directories, and product listings.

FPN No. 2: FPN: See 8.14.1 of NFPA 13, *Installation of Sprinkler Systems*, for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The title of Section 770.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 770. It is out of place in Section 770.3. This proposal will move it to a new section of Article 770. The reference to Section 300.21 for optical fiber cables and raceways is awkward because Section 300.21 deals with electrical installations. The text of proposed Section 770.26 is based on Section 300.21 but modified to apply to optical fiber cables and raceways. For clarity, "ventilation or air-handling ducts" has been simplified by replacing it with "air ducts". Also, "concealed spaces" have been added to the list of areas requiring fire protection vigilance (hollow spaces, vertical shafts, and air ducts) to correlate with NFPA 13, *Installation of Sprinkler Systems*, which has requirements for protecting concealed spaces. A FPN is included to refer users to the NFPA 13 requirements. It should be noted that the section number may need to be revised once the 2006 Edition of NFPA 13 is published.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: See panel action and statement on Proposal 16-29.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: See my Explanation of Negative on Proposal 16-29.

16-31 Log #705 NEC-P16 **Final Action: Accept in Principle**
(770.3(A), 770.25 (new) and 770.26 (new))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal and that further consideration be given to the comments expressed in the affirmative voting. This action will be considered by the Panel as a Public Comment.

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete 770.3(A) and relocate material in new 770.25 and 770.26 as shown:

~~**770.3(A) Spread of Fire or Products of Combustion.** The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. The accessible portion of abandoned optical fiber cables shall be removed.~~

770.25. Abandoned Cables. The accessible portion of abandoned optical fiber cables shall be removed.

770.26 Spread of Fire or Products of Combustion.Ê Installations of optical fiber cables and raceway in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of optical fiber cables and raceways through fire-resistantÐrated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistanceÐrated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 770.26 can be found in building codes, fire resistance directories, and product listings.

Substantiation: This proposal is editorial. (Task Group No. 770-11)

The title of Section 770.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 770. It is out of place in section 770.3. This proposal will move it to a new section of Article 770. The reference to section 300.21 for optical fiber cables and raceways is awkward because section 300.21 deals with electrical installations. The text of proposed section 770.26 is based on section 300.21 but modified to apply to optical fiber cables and raceways

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

The panel accepts the submitter's direction.

In addition, delete alpha reference (B) to 770.3 only so there are not two separate subsections. Retain the exception.

Add a new subsection 770.26 to read as follows:

770.26 Spread of Fire or Products of Combustion. Installations of optical fiber cables and rac eways in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of optical fiber cables and raceways through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Panel Statement: The panel edited the submitter's text for editorial clarity.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 770.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.

The substantiation provided to delete 770.3(A) which contains the requirements of 300.21 is unclear. Substantiation indicated the reference of 300.21 for optical fiber cables and raceways was awkward because 300.21 deal with electrical installation. Yet with the submitter's new 770.26 (which is the language of 300.21 in its entirety) talks about installations of electrical equipment such as optical fiber cables and raceways. In addition there is no need for the FPN No.1 to be mentioned as the language in 770.3(A) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.

Comment on Affirmative:

BRUNSSEN, J.: The Panel Meeting Action needs to be clarified to indicate that the Panel also accepted the FPN associated with 770.26 (new). See Panel Action on Proposals 16-128 and –259.

DORNA, G.: The panel action needs to be clarified. The panel accepted the FPN. See panel action on parallel Proposals 16-128 and 16-259.

KAHN, S.: The panel action requires correction as the FPN was accepted. See parallel Proposals 16-128 and 16-259.

16-32 Log #32 NEC-P16 **Final Action: Reject**
(770.3(B))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Delete as follows:

~~**(B) Ducts, Plenums, and Other Air-Handling Spaces.** The requirements of 300.22 for electric wiring shall also apply to installations of optical fiber cables and raceways where they are installed in ducts or plenums or other space used for environmental air.~~

~~*Exception: As permitted in 770.154(A).*~~

Substantiation: Section 770.3(B) provides no additional guidance or requirements that are not already in 770.154(A). It's redundant and perhaps confusing to send a optical fiber cable installer to section 300.22 to look for requirements that are already in Article 770. Section 800.3 does not have a similar requirement. Elimination of 770.3(B) will improve the parallelism between the articles.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-33 Log #706 NEC-P16 **Final Action: Reject**
(770.3(B))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Delete the following:
~~**(B) Ducts, Plenums, and Other Air-Handling Spaces.** The requirements of 300.22 for electric wiring shall also apply to installations of optical fiber cables and raceways where they are installed in ducts or plenums or other space used for environmental air.~~
~~*Exception: As permitted in 770.154(A).*~~
Substantiation: This proposal is editorial. (Task Group No.770-12)
Section 770.3(B) provides no additional guidance or requirements that are not already in 770.154(A). It's redundant and perhaps confusing. Section 800.3 does not have a similar requirement.
Acceptance of this proposal will make Articles 770, 800, 820 and 830 consistent and in compliance with section 3.3.5 of the NEC Style Manual, shown below:
3.3.5 Parallel Construction. Parallel construction means stating similar requirements in similar ways for greater consistency. This helps makes the *NEC* clear for users. Lack of consistency often creates confusion, causing users to ask: *Does this difference in wording represent a different requirement? Or is it simply two different ways of trying to say the same thing?* There are several kinds of parallel construction:
Organization and Numbering . If practicable, the subsections of similar articles should be numbered in the same order (see 2.4.1).
Sections. Different sections, within the same article, that reflect similar or closely related subjects, should have similar structures.
Lists. All items in a list should be parallel (that is, singular or plural, written in the same verb tense, using phrases or sentences but not a mix).
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-34 Log #897 NEC-P16 **Final Action: Reject**
(770.4)

Submitter: Noel Williams, Noel Williams Consulting
Recommendation: Revise 770.4 as follows:
"...Cables installed exposed ~~on the surface of ceilings and sidewalls~~ shall be supported in such a manner...The installations shall also conform to 300. 4 ~~(D)~~ and 300.11." (Other portions to remain unchanged.)
Substantiation: Current cable support rules apply only to cables exposed to view (on surfaces). Cables above ceilings are "exposed" as defined, but such cables are only required to be "neat and workmanlike." All of 300.4 should apply (or none of it). 300.4(D) is only for cables run parallel to framing.
Panel Meeting Action: Reject
Panel Statement: The panel recognizes that the proposal is intended to address 770.24. There are multiple definitions of "exposed" in the NEC. The appropriate Article 100 definition in this case is "Exposed (as applied to wiring methods). On or attached to the surface or behind panels designed to allow access". The phrase "on the surface of ceilings and sidewalls" is appropriate to which portion of the definition is being addressed. Compliance with 300.4(D) has been a Code requirement for many years, resulting in an exemplary safety record. It is inappropriate and poor workmanship to permit damage to optical cable by nails, screws or other construction/decorative attachments.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-35 Log #1380 NEC-P16 **Final Action: Reject**
(770.6)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Move definition of optical fiber cables from 770.6 to 770.2
~~**770.6 Optical Fiber Cables.** Optical fiber cables transmit light for control, signaling, and communications through an optical fiber.~~
Substantiation: This section contains no requirements and is inconsistent with the rest of the National Electrical Code.
An additional proposal is being submitted to 770.2 to add a definition of Optical Fiber Cables, using the existing language of 770.6
Panel Meeting Action: Reject
Panel Statement: Section 770.6 describes the function of optical fiber cables.
See panel action on Proposal 16-19.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-36 Log #703 NEC-P16 **Final Action: Accept**
(770.9, 770.2 and 770.3)

TCC Action: The Technical Correlating Committee understands that the accepted text for 770.3(A) replaces the text deleted by the Panel Action on Proposal 16-29.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:
~~**770.9 Types.**~~
~~Optical fiber cables can be grouped into three types.~~
~~**(A) Nonconductive.** These cables contain no metallic members and no other electrically conductive materials.~~
~~**(B) Conductive.** These cables contain nonÐcurrent-carrying conductive members such as metallic strength members, metallic vapor barriers, and metallic armor or sheath.~~
~~**(C) Composite.** These cables contain optical fibers and current-carrying electrical conductors, and shall be permitted to contain nonÐcurrent-carrying conductive members such as metallic strength members and metallic vapor barriers. Composite optical fiber cables shall be classified as electrical cables in accordance with the type of electrical conductors.~~
Establish three new definitions in 770.2 Definitions.
<u>**Cable, Nonconductive Optical Fiber.** These optical fiber cables contain no metallic members and no other electrically conductive materials.</u>
<u>**Cable, Conductive Optical Fiber.** These optical fiber cables contain nonÐcurrent-carrying conductive members such as metallic strength members, metallic vapor barriers, and metallic armor or sheath.</u>
<u>**Cable, Composite Optical Fiber.** These cables contain optical fibers and current-carrying electrical conductors.</u>
Revise 770.3 Other Articles.
<u>**(A) Composite Cables** . Composite optical fiber cables shall be classified as electrical cables in accordance with the type of electrical conductors. They shall be constructed, listed and marked in accordance with the appropriate article for each type of electrical cable.</u>
Substantiation: This is an editorial proposal. (Task Group No. 770-09)
The components of Section 770.9 are in the wrong place. The definitions belong in the definitions section. The requirement that composite cable be classified as electrical cable belongs in the other articles section. This proposal moves the components of 770.9 to the correct places. A definition of optical fiber cable has been proposed separately. The new text for 770.3 has been lettered (A) to correlate with another proposal from the task group that deleted the existing (A).
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected as the new lettered 770.3(A) is in conflict with the present lettered 770.3(A).

16-37 Log #59 NEC-P16 **Final Action: Accept in Principle**
(770.12)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows;

770.12 ~~Raceways for Optical Fiber Cables.~~
I ~~nstallations of raceways shall comply with 770.12(A) through.~~
~~**(A) Listed Chapter 3 Raceways.** Listed optical fiber cable shall be permitted to be installed in any type of listed raceway permitted in Chapter 3 where that listed raceway is installed in accordance with Chapter 3. Where optical fiber cables are installed within raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply.~~
~~**(B) Optical Fiber Raceways.** Listed optical fiber cable shall be permitted to be installed in listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 and 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing shall apply.~~
~~**(C)**~~ **Innerduct.** Listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 shall be permitted to be installed as innerduct in any type of listed raceway permitted in Chapter 3.
~~**(D) Entering Buildings.** Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.~~

Substantiation: This is a corollary proposal to proposals that move the requirements of 77012(A), (B) and (C) to other sections leaving only 770.12(C) in 770.12.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-38.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: See my Explanation of Negative on Proposal 16-38.

16-38 Log #707 NEC-P16 **Final Action: Accept in Principle**
(770.12 and 770.110 (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:

770.12 ~~Raceways~~ Innerduct for Optical Fiber Cables.
~~Installations of raceways shall comply with 770.12(A) through 770.12(D).~~
~~770.12(A) Listed Chapter 3 Raceways. Listed optical fiber cable shall be permitted to be installed in any type of listed raceway permitted in Chapter 3 where that listed raceway is installed in accordance with Chapter 3 . Where optical fiber cables are installed within raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply .~~
~~770.12(B) Optical Fiber Raceways. Listed optical fiber cable shall be permitted to be installed in listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 and 362.24 through 362.56 , where the requirements applicable to electrical nonmetallic tubing shall apply.~~
~~**(C) Innerduct.**~~ Listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 shall be permitted to be installed as innerduct in any type of listed raceway permitted in Chapter 3.
~~**(D) Entering Buildings.** Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance~~
770.110 Raceways for Communications Wires and Cables.
Where optical fiber cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154, and with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.ÊWhere optical fiber cables are installed in raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply.

Substantiation: This is an editorial proposal. (Task Group No. 770-13)
Installation requirements for optical fiber, communications and CATV raceways are:
770.12(A) Listed Chapter 3 Raceways. Listed optical fiber cable shall be permitted to be installed in any type of listed raceway permitted in Chapter 3 where that listed raceway is installed in accordance with Chapter 3 . Where optical fiber cables are installed within raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply.
770.12(B) Optical Fiber Raceways. Listed optical fiber cable shall be permitted to be installed in listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 and 362.24 through 362.56 , where the requirements applicable to electrical nonmetallic tubing shall apply.
770.12(C) Innerduct. Listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 shall be permitted to be installed as innerduct in any type of listed raceway permitted in Chapter 3.Ê
770.12(D) Entering Buildings. Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.
800.110 Raceways for Communications Wires and Cables.
Where communications wires and cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or a listed nonmetallic raceway complying with 800.182, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.
Exception: Conduit fill restrictions shall not apply.
820.110 Raceways for Coaxial Cables.
Where coaxial cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or a listed nonmetallic raceway complying with 820.182(A), (B), or (C), as applicable, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.
Exception: Conduit fill restrictions shall not apply.
Article 770 is not editorially consistent with Articles 800 and 820. This proposal will relocate 770.12(A) and 770.12(B) to 770.110 in order for the location on these requirements to be consistent with the Articles 800 and 820. Corollary proposals are being submitted for Articles 800 and 820 to use similar text. Specifically mentioning each plenum, riser and general-purpose raceway, rather that using the term “nonmetallic raceway” is more user-friendly. Section (D) has been deleted to correlate with another task group proposal has been submitted to place the requirements for entrance raceway in a new Part II, in section 770.48 Unlisted Cables and Raceways Entering Buildings. Since section (C) is the only part left in 770.12, it will no longer be a subsection; it has been renumbered accordingly.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) mprove the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Principle
Delete 770.12(A), (B), (C), and (D).
Change 770.12 to read as follows:
770.12 Innerduct for Optical Fiber Cables. Listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway selected in accordance with the provisions of 770.154 shall be permitted to be installed as innerduct in any type of listed raceway permitted in Chapter 3.
Add new 770.110 as follows:
770.110 Raceways for Optical Fiber Cables. Where optical fiber cables are installed in a raceway, the raceway shall be of a type either permitted in Chapter 3 and installed in accordance with Chapter 3 or listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway selected in accordance with the provisions of 770.154, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply. Where optical fiber cables are installed in raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply.
Panel Statement: The panel has revised the submitter’s text for clarity.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be modified. Change the last part of the first sentence of the new 770.110 as follows: “and installed in accordance with 362.10, 362.12 and 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply”.
The Chapter 3 raceways must be installed in accordance with all of the requirements of Chapter 3. These raceways (general-purpose, riser) should also have to be installed in accordance with 362.10 and 362.12 since they have the same or similar characteristics to ENT.

16-39 Log #68 NEC-P16 **Final Action: Reject**
(770.12(A) (New))

Submitter: Michael Rytelewski, Rytel Electric #8372
Recommendation: Add new text to read:
The maximum fill capacity of all conduit raceways used with optical fiber cables shall not exceed 50 percent fill capacity.
Substantiation: This is to ensure that the installer does not over fill the conduit raceways which could lead to premature fiber failure because of the installation.
Panel Meeting Action: Reject
Panel Statement: See 770.12 of the Code.
The submitter has not provided adequate substantiation that there is a safety issue.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We agree with the submitter's intent that there should be a maximum fill capacity of conduit raceways with optical fibers, however he has not provided any substantiation to the panel to review. The submitter should submit such substantiation for the panel to review in the 2008 NEC ROC stage.

16-40 Log #61 NEC-P16 **Final Action: Accept in Principle**
(770.12(A), 770.12(B) and 770.110 (New))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
~~**(A) Listed Chapter 3 Raceways.** Listed optical fiber cable shall be permitted to be installed in any type of listed raceway permitted in Chapter 3 where that listed raceway is installed in accordance with Chapter 3. Where optical fiber cables are installed within raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply.~~
~~**770.12(B) Optical Fiber Raceways.** Listed optical fiber cable shall be permitted to be installed in listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 and 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing shall apply~~ .
770.110 Raceways for Communications Wires and Cables. Where optical fiber cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154, and with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply. Where optical fiber cables are installed in raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply.
Substantiation: Installation requirements for optical fiber, communications and CATV raceways are:
770.12(A) Listed Chapter 3 Raceways. Listed optical fiber cable shall be permitted to be installed in any type of listed raceway permitted in Chapter 3 where that listed raceway is installed in accordance with Chapter 3. Where optical fiber cables are installed within raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 shall apply.
770.12(B) Optical Fiber Raceways. Listed optical fiber cable shall be permitted to be installed in listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 and 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing shall apply.
770.12(C) Innerduct. Listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 shall be permitted to be installed as innerduct in any type of listed raceway permitted in Chapter 3.
770.12(D) Entering Buildings. Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.
800.110 Raceways for Communications Wires and Cables. Where communications wires and cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or a listed nonmetallic raceway complying with 800.182, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.
Exception: Conduit fill restrictions shall not apply.
820.110 Raceways for Coaxial Cables. Where coaxial cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or a listed nonmetallic raceway complying with 820.182(A), (B), or (C), as applicable, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.
Exception: Conduit fill restrictions shall not apply.
Article 770 is not editorially consistent with Articles 800 and 820. This proposal will relocate 770.12(A) and 770.12(B) to 770.100 in order for the location on these requirements to be consistent with the Articles 800 and 820. Corollary proposals are being submitted for Articles 800 and 820 to use similar text. Specifically mentioning each plenum, riser and general-purpose raceway, rather that using the term "nonmetallic raceway" is more user-friendly. Another proposal has been submitted to place the requirements for entrance raceway in a new Part II, in section 770.48 Unlisted Cables and Raceways Entering Buildings.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-38.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: See my Explanation of Negative on Proposal 16-38.

16-41 Log #708 NEC-P16 **Final Action: Accept**
(770.21)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
770.21 Access to Electrical Equipment Behind Panels Designed to Allow Access.
Access to electrical equipment shall not be denied by an accumulation of optical fiber cables that prevents removal of panels, including suspended ceiling panels.
Substantiation: This is an editorial proposal. (Task Group No. 770-14)
It creates consistency among parallel articles and references the specific medium used in this article.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-42 Log #1381 NEC-P16 **Final Action: Reject**
(770.24)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete requirement to comply with 300.4(D)
770.24 Mechanical Execution of Work.
Optical fiber cables shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with ~~300.4(D) and~~ 300.11.
Substantiation: There is no reason to protect limited energy circuits from accidental contact with nails or screws. Limited energy circuits are considered to be inherently safe from a fire and electric shock perspective, hence the allowances of lesser wiring methods and allowances for open splicing with out boxes. The protection of these circuits is a design and/or performance issue, not a safety issue. The requirement found in the existing *Code* text does not fit into the purpose of the NEC, as addressed in 90.1(A).
Panel Meeting Action: Reject
Panel Statement: Compliance with 300.4(D) has been a Code requirement for many years, resulting in an exemplary safety record. While optical fiber cables generally do not contain power and there is little or no shock hazard, it is inappropriate and poor workmanship to permit damage to the optical fiber cable by nails, screws, or other construction/decorative attachments.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-43 Log #1382 NEC-P16 **Final Action: Accept in Principle**
(770.24)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add "Cable Ties" to the list of supporting methods
770.24 Mechanical Execution of Work.
Optical fiber cables shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps,

staples, <u>cable ties</u> , hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.

Substantiation: This is being proposed in an effort to create uniform language with the chapter three cable wiring method support sections, specifically, 230.30(A), 330.30(A) and 334.30. Similar proposals are also being made to 725.8, 640.6, 760.8, 800.24, 820.24 and 830.24

Panel Meeting Action: Accept in Principle

Change 770.24 to read as follows:

770.24 Mechanical Execution of Work.

Optical fiber cables shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by <u>listed hardware including</u> straps, staples, <u>cable ties,</u> hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform to 300.4(D) and 300.11.

Panel Statement: The panel accepted the requirement for listing in accordance with Proposal 16-45 and includes a clear requirement for listed hardware.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 11 Negative: 3 Abstain: 1

Explanation of Negative:

BOYER, J.: NEMA does not believe that all such product used for the securement of communications circuits need be listed. Code Panel 8 has steadily rejected similar proposals relating to the support of conduit and cables. UL 1565 provides requirements for listed cable ties intended for primary support of flexible conduits and cables in accordance with the NEC. Such cable ties must have a minimum loop tensile strength rating of 23 kg (50 lbs) or greater. NEMA proposes that the panel reconsider its action and ACCEPT the proposal in principle and in part with the following action. Accept the proposed addition of “cable ties” in the third sentence, reject the requirement that all such hardware be “listed”, and add the following new fourth sentence. “ <u>Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.</u>)”

BRUNSSEN, J.: Listed hardware including cable ties, cable tie mounts, staples, conduit straps and similar hardware are covered under specific UL categories and are listed as suitable for use in air handling spaces. This proposal should have been rejected per the Standards Council directive relative to such proposals. The Standards Council directive should be applied consistently to all applicable proposals.

DORNA, G.: See my explanation of negative vote on Proposal 16-45.

Explanation of Abstention:

KAHN, S.: Though I agree with the proposal and the submitter’s intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

16-44 Log #1862 NEC-P16 **Final Action: Reject**
(770.24)

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: In the final sentence, delete the reference to 300.11 as follows:

“The installation shall also conform with 300.4(D) ~~and 300.11~~ .”

Substantiation: The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for optical fiber cables. The Fine Print Note associated with 770.24 presently directs the reader to the appropriate installation practices for such cables. Section 300.11 is directed toward power cable assemblies that are heavier and larger than optical fiber cables. Further, optical fiber cables typically contain no electrical power. Deletion of the reference to 300.11 will yield consistency throughout the NEC as Panel 3 did not see fit to adopt this reference in Articles 760 and 725.

Panel Meeting Action: Reject

Panel Statement: The requirements of 300.11 are applicable to optical fiber cables.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for optical fiber cables. The Fine Print Note associated with 770.24 directs the reader to the appropriate installation standards. The Panel has enhanced the Fine Print Note during this cycle by the addition of a reference to ANSI/NECA/FOA 301-2004 covering the installation of optical fiber cables (see Proposal 16-46). These references are all that is necessary and sufficient for such cables without imposing the burdensome requirements of 300.11. Section 300. 11 is directed toward power cable assemblies that are heavier and larger than optical fiber cables. Optical fiber cables contain no power. (Where composite optical fiber cables are used, they are classified as electrical cables in accordance with the type of electrical conductors.)

JOHNSON, S.: I agree with the submitter’s points in his proposal. 300.11 deals with cables that are larger and heavier than optical fiber cables. Referencing 300.11 also creates an inconsistency with Sections 760 and 725, which deal with similar sized cables and do not make this reference. I vote against the Panel’s action to reject.

16-45 Log #3052 NEC-P16 **Final Action: Accept in Principle in Part**
(770.24)

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Revise 770.24 as follows:

770.24 Mechanical Execution of Work

(A) <u>**Neat and Workmanlike Manner.**</u> Optical fiber <u>equipment</u> , cables <u>and circuits</u> shall be installed in a neat and workmanlike manner.

(B) <u>**Installation of Optical Fiber Cables.**</u> Optical fiber cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the optical fiber cable will not be damaged by normal building use. Such cables shall be secured by <u>listed</u> straps, stapes, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D) and 300.11.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling,* and other ANSI- approved installation standards.

(C) <u>Abandoned Optical Fiber Cables. Abandoned optical fiber cables shall be removed.</u>

<u>FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI- approved standards which provide cable installation that facilitates the removal of abandoned cables.</u>

Substantiation: This proposal revises this section into a practical working tool which will assist in making 770.24 a clear, usable and enforceable code. Each first level subdivision contains a code rule that requires action and the required action has been presented din clear, usable and enforceable manner.

In the electrical industry, the electrician, contractor and AHJ have been taught the importance and significance of the concept of mechanicla execution of work. I am an electrical instructor who teaches this important concept to the people involved. This is one of the basis for 90.1(A) which serves as the purpose of this Code. The Code’s purpose is to provide a safe installation from hazards arising from the use of electricity.

The revised text in 770.24(A) will require all optical fiber equipment, cables and circuits to be installed in a neat and workmanlike manner.

770.24(B) is an editorial change with additional language to require the means of securing and supporting to be listed for the purpose.

The addition of 770.24(C) would replace the requirements that were located in 770.3(A), 770.154(A), and 770.154(B). It makes sense to have the requirements of both the installation of cable and the removal of cable in the same Code section. This would provide the proper guidance to everyone involved. The installer, contractor and the AHJ would gain from this revised section as the rules are centrally located in one Code section. If optical fiber cable is installed properly then the removal of optical fiber cable should be no problem if it is not needed anymore or abandoned. The proposed FPN will provide useful guidance and information to everyone involved regarding correct installation practices which would facilitate the removal of the cable as well.

Similar proposals have been submitted for 640.6, 725.8, 760.8 800.24, 820.24, and 830.24.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: The panel accepts the incorporation of the term “listed”. See panel action on Proposal 16-43.

The panel accepts in principle the part of the proposal that recommends relocating requirements for abandoned cable. See panel Action on Proposal 16-31 for the correct text.

The panel does not accept the breaking up of 770.24 and the changes to the FPN.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 10 Negative: 4 Abstain: 1

Explanation of Negative:

BRUNSSEN, J.: See my explanation of negative vote on Proposal 16-43.

DORNA, G.: The UL Directory (2005), shows that category ZODZ covers “cable ties, cable tie mounts and similar types of related hardware”. Likewise, Conduit and Fittings, category DWFV covers “cable ties, conduit straps, staples and similar hardware...”. Both categories list as “Suitable for use in air handling spaces in accordance with 300.22(C) and (D) of the National Electrical Code.” This proposal should have been rejected because of the Standards Council decision concerning NFPA 90A.

OHDE, H.: This proposal should have been accepted in part. The FPN located after 770.24 (C) is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.

PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

Explanation of Abstention:

KAHN, S.: Though I agree with the proposal and the submitter's intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

16-46 Log #2274 NEC-P16 **Final Action: Accept in Principle**
(770.24, FPN)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: 770.24 Revise the Fine Print Note to read as follows:

FPN: Accepted industry practices are described in ANSI/NECA/FOA 301-2004, Standard for Installing and Testing Fiber Optic Cables, and other ANSI-approved installation standards.

Substantiation: This standard, which was published after the 2002 National Electrical Code, provides more detailed guidance for optical fiber installations than ANSI/NECA/BICSI 568-2001.

Panel Meeting Action: Accept in Principle

Change FPN to read as follows:

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, ANSI/NECA/FOA 301-2004, Standard for Installing and Testing Fiber Optic Cables, and other ANSI-approved installation standards.

Panel Statement: The panel combined the submitter's FPN with the existing text.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 12 Negative: 3

Explanation of Negative:

BOYER, J.: See NEMA's negative comment on Proposal 16-136.

OHDE, H.: This proposal should have been rejected because CMP 16 members were not provided a copy of this standard to review prior the 2008 ROP.

PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

16-47 Log #2888 NEC-P16 **Final Action: Reject**
(770.24, FPN)

Submitter: Ron Alley, ELECTRICO
Recommendation: Delete the following FPN:

~~FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI approved installation standards.~~

Substantiation: Numerous consensus standards from organizations such as Electronics Industry Association (EIA), Telecommunication Industry Association (TIA), Underwriters Laboratories Inc. (UL), NEMA, IEEE, and IEC/ISO could be added as a Fine Print Note throughout the Code to assist the reader of the NEC as the existing FPN notes do. There are just as many publications such as Telecommunications Cabling Installation, Network Cabling, Telecommunications Cable Splicing, Communications Cabling, Telecommunications Internetworking and too many others to mention, that could be listed in a FPN that would benefit the reader. Also, there are safety regulations, pertaining to telecommunication systems such as OSHA 1910 and OSHA 1926 that could be added as a Fine Print Note to assist readers to make their companies and workers safer. Adding a Fine Print Note for the purpose of informing the reader of all related standard and publications would be cumbersome. The FPN should be deleted unless it lists all pertinent standards and publications.

The particular standard mentioned in the FPN, (ANSI/NECA/BICSI 568-2001 (Installing Commercial Building Telecommunications Cabling) contains only 46 pages. The Standard mentioned in the FPN is very basic. It lists only a small percentage of the terminations used in the industry. Also, only a limited number of communications cables are shown and their limitations are not discussed. The standard does not contain enough information to be used as a stand alone document without the use of other standards and text books that are not mentioned in the FPN. In my opinion the ANSI standard listed in the FPN should never be used instead of manufacturer's instructions.

Manufacturer's instructions are sometimes required to be included as a condition of listing or labeling of telecommunications equipment and are sent wit the listed or labeled products or can be requested from the manufacturer prior to installation. The FPN in the 2005 Code most likely will not be as up to date as the manufacturer's instructions.

If the committee decides to keep the FPN, please consider modifying the FPN as follows:

ANSI/NECA/BICSI 568-2001 Standard for Installing Commercial Building Telecommunications Cabling is one source of many that can be used along with manufacturer's instructions.

Panel Meeting Action: Reject

Panel Statement: The references provided in the FPN provide guidance for installation in a neat and workmanship like manner.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

OHDE, H.: This proposal should have been accepted. The submitter substantiates that there are numerous consensus standards from reputable organization that also could be added to assist the reader of the NEC as existing FPN do. The ANSI/NECA/BICSI 568-2001 Standard is also a very basic and non-informative document that does not provide much guidance to the installer.

PREZIOSO, L.: The proposal removes a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly the proposal should be accepted and the FPN should be removed.

16-48 Log #1761 NEC-P16 **Final Action: Reject**
(770.24 Exception)

Submitter: Percy E. Pool, Verizon NS
Recommendation: Add the following exception to 770.24:

"Exception: 300.11(C) shall not apply."

Substantiation: 300.11(C) is clearly not applicable to optical fiber (OF) cables. OF cables are typically lashed together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. OF cables are physically smaller and lighter than power cables and carry no power. It is overly restrictive to prohibit lashing of OF cables together to form a cable assembly. OF cables secured in this manner have adequate support (see 300.11(A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.

Panel Meeting Action: Reject

Panel Statement: The requirements of 300.11(C) are applicable to optical fiber cables.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. If the Panel continues to support the addition of the requirements of 300.11 to 770.24, then at the very least, the requirements of 300.11(C) should be waived. Section 300.11(C) is clearly not applicable to optical fiber cables. Typical installation practice is to lash optical fiber cables together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. Optical fiber cables are physically smaller and lighter than power cables and carry no power. Application of 300.11(C) is overly restrictive and will preclude lashing of optical fiber cables together to form a cable assembly. Optical fiber cables secured in this manner have adequate support (see 300.11(A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.

JOHNSON, S.: I agree with the submitter's points in his proposal. There is no safety issue that should preclude the long-standing practice of lashing an additional optical cable to an existing bundle that is already installed and supported properly where it is owned by the same entity. These cables are lightweight, and carry no voltage or current. No evidence has been shown that this practice has not been used safely and successfully in the past and should not continue to be allowed. I vote against the Panel's action to reject.

16-49 Log #54 NEC-P16 **Final Action: Accept in Principle**
(770.25 (New), 770.26 (New), & 770.3(A))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
770.25. Abandoned Cables. The accessible portion of abandoned optical fiber cables shall be removed.
FPN: See Article 100 for a definition of "accessible"
770.26 Spread of Fire or Products of Combustion. Installations of optical fiber cables and optical fiber raceways in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of optical fiber cables and optical fiber raceways through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
FPN: See Article 100 for the definition of "approved".
~~**770.3(A) Spread of Fire or Products of Combustion.** The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. The accessible portion of abandoned optical fiber cables shall be removed.~~
Substantiation: The title of Section 770.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 770. It is out of place in section 770.3. This proposal will move it to a new section of Article 770. The reference to section 300.21 for optical fiber cables and raceways is awkward because section 300.21 deals with electrical installations . The text of proposed section 770.26 is based on section 300.21 but modified to apply to optical fiber cables and optical fiber raceways. The fine print notes are intended to assist installers who are not code experts and may not be aware of Article 100. The fine print note in 300.21 was not copied because does not provide sufficient guidance for an optical fiber cable installer.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-31.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 770.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.
The substantiation provided to delete 770.3(A) which contains the requirements of 300.21 is unclear. Substantiation indicated the reference of 300.21 for optical fiber cables and raceways was awkward because 300.21 deal with electrical installation. Yet with the submitter's new 770.26 (which is the language of 300.21 in its entirety) talks about installations of electrical equipment such as optical fiber cables and raceways.
In addition, Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states these FPN's will help installers who are not Code experts. The addition of the FPN following 770.25 referencing Article 100 for the definition of accessible the FPN following 770.26 referencing Article 100 for the definition of approved is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-50 Log #2653 NEC-P16 **Final Action: Accept in Principle in Part**
(770.30)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action and Statement on this Proposal and that further consideration be given to the comments expressed in the affirmative votes. This action will be considered by the Panel as a Public Comment.
Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Consolidated from various areas to a new section:
770.30. Abandoned Cables. The accessible portion of abandoned optical fiber cables shall be removed.
Remove wording in 770.154(A), Abandoned cables shall not be permitted to remain.
Remove wording in 770-154(B)(1), Abandoned cables shall not be permitted to remain.
Substantiation: The title of Section 770.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 770. It is out of place in section 770.3. This proposal will move it to a new section of Article 770. The deletion of the requirements to remove abandoned cable in 770.154(A) and (B) corrects an error.
Panel Meeting Action: Accept in Principle in Part
The panel accepts in principle the recommendation to move the abandoned cable requirements. See panel action on Proposal 16-31.
Panel Statement: The panel rejects the submitter's action on 770.154(A) and accepts the change to 770.154(B)(1). See panel action on Proposal 16-184.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: We agree with the submitter's intent to locate all abandoned cable requirements to a new section in Part 1- General within the Article. Part 1-General applies to the entire article and therefore would reduce the confusion. We believe that not just the accessible portion of abandoned cables but all abandoned cables be removed to reduce the fuel load.
Comment on Affirmative:
BRUNSSEN, J.: The reference to Proposal 16-184 in the Panel Statement is incorrect. The correct reference is 16-84.
DORNA, G.: The reference to 16-184 in the panel statement is incorrect. It should be 16-84.
KAHN, S.: The panel statement requires correction as the proper reference is to Proposal 16-84.

16-51 Log #709 NEC-P16 **Final Action: Accept in Principle**
(770.48 (new), 770.113 Exception No.1 Parts II, III and IV, & 770.12(D))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Renumber existing parts II, III and IV as shown:
III ~~II.~~ Protection
IV ~~III.~~ Cables Within Buildings
V ~~IV~~ . Listing Requirements
Create a new Part II. Cables Outside and Entering Buildings.
770.48 Unlisted Cables and Raceways Entering Buildings.
(A) Conductive and Nonconductive Cables. Unlisted conductive and nonconductive outside plant optical fiber cables shall be permitted in building spaces other than air ducts, plenums and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure.
FPN No. 1: Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures for splicing or terminating optical fiber cables.
FPN No. 2: See 770.2 for the definition of point of entrance.
FPN No. 3: See 770.2 for a definition of air duct.
FPN No. 4: See Article 100 for a definition of plenum.
FPN No. 5: See 300.22(C) for information on other space used for environmental air.
(B) Nonconductive Cables. Unlisted nonconductive outside plant optical fiber cables shall be permitted to enter the building from the outside and run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Nonmetallic Conduit: Type RNC; and Article 358, Electrical Metallic Tubing: Type EMT.
(C) Raceway. Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.
_Change 770.113 Exceptions as follows:
770.113 Exception: As permitted in 770.48 . ~~Optical fiber cables shall not be required to be listed and marked where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure.~~ Ê
~~FPN: Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures for splicing or terminating optical fiber cables.~~
~~770.113 Exception No. 2: Nonconductive optical fiber cables shall not be required to be listed and marked where the cable enters the building from the outside and is run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Nonmetallic Conduit: Type RNC; and Article 358, Electrical Metallic Tubing: Type EMT.~~
—Delete 770.12(D).
~~770.12(D) Entering Buildings. Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.~~
Substantiation: This is an editorial and technical proposal. (Task Group No. 770-15)
This is a companion proposal to similar proposals made for articles 800 and 820. It adds a new Part II, "Cables Outside and Entering Buildings", thereby improving the parallelism between the three articles. Exceptions No. 1 and No. 2 to 770.113 deal with entrance cables and therefore this proposal moves them to the new Part II.
The proposed new fine print notes 2, 3, 4 & 5 are provided to help the reader by pointing to the definitions of "point of entrance", "air duct" and "plenum" and a description of "other space used for environmental air". This proposal also moves 770.12(D), which deals with unlisted innerduct entering buildings, to the new Part II.
The proposal has a noneditorial requirement prohibiting outside plant cables from running in risers or in the air distribution system; thereby correcting an omission in the current code.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-52.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-52 Log #28 NEC-P16 **Final Action: Accept in Principle**
(770.48 (New), & 770.113, Exception No. 1, Parts II, III, & IV)

TCC Action: The Technical Correlating Committee understands that the proposed title of 770.48 is also changed by the panel action.

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Renumber existing parts II, III and IV as shown:

III ~~II~~ . Protection
IV ~~III~~ . Cables Within Buildings
V I ~~V~~ . Listing Requirements

Create a new **Part II. Cables Outside and Entering Buildings.**

770.48 Unlisted Cables Entering Buildings.

(A) Conductive and Nonconductive Cables. Unlisted conductive and nonconductive outside plant optical fiber cables shall be permitted in building spaces other than risers, air ducts, concealed spaces, plenums and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure.

FPN No. 1: Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures for splicing or terminating optical fiber cables.

FPN No, 2: See 770.2 for the definition of point of entrance.

FPN No. 3: See 770.2 for a definition of air duct.

FPN No. 4: See Article 100 for a definition of plenum.

FPN No. 5: See 300.22(C) for a information on other space used for environmental air.

(B) Nonconductive Cables. Unlisted nonconductive optical fiber outside plant optical fiber cables shall be permitted to enter the building from the outside and run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Nonmetallic Conduit: Type RNC; and Article 358, Electrical Metallic Tubing: Type EMT.

770.113 Exception No. 1: As permitted in 770.48 . ~~Optical fiber cables shall not be required to be listed and marked where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure. FPN: Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures for splicing or terminating optical fiber cables.~~

~~770.113 Exception No. 2: Nonconductive optical fiber cables shall not be required to be listed and marked where the cable enters the building from the outside and is run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Nonmetallic Conduit: Type RNC; and Article 358, Electrical Metallic Tubing: Type EMT.~~

Substantiation: This is a companion proposal to similar proposals made for articles 800 and 820, It adds a new Part II, "Cables Outside and Entering Buildings", thereby improving the parallelism between the three articles. Exceptions No. 1 and No. 2 to 770.113 deal with entrance cables and therefore this proposal moves them to the new Part II.

In addition to editorially changing the exception to positive language and moving it to Part II, this proposal deals with the issue of the fire hazard of unlisted outside plant cables in buildings. Unlisted outside plant entrance cables are sometimes run in risers, air ducts, concealed spaces and plenums. When the 50-foot exemption for outside plant cable was adopted, it was assumed that the entrance cable would go into an equipment room. It was not envisioned that the unlisted cable, which is not fire resistant, would run up a riser, in an air duct, in concealed spaces or a plenum. The proposed new fine print notes 2, 3, 4 & 5 are provided to help the reader by pointing to the definitions of "point of entrance", "air duct" and "plenum" and a description of "other space used for environmental air".

Panel Meeting Action: Accept in Principle

The panel accepts the submitter's proposal with the following revisions:

770.48(A) to read as follows:

770.48 Unlisted Cables and Raceways Entering Buildings.

(A) Conductive and Nonconductive Cables. Unlisted conductive and nonconductive outside plant optical fiber cables shall be permitted to be installed in locations as described in 770.154(C), where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure.

Delete FPNs 3, 4, and 5.

770.113 Exception No.1 to be Exception.

Panel Statement: The panel made changes to the submitter's text to correlate with the language in the remainder of the Article.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-53 Log #60 NEC-P16 **Final Action: Accept in Principle**
(770.48 (New), 770.113, Exception No. 1, Parts II, III and IV, & 770.12(D))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Renumber existing parts II, III and IV as shown:

III ~~II~~ . Protection
IV ~~III~~ . Cables Within Buildings
V ~~IV~~ . Listing Requirements

Create a new **Part II. Cables Outside and Entering Buildings.**

770.48 Unlisted Cables Entering Buildings.

(A) Conductive and Nonconductive Cables. Unlisted conductive and nonconductive outside plant optical fiber cables shall be permitted in building spaces other than risers, air ducts, concealed spaces, plenums and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure.

FPN No. 1: Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures for splicing or terminating optical fiber cables.

FPN No, 2: See 770.2 for the definition of point of entrance.

FPN No. 3: See 770.2 for a definition of air duct.

FPN No. 4: See Article 100 for a definition of plenum.

FPN No. 5: See 300.22(C) for a information on other space used for environmental air.

(B) Nonconductive Cables. Unlisted nonconductive optical fiber outside plant optical fiber cables shall be permitted to enter the building from the outside and run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Nonmetallic Conduit: Type RNC; and Article 358, Electrical Metallic Tubing: Type EMT.

(C) **Raceway.** Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.

770.113 Exception No. 1: As permitted in 770.48 . ~~Optical fiber cables shall not be required to be listed and marked where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure.~~

~~FPN: Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures for splicing or terminating optical fiber cables.~~

~~770.113 Exception No. 2: Nonconductive optical fiber cables shall not be required to be listed and marked where the cable enters the building from the outside and is run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Nonmetallic Conduit: Type RNC; and Article 358, Electrical Metallic Tubing: Type EMT.~~

~~**770.12(D) Entering Buildings.** Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.~~

Substantiation: This is a companion proposal to similar proposals made for articles 800 and 820, It adds a new Part II, "Cables Outside and Entering Buildings", thereby improving the parallelism between the three articles. Exceptions No. 1 and No. 2 to 770.113 deal with entrance cables and therefore this proposal moves them to the new Part II.

In addition to editorially changing the exception to positive language and moving it to Part II, this proposal deals with the issue of the fire hazard of unlisted outside plant cables in buildings. Unlisted outside plant entrance cables are sometimes run in risers, air ducts, concealed spaces and plenums. When the 50-foot exemption for outside plant cable was adopted, it was assumed that the entrance cable would go into an equipment room. It was not envisioned that the unlisted cable, which is not fire resistant, would run up a riser, in an air duct, in concealed spaces or a plenum. The proposed new fine print notes 2, 3, 4 & 5 are provided to help the reader by pointing to the definitions of "point of entrance", "air duct" and "plenum" and a description of "other space used for environmental air".

This proposal also moves 770.12(D), which deals with unlisted innerduct entering buildings, to the new Part II.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel Action on Proposal 16-52.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-54 Log #711 NEC-P16 **Final Action: Accept in Part**
(770.93)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise the title of 770.93 as follows:
770.93 Grounding or Interruption of ~~Entrance Cables~~ Non-Current-Carrying Metallic Members of Optical Fiber Cables Entering Buildings .
Where exposed to contact with electric light or power conductors, the nonÐcurrent-carrying metallic members of optical fiber cables entering buildings shall be grounded ……..
Substantiation: This is an editorial change. (Task Group No. 770-17)
It will provide consistency between 770.93, 800.93, 820.93 and 830.93. This is a companion proposal to 800.93, 820.93 and 830.93.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Part
Revise the title of 770.93 as follows:
770.93 Grounding or Interruption of ~~Entrance Cables~~ Non-Current-Carrying Metallic Members of Optical Fiber Cables .
Panel Statement: "Entering Buildings" is inappropriate as the cable may not actually enter the building.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
BRUNSSEN, J.: The Panel Action should be "Accept in Principle" as the panel accepted the submitter's proposal with a modification in text.

16-55 Log #1884 NEC-P16 **Final Action: Accept in Principle**
(770.93)

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc.
Recommendation: Revise 770.93 **Grounding of Entrance Cables** by adding text as follows:
770.93 Grounding of Entrance Cables.
Where exposed to contact with electric light or power conductors, the non–current-carrying metallic members of optical fiber cables entering buildings shall be grounded as close to the point of entrance as practicable or shall be interrupted as close to the point of entrance as practicable by an insulating joint or equivalent device.
Where grounded, the non–current-carrying metallic members of optical fiber cables entering buildings shall be grounded as specified in 770.93(A) through 770.93(D).
(A) Grounding Conductor.
(1) Insulation. The grounding conductor shall be insulated and shall be listed.
(2) Material . The grounding conductor shall be copper or other corrosion-resistant conductive material, stranded or solid.
(3) Size. The grounding conductor shall not be smaller than 14 AWG.
(4) Run in Straight Line. The grounding conductor shall be run to the grounding electrode in as straight a line as practicable.
(5) Physical Damage. Where necessary, the grounding conductor shall be guarded from physical damage. Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or the same terminal or electrode to which the grounding conductor is connected.
(B) Electrode. The grounding conductor shall be connected in accordance with 700.93(B)(1), (B)(2) and (B)(3).
(1) In Buildings or Structures with an Intersystem Grounding Termination. If the building or structure served has an intersystem grounding termination the grounding conductor shall be connected to the intersystem grounding termination.
(2) In Buildings or Structures with Grounding Means. If the building or structure served has no intersystem grounding termination, the grounding conductor shall be connected to the nearest accessible location on the following:
(1) The building or structure grounding electrode system as covered in 250.50
(2) The grounded interior metal water piping system, within 1.5 m (5 ft) from its point of entrance to the building, as covered in 250.52
(3) The power service accessible means external to enclosures as covered in 250.94
(4) The metallic power service raceway
(5) The service equipment enclosure
(6) The grounding electrode conductor or the grounding electrode conductor metal enclosure
(7) The grounding conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in 250.32
(3) In Buildings or Structures Without Intersystem Grounding Termination or Grounding Means. If the building or structure served has no intersystem grounding termination or grounding means , as described in 770.93(B)(2), the grounding conductor shall be connected to either of the following
(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)
(2) If the building or structure served has no grounding means, as described in 770.93(B)(2) or (B)(3)(1), to an effectively grounded metal structure or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or air terminal conductors (lightning-rod conductors) shall not be employed as electrodes for protectors.
(C) Electrode Connection . Connections to grounding electrodes shall comply with 250.70.
(D) Bonding of Electrodes . A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the grounding electrode and power grounding electrode system at the building or structure served where separate electrodes are used.
Exception: At mobile homes as covered in 770.95.
FPN No. 1: See 250.60 for use of air terminals (lightning rods).
FPN No. 2: Bonding together of all separate electrodes limits potential differences between them and between their associated wiring systems.
770.95 Grounding of Entrance Cables at Mobile Homes .
Where grounded as required by 770.93 at a mobile home, the non–current-carrying metallic members of optical fiber cables entering buildings shall be grounded as specified in 770.95(A) and (B).
(A) Grounding . Where there is no mobile home service equipment located in sight from, and not more than 9.0 m (30 ft) from, the exterior wall of the mobile home it serves, or there is no mobile home disconnecting means grounded in accordance with 250.32 and located within sight from, and not more than 9.0 m (30 ft) from, the exterior wall of the mobile home it serves, the ground for non–current-carrying metallic members of optical fiber cables entering buildings shall be in accordance with 770.93(B)(3).
(B) Bonding . The primary protector grounding terminal or grounding electrode shall be bonded to the metal frame or available grounding terminal of the mobile home with a copper grounding conductor not smaller than 12 AWG under either of the following conditions:
(1) Where there is no mobile home service equipment or disconnecting means as in 770.95(A)
(2) Where the mobile home is supplied by cord and plug
Substantiation: This is one of several correlated proposals (100 Definitions, 250.95, Chapter 8 Articles) to improve the requirements related to intersystem bonding and grounding of communication systems. The intent is to create a dedicated and well-defined location for terminating the grounding conductors required in Chapter 8 Articles and 770.93. These grounding conductors also provide between communication and power systems (intersystem bonding). The proposed termination would have sufficient capacity to handle multiple communication systems (telecom, satellite, CATV) on premises. See the figures which I have provided.
Intersystem bonding accomplished by connection of a communication grounding conductor to the power system is an important safety measure to prevent occurrences of voltages between communication system and power system. However, the existing requirements are not adequate. Bonding is becoming difficult to implement due to changes in building construction practices such as increased prevalence of flush construction and use of PVC conduits. Frequently, in new construction, the grounding electrode, the raceway and the grounding electrode conductor are hidden behind walls and not accessible for bonding connection.
Even in older construction with accessible equipment, the requirement for installation of intersystem bonding connection is subject to varying interpretation because there is not a clearly defined dedicated bonding location. The connection to the power system is sometimes haphazard. Installers are sometimes confused over where the connection should be made especially if multiple Communication Systems are present on premises.
The existing 770.93 does not provide a prescriptive method for grounding of the building entrance cables. The procedures should be similar to those required in Chapter 8 articles. The proposed revision parallels the existing text in Article 800 (including grounding at mobile homes), but makes the intersystem grounding terminal the preferred destination for the grounding conductor. The only difference with Chapter 8 Articles is that the limitation of the grounding conductor length to 6 m (20 ft) is not relevant since the metallic members of optical fiber cable do not extend to the circuits of utilization equipment.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-25.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-56 Log #710 NEC-P16 **Final Action: Accept**
(770.93, FPN (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add a Fine Print Note (FPN) to 770.93 as follows:
FPN: See 770.2 for the definition of *point of entrance* .
Substantiation: This is an editorial proposal. (Task Group No.)
The editorial addition of the FPN will provide consistency between 770.93, 800.93, 820.93 and 830.93. This is a companion proposal to 820.93 and 830.93, and to 770.2 adding the definition of "point of entrance".
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing 770.2 for the definition of point of entrance is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-57 Log #6 NEC-P16 **Final Action: Accept**
(770.113)

Submitter: Stanley Kaufman, CableSafe, Inc.
Recommendation: Revise as follows:
770.113 Installation and Marking of Listed Optical Fiber Cables. ~~Listed optical fiber cables shall be installed as wiring within buildings.~~ Optical fiber cables installed in buildings shall be listed . Optical fiber cables shall be marked in accordance with Table 770.113.
Substantiation: The proposed text is an editorial improvement. It removes the term wiring, thereby avoiding the implication optical fiber cables are "wiring". It is also editorially consistent with the exception.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-58 Log #696 NEC-P16 **Final Action: Accept**
(770 Part III)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change title and numbering:
From III. Cables Within Buildings
To V. Installation Methods Within Buildings
Substantiation: This proposal is editorial. (Task Group No. 770-02)
The sections included under the previous Section III. consist of more than cables and the recommended change is more descriptive. This title is consistent with similar recommendations for Articles 800, 820 and 830. The change to V. makes this article parallel to Articles 800, 820 and 830,
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 16-2.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-59 Log #2382 NEC-P16 **Final Action: Reject**
(770.113)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add a sentence at the end of 770.113.
The temperature rating shall be marked on the cable .
Substantiation: It is important for the system designer, installer, local authority, and building owners to know the temperature rating of cables for proper application.
Panel Meeting Action: Reject
Panel Statement: The Code presently permits the temperature rating to be marked on the cable. See UL 444.
The AHJ does not have the authority to require the manufacturer to mark the temperature rating on the cable.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-60 Log #712 NEC-P16 **Final Action: Accept**
(770.113 and Table 770.113)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-57. This action will be considered by the Panel as a Public Comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise 770.113 as shown and move Table 770.113 and Table FPNs to 770.179.
770.113 Installation ~~and Marking~~ of ~~Listed~~ Optical Fiber Cables.
Listed optical fiber cables shall be installed as cabling in buildings. ~~Optical fiber cables shall be marked in accordance with Table 770.113.~~
Exception No. 1: Optical fiber cables shall not be required to be listed ~~and marked~~ where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure.
FPN: Splice cases or terminal boxes, both metallic and plastic types, typically are used as enclosures for splicing or terminating optical fiber cables.
Exception No. 2: Nonconductive optical fiber cables shall not be required to be listed ~~and marked~~ where the cable enters the building from the outside and is run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Nonmetallic Conduit: Type RNC; and Article 358, Electrical Metallic Tubing: Type EMT.
Substantiation: This change is editorial. (Task Group No. 770-18)
It puts the listing and marking requirements together for use by listing organizations. Section 770.113 contains installation requirements for various types of listed cables. The word "Listed" was deleted from the title because this section deals with listed as well as unlisted cables.
There is a companion proposal to make appropriate revisions to 770.179.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-61 Log #1863 NEC-P16 **Final Action: Accept in Principle**
(770.113 Exception No. 1)

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 770.113, Exception No. 1 as follows:
Exception No. 1: Unlisted optical fiber cables shall be permitted within buildings in spaces other than risers, air ducts, plenums and other spaces used for environmental air. ~~*Optical fiber cables shall not be required to be listed and marked where the*~~ *The length of the unlisted cable permitted within the building, measured from its point of entrance,* ~~*does*~~ *shall not exceed 15 m (50 ft) .* ~~*and the*~~ *The unlisted cable* ~~*enters*~~ *shall enter the building from the outside and* ~~*is*~~ *shall be terminated in an enclosure.*
Substantiation: The NEC presently permits up to 50 ft of unlisted optical fiber cable to be run into a building, but places no restriction on installing the unlisted cables in air handling spaces where they could contribute to fire and smoke hazard. This proposal adds that restriction, further contributing to fire and smoke safety. This is a companion proposal and is intended to correlate with similar proposals for 800.113 Ex. No. 2 and 820.113 Ex. No. 2, and 770.2.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-52.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-62 Log #1936 NEC-P16 **Final Action: Reject**
(770.113 Exception No. 2)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 8-53 and 8-78. See Technical Correlating Committee action on Proposals 8-53 and 8-78. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for comment. This action will be considered by the Panel as a Public Comment.
Submitter: William Wagner, Certification Solutions
Recommendation: Revise 770.113 Exception No. 2 as follows:
Exception No. 2: Nonconductive optical fiber cables shall not be required to be listed and marked where the cable enters the building from the outside and is run in raceway systems installed in compliance with any of the following articles in Chapter 3; Article 342, Intermediate Metal Conduit; Type IMC;

Article 344, Rigid Metal Conduit; Type RMC; Article 352, Rigid ~~Nonmetallic~~ PVC Conduit; Type PVC ~~RNC~~ ; Article 355, Reinforced Thermosetting Resin Conduit; type RTRC ; and Article 358, Electrical Metallic Tubing: Type EMT.
Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100, the revised Article 352 for Type PVC Conduit and the new Article 355 for RTRC. Rigid Nonmetallic Conduit (Type RNC), which includes PVC, HDPE and RTRC, was previously covered under a single Article (352). However, with the acceptance of the companion proposals, each of these types will now be located in a separate Article. This proposal revises Exception No. 2 of 770.113 in order to reference the Articles for Type PVC and Type RTRC conduits, which are acceptable wiring methods for this application. Type HDPE conduit is prohibited from use within a building by 353.12, and, therefore, would not be included.
Panel Meeting Action: Reject
Panel Statement: The panel cannot make a determination regarding Type RTRC until the disposition of proposed new Article 355 is known.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-63 Log #35 NEC-P16 **Final Action: Accept**
(770.133(A))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
770.133 Installation of Optical Fibers and Electrical Conductors.
(A) With Conductors for Electric Light, Power, Class 1, Non-Power-Limited Fire Alarm, or Medium Power Network-Powered Broadband Communications Circuits. When optical fibers are ~~Optical fibers shall be permitted~~ within the same composite cable for electric light, power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits operating at 600 volts or less, they shall be permitted to be installed only where the functions of the optical fibers and the electrical conductors are associated.

Nonconductive optical fiber cables shall be permitted to occupy the same cable tray or raceway with conductors for electric light, power, Class 1, non-power-limited fire alarm, Type ITC, or medium power network-powered broadband communications circuits, operating at 600 volts or less. Conductive optical fiber cables shall not be permitted to occupy the same cable tray or raceway with conductors for electric light, power, Class 1, non-power-limited fire alarm, Type ITC, or medium power network-powered broadband communications circuits.

Optical fibers in composite ~~Composite~~ optical fiber cables containing only current-carrying conductors for electric light, power, Class 1 circuits rated 600 volts or less shall be permitted to occupy the same cabinet, cable tray, outlet box, panel, raceway, or other termination enclosure with conductors for electric light, power, or Class 1 circuits operating at 600 volts or less.

Nonconductive optical fiber cables shall not be permitted to occupy the same cabinet, outlet box, panel, or similar enclosure housing the electrical terminations of an electric light, power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuit.

Exception No. 1: Occupancy of the same cabinet, outlet box, panel, or similar enclosure shall be permitted where nonconductive optical fiber cable is functionally associated with the electric light, power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuit.

Exception No. 2: Occupancy of the same cabinet, outlet box, panel, or similar enclosure shall be permitted where nonconductive optical fiber cables are installed in factory- or field-assembled control centers.

Exception No. 3: In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons service the installation, nonconductive optical fiber cables shall be permitted with circuits exceeding 600 volts.

Exception No. 4: In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons service the installation, optical fibers in composite optical fiber cables s ~~hall be permitted to~~ contain ing current-carrying conductors operating over 600 volts shall be permitted to be installed.

Substantiation: Section 770.133 covers the installation of optical fibers along with electrical conductors. Parts of this section can easily be misinterpreted to cover the construction of composite optical fiber cables. According to 770.9(C), "Composite optical fiber cables shall be classified as electrical cables in accordance with the type of electrical conductors. The proposed rewording is editorial. It attempts to clarify that this section is about installation and not composite cable construction.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-64 Log #1260 NEC-P16 **Final Action: Accept in Principle**
(770.133(A) Exception (New))

Submitter: Nicholas Alger, Modjeski and Masters Inc.
Recommendation: Add an exception to 770.133(A) as follows:
Conductive optical fiber cables shall be permitted to occupy the same cable tray or raceway with conductors for electric light, power, Class 1, nonpower-limited fire alarm, Type ITC, or medium power network-powered broadband communication circuits where the functions of the optical cables and the electrical conductors are associated and the optical cables are separated from such circuits by a solid barrier. Where the cable tray or raceway is metallic, the conductive members of the optical cable shall also be solidly bonded to the cable tray or raceway.
Substantiation: In industrial installations, the use of armored optical fiber cables may be desirable to help protect the fibers from physical damage. The requirements of 770.133(A), as currently written, require the use of a separate cable tray or raceway for armored optical fiber cable(s), even if the optical fiber cables are functionally associated with power and/or control circuits already installed in an existing cable tray or raceway (such as when an existing control system is upgraded from hardwired circuits to a communications network based system using optical fiber links). Class 2 and Class 3 circuits are already permitted to be installed in the same cable tray or raceway with these higher powered circuits by 725.55(B) and (H). Similarly, communications circuits are permitted to be installed in the same cable tray or raceway with such circuits when separated by a divider per 800.133(A)(1)(c) Exception No. 1.

Futhermore, when a metallic cable tray or raceway is used, it is unlikely that the presence of a non-current-carrying conductive member in an optical fiber cable installed with such circuits will create a safety hazard if it is solidly bonded to the metallic cable tray or raceway so as to prevent a difference of potential between the two.

This change would simply installations involving armored optical fiber cables by avoiding the need to provide separate cable trays or raceways to serve armored optical fiber cables, as well as increase consistency between Articles 725, 770, and 800.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-65.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-65 Log #2627 NEC-P16 **Final Action: Accept**
(770.133(A) Exception (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add a new exception to 770.133(A) to read as follows:
Exception: Where all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the optical fiber cables by a permanent barrier or listed divider.
Substantiation: This is a new exception for 770.133(A) that would allow a optical fiber cable to share the same raceway, outlet box or enclosure as long as a barrier was in place. This language is similar to the language found in 800.133(A)(1)(c) Exception No. 1. Metal Clad Optical Fiber cable can become energized if it comes in contact with electrical conductors. This proposal defines the barrier as a permanent function of the enclosure or that it may be a removable or field installed listed divider. These barriers are used to divide the optical fiber cable from the power circuits.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-66 Log #1865 NEC-P16 **Final Action: Accept in Principle**
(770.133(C))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 770.133 (C) as follows:
(C) Grounding. Non–current-carrying conductive members of optical fiber cables ~~shall be grounded in accordance with Article 250.~~ that are likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding conductor(s) shall be sized in accordance with 250.122, using the rating of the circuit that is likely to energize the conductive members of optical fiber cables. The equipment grounding conductor for the circuit that is likely to energize non–current-carrying conductive members of optical fiber cables shall be permitted to serve as the bonding means. The grounding required in 770.93 shall be permitted to serve as the bonding required in this section. The points of attachment of the bonding conductor(s) shall be accessible.

Substantiation: The reference to the entire Article 250 presently contained in 770.133(C) violates the NEC Style Manual. In addition, it is difficult to locate the pertinent section of 250 since it does not mention optical fiber cables explicitly. This proposal is intended to clarify the required grounding and is based on existing rules of Article 250.

Non–current-carrying conductive members of optical fiber cables are not part of an electrical circuit or system and therefore should be classified as Electrically Conductive Materials and Other Equipment in the context of Article 250. The general principle for grounding of these parts is contained in 250.4(A)(4) as follows:

(4) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials that are likely to become energized shall be connected together and to the electrical supply source in a manner that establishes an effective ground-fault current path.

The proposed prescriptive language is based on the language of 250.104(B) Other Metal Piping:

(B) Other Metal Piping. Where installed in or attached to a building or structure, metal piping system(s), including gas piping, that is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with 250.122, using the rating of the circuit that is likely to energize the piping system(s). The equipment grounding conductor for the circuit that is likely to energize the piping shall be permitted to serve as the bonding means. The points of attachment of the bonding jumper(s) shall be accessible.

The proposal also clarifies that grounding required in Section 770.93 also provides the bonding that would be required in 770.133(C).

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-25.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-67 Log #2628 NEC-P16 **Final Action: Reject**

(770.135 (New))

Submitter: David H. Kendall, Carlon

Recommendation: Add a new section to read as follows:

770.135 Optical Fiber Device and Equipment Mounting. Optical fiber devices or equipment shall be mounted in listed boxes, brackets or assemblies designed for the purpose, and such boxes or assemblies shall be securely fastened in place. Boxes or brackets can be completely enclosed or backless.

(A) Optical Fiber Devices and Equipment Mounted to Boxes or Brackets. Optical Fiber devices or equipment shall be mounted to a listed boxes or bracket and installed per 314.20.

(B) Optical Fiber Devices and Equipment Mounted on Covers. Optical Fiber devicse and equipment mounted to and supported by a cover shall be held rigidly against the cover which is mounted to the box or bracket.

Substantiation: This proposal adds a new section to Article 770 addressing the mounting of devices or equipment to listed boxes and brackets. Currently, depending on the quality of workmanship, Optical Fiber devices or equipment have not been mounted to boxes or brackets that can support them. After several years device and/or covers that are mounted directly to the dry wall will become hazard because they have become loose and exposed. Conductive optical fiber cable can become energized by coming in incidental contact with electrical conductors.

770.135 was only a suggestion for the location of this new section. (A) addresses devices mounted directly to boxes or devices where as (B) address devices mounted to covers.

Panel Meeting Action: Reject

Panel Statement: Optical fiber devices and equipment are beyond the scope of Article 770.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-68 Log #714 NEC-P16 **Final Action: Accept**

(770.154)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Renumber 770.154 subsections (D) through (F) as follows:

Renumber 770.154 subsections (D) through (F) as follows:

770.154 Applications of Listed Optical Fiber Cables and Raceways. Nonconductive and conductive optical fiber cables shall comply with any of the requirements given in 770.154(A) through ~~770.154(E)~~ 770.154(D) and 770.154(F), or where cable substitutions are made as shown in ~~770.154(F)~~ 770.154(E).

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.

FPN: See 8.14.1 of NFPA 13 (2002), *Installation of Sprinkler Systems*, for requirements for sprinklers in concealed spaces containing exposed combustibles.

(B) Riser. Cables installed in risers shall be as described in any of the following:

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type OFNR or OFCR. Floor penetrations requiring Type OFNR or OFCR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain. Listed riser optical fiber raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type OFNP, OFCP, OFNR, and OFCR cables shall be permitted to be installed in these raceways.

(2) Type OFNG, OFN, OFCG, and OFC cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.

(3) Type OFNG, OFN, OFCG, and OFC cables shall be permitted in one- and two-family dwellings.

FPN: See 300.21 for firestop requirements for floor penetrations.

(C) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 770.154(A) and 770.154(B) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways.

~~(D)~~ (F) **Hazardous (Classified) Locations.** Cables installed in hazardous (classified) locations shall be any type indicated in Table 770.154.

~~(E)~~ (D) **Cable Trays.** Optical fiber cables of the types listed in Table 770.113 shall be permitted to be installed in cable trays.

FPN: It is not the intent to require that these optical fiber cables be listed specifically for use in cable trays.

~~(F)~~ (E) **Cable Substitutions.** The substitutions for optical fiber cables listed in Table 770.154 shall be permitted.

Table 770.154 Cable Substitutions

Cable Type	Permitted Substitutions
OFNP	None
OFCP	OFNP
OFNR	OFNP
OFCR	OFNP, OFCP, OFNR
OFNG, OFN	OFNP, OFNR
OFCG, OFC	OFNP,OFCP,OFNR,OFCR, OFNG, OFN

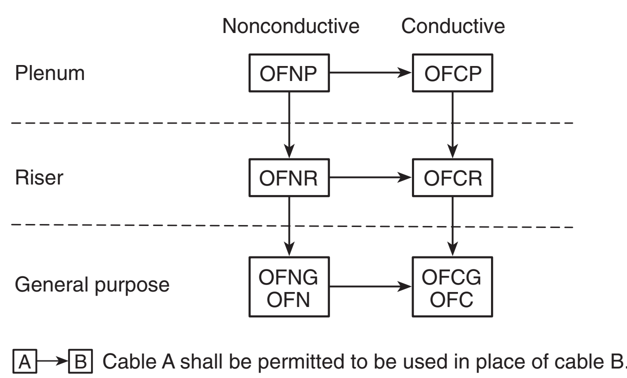

Figure 770.154 Cable Substitution Hierarchy.

Substantiation: This is an editorial revision. (Task Group No. 770-20)

It will align similar paragraphs in Sections 770.154, 800.154, 820.154 and 830.154. It will provide consistency between similar sections in the affected four articles and improve usability of the Code. This is a companion proposal to similar proposals concerning Sections 800.154, 820.154 and 830.154.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Panel Statement: See panel action on Proposal 16-41a (Log #CP-1602).

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRUNSSEN, J.: The reference to Proposal 16-41a in the Panel Statement is incorrect. The correct reference is 16-411a.

DORNA, G.: The reference to 16-41a in the panel statement is incorrect. It should be 16-411a.

KAHN, S.: The panel statement requires correction as the proper reference is to Proposal 16-411a.

16-69 Log #2527 NEC-P16 **Final Action: Reject**
(770.154)

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Revise 770.154, as shown.

Nonconductive and conductive optical fiber cables shall comply with any of the requirements given in 770.154(A) through 770.154(E) or where cable substitutions are made as shown in 770.154(F). Types OFN50 and OFC50 very-low-smoke cables shall be permitted to be installed meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.

Substantiation: NFPA 13-2002 has requirements for installation of sprinklers where a concealed space has combustible loading. The proposed very-low-smoke producing cables have a heat release that is significantly lower than combustible plenum cable listed using NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces* .

The 2003 International Mechanical Code (IMC), 602.2.1 requires a smoke developed index less than 25 and a smoke developed index less than 50 for materials in plenums.

The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).

NFPA 13-2002, Installation of Sprinkler Systems, requires installation of a sprinkler system in concealed spaces where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:

"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:

(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.

(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."

"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."

The definition of combustible, from NFPA 5000 is:

"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."

During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because communications cables are permitted to substitute for Class 2 and Class 3 circuit cables, it is important to have parallel requirements in both NEC Sections. Additionally, the Fine Print Note applies to all concealed spaces.

In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied.

There is a companion proposal for the listing and marking of Types OFN50 and OFC50.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-70 Log #2652 NEC-P16 **Final Action: Reject**
(770.154)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Delete the following text:

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: This FPN is being misinterpret and used in aggressive marketing attempts to require the installation of "limited combustible cable" (one such example is found at http://www.dupont.com/cablingsolutions/products/codes.html). The FPN has had a profound effect in which it is used in misleading the AHJ to require limited combustible cable, conduit, or a sprinkler system to be installed within the concealed space.

As an example, an AHJ Massachusetts would not provide a certificate of occupancy until the communications cabling was either replaced with limited combustible cable, the CMP cable was placed in conduit, or a sprinkler system installed above the suspended ceiling.. Although the installer had met the requirements of the NEC, the FPN misled the AHJ causing project delays and the potential of inordinate cost to the project. A plea to the NFPA aided the communications installer in which clarification was given that the CMP cabling was indeed sufficient to meet code and that NFPA 13 allowed some quantities (which is not defined) of communications cabling within concealed spaces. The installation of the CMP cable was allowed.

To further the removal of this FPN, the Report on Proposals A2006 from NFPA 13 (see attached), the NFPA committee specifically added an annex A.8.14.1.2.1 in 13-284 log #551 stating that, "Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection."

In addition to the above, Panel 3 rejected the last minute introduction of this proposal that was made in the ROC stage. BICSI, which represents 24,000 installers, designers and manufacturers, feels that this last minute interjection of a FPN was not sufficiently vetted to industry and that the TCC should review this matter.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: We do not believe that the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) would prohibit this Fine Print Note from being deleted. We do believe that expansion of or new Fine Print Notes referencing NFPA 13 would be in violation of NFPA Standards Council Long Decision 05-24 (SC #05-7-4). This proposal should have been accepted. This Fine Print Note referencing NFPA 13 offers no value to the user of NFPA 70 and in fact misleads the user and AHJ.

16-71 Log #2998 NEC-P16 **Final Action: Reject**
(770.154)

Submitter: Marcelo M. Hirschler, GBH International

Recommendation: Revise text to read as follows:

770.154 Applications of Listed Optical Fiber Cables and Raceways. Nonconductive and conductive optical fiber cables shall comply with any of the requirements given in 770.154(A) through 770.154(E) or where cable substitutions are made as shown in 770.154(F).

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: This is one of three references to NFPA 13 (it is repeated identically in articles 770, 800 and 820) included in the code that is a meaningless reference. Other references to NFPA 13, in Article 362, are properly included in mandatory sections of the code (section 362.10). Whenever a jurisdiction adopts NFPA 13 they need to adopt it for mandatory sections and not for an unenforceable FPN in one section, which is intended to mislead the user. In fact, there have been several documented examples already of misrepresentation in that authorities having jurisdiction have been told that this means that sprinklers are required in plenum areas unless "limited combustible cable" is installed. I have been personally involved in two cases to date, and have heard of many more cases where this is being stated.

Section 8.14.1 of NFPA 13 (2002) reads as follows:

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

8.14.1.2 Concealed Spaces Not Requiring Sprinkler Protection.*

8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

8.14.1.2.2 Noncombustible and limited combustible concealed spaces with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

8.14.1.2.3 Concealed spaces formed by studs or joists with less than 6 in. (152 mm) between the inside or near edges of the studs or joists shall not require sprinkler protection. (See Figure 8.6.4.1.5.1.)

8.14.1.2.4 Concealed spaces formed by bar joists with less than 6 in. (152 mm) between the roof or floor deck and ceiling shall not require sprinkler protection.

8.14.1.2.5 Concealed spaces formed by ceilings attached directly to or within 6 in. (152 mm) of wood joist construction shall not require sprinkler protection.

8.14.1.2.6 Concealed spaces formed by ceilings attached to composite wood joist construction either directly or onto metal channels not exceeding 1 in. in depth, provided the joist channels are firestopped into volumes each not exceeding 160 ft3 (4.53 m3) using materials equivalent to the web construction and at least 3½ in. of batt insulation is installed at the bottom of the joist channels when the ceiling is attached utilizing metal channels, shall not require sprinkler protection.*

8.14.1.2.7 Concealed spaces entirely filled with noncombustible insulation shall not require sprinkler protection.

8.14.1.2.8 Concealed spaces within wood joist construction and composite wood joist construction having noncombustible insulation filling the space from the ceiling up to the bottom edge of the joist of the roof or floor deck, provided that in composite wood joist construction the joist channels are firestopped into volumes each not exceeding 160 ft3 (4.53 m3) to the full depth of the joist with material equivalent to the web construction, shall not require sprinkler protection.

8.14.1.2.9 Concealed spaces over isolated small rooms not exceeding 55 ft2 (4.6 m2) in area shall not require sprinkler protection.

8.14.1.2.10 Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread rating of 25 or less and the materials have been demonstrated not to propagate fire in the form in which they are installed shall not require sprinkler protection.

8.14.1.2.11 Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703, Standard for Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Materials, shall not require sprinkler protection.

8.14.1.2.12 Noncombustible concealed spaces having exposed combustible insulation where the heat content of the facing and substrate of the insulation material does not exceed 1000 Btu/ft2 (11,356 kJ/m2) shall not require sprinkler protection.

8.14.1.2.13 Concealed spaces below insulation that is laid directly on top of or within the ceiling joists in an otherwise sprinklered attic shall not require sprinkler protection.

8.14.1.2.14 Vertical pipe chases under 10 ft2 (0.93 m2), where provided that in multifloor buildings the chases are fire stopped at each floor using materials equivalent to the floor construction, and where such pipe chases shall contain no sources of ignition, piping shall be noncombustible, and pipe penetrations at each floor shall be properly sealed and shall not require sprinkler protection.

8.14.1.2.15 Exterior columns under 10 ft2 in area formed by studs or wood joist, supporting exterior canopies that are fully protected with a sprinkler system, shall not require sprinkler protection.

8.14.1.3 Concealed Space Design Requirements. Sprinklers in concealed spaces having no access for storage or other use shall be installed in accordance with the requirements for light hazard occupancy.

8.14.1.4 Heat Producing Devices with Composite Wood Joist Construction. Where heat-producing devices such as furnaces or process equipment are located in the joist channels above a ceiling attached directly to the underside of composite wood joist construction that would not otherwise require sprinkler protection of the spaces, the joist channel containing the heat-producing devices shall be sprinklered by installing sprinklers in each joist channel, on each side, adjacent to the heat-producing device.

8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:

(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.

(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (3.7 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction.

8.14.1.6 Sprinklers used in horizontal combustible concealed spaces (with a slope not exceeding 2 in 12) having a combustible upper surface where the assembly or supporting members channel heat and where the depth of the space is less than 36 in. from deck to deck or with double wood joist construction with a maximum of 36 in. between the top of the bottom joist and the bottom of the upper joist shall be listed for such use.*

Moreover, the NFPA13 ROP indicates the following change:

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15 and 8.14.6.

8.14.1.2.1 Concealed spaces of noncombustible and limited combustible construction with minimal combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum. (For additional information on combustible loading See 8.14.1.2.1)*

8.14.1.2.2 Conceal d spaces of noncombustible and limited combustible construction with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

A.8.14.1.2.1 Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection.

This FPN is being misinterpreted by authorities having jurisdiction to indicate that these concealed spaces require sprinkler protection. Moreover, I have come across at least two cases (one in Massachusetts and one in California), where the authority having jurisdiction was informed by a vendor that the only cabling alternative to using sprinklers was the installation of “limited combustible cable”. In fact, in one case I have worked on, the concealed space was an 8 inch high underfloor space of totally non combustible construction, which had no ducts or other parts of an air distribution system, and yet the code official had been led to the belief that cables could only be used if the space was sprinklered or the cable was “limited combustible cable”.

Examples of misinformation exist and some are attached for committee members’ use.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

“So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A.”

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter’s substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: See my Explanation of Negative on Proposal 16-70.

16-72 Log #3005 NEC-P16 **Final Action: Reject**
(770.154)

Submitter: Marcelo M. Hirschler, GBH International

Recommendation: Revise text to read as follows:

770.2 Definitions.

Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

770.154 Applications of Listed Optical Fiber Cables and Raceways. Nonconductive and conductive optical fiber cables shall comply with any of the requirements given in 770.154(A) through 770.154(E) or where cable substitutions are made as shown in 770.154(F).

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned optical fiber cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components. ~~not be permitted to remain.~~ Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.

FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.

(B) Riser. Cables installed in risers shall be as described in any of the following:

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type OFNR or OFCR. Floor penetrations requiring Type OFNR or OFCR shall contain only cables suitable for riser or plenum use. Abandoned optical fiber cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components. ~~not be permitted to remain.~~ Listed riser optical fiber raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type OFNP, OFCP, OFNR, and OFCR cables shall be permitted to be installed in these raceways.

Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in “inaccessible spaces”. This is not conducive to safe electrical practice; this the key change is the elimination of the words “the accessible portion of”.

If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.

Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.

For information, see the relevant definitions in the NEC.

Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.

Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.

Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.

Panel Meeting Action: Reject

Panel Statement: See panel action on Proposal 16-28.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We concur with submitter’s substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article.

16-73 Log #2198 NEC-P16 **Final Action: Reject**
(770.154, 770.179)

Submitter: Frank Peri, Communications Design Corporation

Recommendation:

In 770.154 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Also revise (G) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Air Ducts. Cables installed in air ducts shall be Type OFND or OFCD and shall be associated with the air distribution system and shall be as short as practicable. Types OFND, OFCD, OFNP, OFCP, OFNG, OFN, OFCG and OFC cables installed in raceway that is installed in compliance with 300.22(B) shall also be permitted.

(B~~A~~) Plenum. Cables installed in ~~ducts,~~ plenums~~,~~ and other space~~s~~ used for environmental air shall be Types OFND, OFCD, OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFND, OFCD, OFNP, OFCP, OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ~~ducts and~~ plenums as described in 300.2(b) and in other space~~s~~ used for environmental air as described in 300-22(C). Only Types OFND, OFCD, OFNP and OFCP cables shall be permitted to be installed in ~~these~~ listed plenum communications raceways.

FPN: See 8.14.1 of NFPA13-2002, *Installation of Sprinkler Systems*, for requirements for sprinklers in concealed spaces containing exposed combustibles.

(G~~F~~) Cable Substitutions. The substitutions for optical fiber cables listed in Table 770.154 shall be permitted.

Table 770.154 Cable Substitutions

Cable Type	Permitted Substitutions
OFNP	OFND ~~None~~
OFCP	OFND, OFCD, OFNP
OFNR	OFND, OFNP
OFCR	OFND, OFCD, OFNP, OFCP, OFNR
OFNG, OFN	OFND OFNP, OFNR
OFCG, OFC	OFND, OFCD, OFNP,OFCP,OFNR,OFCR, OFNG, OFN

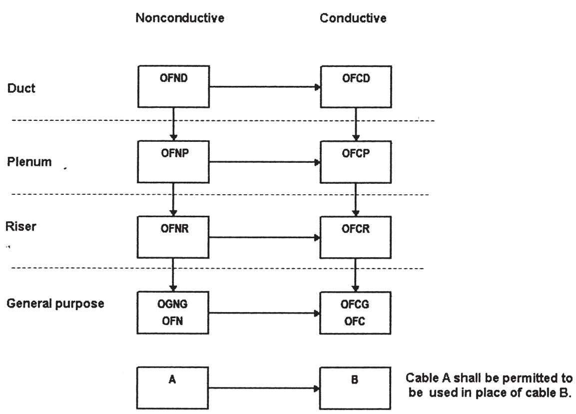

Figure 770.154 Cable substitution hierarchy.

In 770.179 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Types OFND and OFCD. Types OFND and OFCD nonconductive and conductive optical fiber air duct cables shall be listed as suitable for use in air ducts and shall be rated for continuous use at 121°C. Types OFND and OFCD nonconductive and conductive optical fiber air duct cables shall also be listed as having a low potential heat value, low flame spread characteristics, and very low smoke-producing characteristics.

FPN: One method of defining a low potential heat cable is establishing an acceptable value of potential heat when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, to a maximum potential heat value not exceeding 8141 kJ/kg (3500 BTU/lb). One method of defining low flame spread cable is establishing an acceptable value of flame spread when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to a maximum flame spread index of 25, with the cable unslit (intact) and slit. Similarly, one method of defining very low smoke-producing cable is establishing an acceptable value when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to maximum smoke developed index of 50, with the cable unslit (intact) and slit. These test methods and resultant values correlate with the requirements of NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems* for materials installed in ducts and plenums. *For additional testing information see Underwriters Laboratories Subject 2424, Outline of Investigation For Cable Marked Limited Combustible.*

(B~~A~~)Types OFNP and OFCP. Types OFNP and OFCP nonconductive and conductive optical fiber plenum cables shall be listed as being suitable for use in ~~ducts,~~ plenums~~,~~ and other space used for environmental air and shall also be listed as having adequate fire resistant and low smoke producing characteristics.

FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.*

Substantiation: Summary

This proposal is submitted to accomplish four things:

1.) Change the code to not allow the dangerous practice of using air ducts as a cable pathway.

2.) Code recognition that there may be instances where a small amount of in-duct cable is necessary for air handling equipment, dampers, security, temperature control, fire protection, etc.

3.) Establish minimum requirements for flame spread, smoke, and potential heat for in-duct (CL2D, CL3D, FPLP, OFND, OFCD, CMD and CATVD) cables used in this special hazard space.

4.) Include air duct "D" cables as permissible substitute for plenum "P" cables for installation in ceiling cavity and raised floor plenums (other space used for environmental air).

This proposal correlates with a TIA that I submitted for NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems.* Similar proposals have been submitted for Articles 725, 760, 770, 800 and 820.

The substantiation for the TIA is shown below:

"This TIA is being submitted in accordance with Section 5 of the *2005 NFPA REGULATIONS GOVERNING COMMITTEE PROJECTS.* In particular, it addresses a hazard meeting the criteria of section 5-2(d), which states:

(d) The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

The purpose of this TIA is to address the dangerous practice of installing combustible communications/data cables in air ducts.

NFPA 90A-2002 does not have explicit requirements for electrical wiring in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cable into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This TIA would greatly reduce the amount of wiring in air ducts by only permitting wiring and raceways associated with the air distribution system and also requiring that they be as short as practicable. It would require that the wiring and nonmetallic raceway in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A permits the supplied air to be at 121 °C (250 °F). The permitted wiring and nonmetallic raceway would be required to have initial flame spread and smoke requirements identical to those for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). In addition to these initial requirements, there are slitting and ageing requirements to assure that the cables installed in air ducts meet the flame spread, smoke and potential heat requirements equivalent to those for limited combustible materials. Essentially they would be required to be listed to the UL 2424.

Combustible plenum cable is unsuitable and dangerous for this application. Typically, combustible plenum cable has a temperature rating of 60° C, which is significantly less that the 121° C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests, these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

It is essential that these requirements be adopted now in NFPA 90A."

Section 770.154(A) in the 2005 NEC permits unlimited amounts of Types OFNP and OFCP cableS in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of an air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cables into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This proposal would greatly reduce the amount of wiring in air ducts by only permitting wiring associated with the air duct and as short as practicable. It would require that the wiring in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, permits the supplied air to be at 121 °C (250 °F). The permitted wiring would be required to have flame spread and smoke requirements identical to those in NFPA 90A-2002 section 4.3.3.1 for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). Essentially they would be required to be listed to the UL 2424, *Outline of Investigation For Cable Marked Limited Combustible* (copy attached) .

"P" type plenum cables are unsuitable and dangerous for this application. Typically, they have a temperature rating of 60 °C, which is significantly less that the 121 °C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests (copy attached), these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

"D" type air duct cables will meet the NFPA 90A listing requirements for use in ceiling cavity and raised floor plenums (other space used for environmental air) and therefore will be able to safely substitute for "P" type plenum cables. "D" type air duct cables have approximately 1/20 the smoke production of "P" type plenum cables.

In order to be consistent with the applications of plenum cable, this proposal will also prohibit the installation of plenum communications raceways in air ducts.

The cable substitution table and figure have been revised to permit air duct cables to substitute for plenum cables since air duct cables are superior cables. “D” type air duct cables also meet the requirements in NFPA 90A for use in ceiling cavity plenums and raised floor plenums (other space used for environmental air).

Some of the applications that require the installation of cables in air ducts are fire alarm (Article 760), temperature sensing and control (Article 725), security (Articles 725 and 820) and communications (Article 800). Optical fiber cables (Article 770) could be used in place of copper conductor cables. Communications cables are permitted to substitute for Class 2 & 3, fire alarm and CATV cables. I am submitting similar proposals for each of these articles.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

“So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A.”

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-74 Log #22 NEC-P16 **Final Action: Accept**
(Figure 770.154)

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise text at the bottom:

Cable A <u>shall be permitted to</u> be used in place of cable B.

Substantiation: The change is required to conform to the style manual. The panel tried to correct this error in the last code cycle.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-75 Log #9 NEC-P16 **Final Action: Reject**
(770.154(A))

Submitter: Stanley Kaufman, CableSafe, Inc.

Recommendation: Revise as follows:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. ~~Abandoned cables shall not be permitted to remain.~~ Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.

Substantiation: Section 770.3 requires that “The accessible portion of abandoned optical fiber cables shall be removed.” The requirement in to remove all abandoned cables in 770.154(A) is an error from the 1999 NEC that the panel tried to correct in the last code cycle

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

“So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A.”

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-76 Log #715 NEC-P16 **Final Action: Reject**
(770.154(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the sentence as shown:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. ~~Abandoned cables shall not be permitted to remain.~~ Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.

Substantiation: This proposal is editorial. (Task Group No. 770-21)

Section 770.3 requires that “The accessible portion of abandoned optical fiber cables shall be removed.” The requirement in to remove all abandoned cables in 770.154(A) is an error from the 1999 NEC that the panel tried to correct in the last code cycle.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

“So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A.”

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-77 Log #818 NEC-P16 **Final Action: Reject**
(770.154(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the phrase as shown:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed ~~in ducts and plenums as described in 300.22(B) and~~ in other spaces used for environmental air as described in 300.22(C). Only type OFNP and OFCP cables shall be permitted to be installed in these raceways.

Substantiation: This is a technical proposal. (Task Group No. 770-27)

It is a corollary proposal to the task group proposal to have the listing requirements for plenum optical fiber raceway changed to be for use in other space used for environmental air only.

The applications of plenum optical fiber raceways should be consistent with the listing requirements.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-78 Log #3098 NEC-P16 **Final Action: Reject**
(770.154(A))

Submitter: Donald Hall, Corning Cable Systems

Recommendation: This is a companion proposal to two similiar proposals addressing the same NFPA 13 reference in Articles 800 and 820.

Delete FPN text as follows:

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: The reference to 8.14.1 of NFPA 13 is misleading and should be removed for the following reasons:

(1) The reference is related to sprinkler protection of combustible concealed spaces and their stored content. The use of a concealed space as a pathway for cables and raceway in a manner permitted by the NEC does not constitute a storage condition.

(2) The Technical Committee for NFPA 13 has never provided any useful guidance to indicate what quantity of cable/raceway or other circumstance might trigger requirement for communications cables to be protected by sprinklers. The Technical Committee for NFPA 13 proposed a new annex for addition to the next revision of NFPA 13 (shown below). The proposed annex is non binding, contains vague terminology, and does not add any new clarifying information, because it is identical to the existing language of the NFPA 13 Handbook. For normal circumstances in which cables and raceway are installed in accordance with the NEC and are listed by a Nationally Recognized Test Laboratory "as suitable for use in ducts, plenums, and other spaces used for environmental air and as having adequate fire resistant and low smoke producing characteristics" it is understood that these cables and raceways are safe and do not require additional protection from sprinklers.

(3) The cited portion of NFPA 13 is broadly applicable to all concealed spaces, not just those which handle environmental air. The selective placement of this FPN within three sections of the NEC all pertaining to plenum spaces, creates a perceived encumbrance to the permitted use of plenum cables and plenum cables alone. This perceived encumbrance is being aggressively exploited through the marketing efforts of multiple commercial interests to create a new market for their products.

NFPA 13 ROP indicates the following proposed change:

A.8.14.1.2.1 Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: See my Explanation of Negative on Proposal 16-70.

16-79 Log #3238 NEC-P16 **Final Action: Reject**
(770.154(A))

Submitter: Frank Peri, Communications Design Corporation

Recommendation: Revise 770.154(A), as shown.

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFND, OFCD , OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFND, OFCD, OFNP, OFCP, OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type OFND, OFCD, OFNP and OFCP cables shall be permitted to be installed in these raceways.

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1: a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements in Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-80 Log #2811 NEC-P16 **Final Action: Accept in Part**
(770.154(A) and (B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal and that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Delete the wording "Abandoned cables shall not be permitted to remain." in the following areas:

770.154 Applications of Listed Optical Fiber Cables and Raceways. No change.

Revise text to read as follows:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP.

~~Abandoned cables shall not be permitted to remain.~~ Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with 300.22 shall be permitted to remain. List plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in ducts in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Types OFNP and OFCP cables shall be permitted to be installed in these raceways.

(B) Riser. Cables installed in risers shall be described in any of the following:

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type OFNR or OFCR, floor penetrations requiring Type OFNR or OFNR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain.~~ Listed riser optical fiber raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type OFNG, OFN, OFCG, and OFC cables shall be permitted to be installed in these raceways.

(2) No change.

(3) No change.

Substantiation: I have submitted a proposal that would move the abandoned optical fiber cable requirements to a more appropriate and central section within Article 770. The abandoned optical fiber cable requirements belong in 770.24 - Mechanical Execution of Work. 770.24 is located within Part I, General which would apply to the entire Article 770.

Panel Meeting Action: Accept in Part

The panel accepts the submitter's deletion of subsection (B).

The panel rejects the submitter's revision of subsection (A).

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air-handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

See panel action on proposal 16-83.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRUNSSEN, J.: Under "Panel Meeting Action:", revise the first sentence as follows: "The panel accepts the submitter's deletion of the sentence <u>'Abandoned cables shall not be permitted to remain.' in</u> subsection (B)." It was this sentence that was deleted, not the entire subsection (B).

DORNA, G.: The panel statement contains an error. The panel accepted the deletion in subsection (B), not of subsection (B).

KAHN, S.: The panel statement requires correction as the panel accepted the submitter's deletion "in" subsection (B), not the deletion "of" subsection (B).

16-81 Log #2817 NEC-P16 **Final Action: Reject**
(770.154(A), FPN)

Submitter: Ronald E. Hackett, Village of Buffalo Grove

Recommendation: Delete the FPN text that follows: 770.154(A)

~~FPN: See 8.14.1 of NFPA 13 (2002). Installation of Sprinkler Systems for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: As chief electrical inspector of Buffalo Grove, I do not see any reason or any technical support as why this FPN referencing 8.14.1 of NFPA 13(2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles was added to the 2005 NEC. This FPN is very misleading and inappropriate as well. My own personal experience as the AHJ has found that this FPN being a negative effect on the National Electrical Code which is used as an installation documentation to be in conflict with the NFPA 13.

NFPA 13 Technical Committee added new Annex A8.14.1.2.1 in the 2006 ROP #13-284, Log #551 which should provide guidance to both the installer and AHJ for cabling in concealed spaces.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitters substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: See my Explanation of Negative on Proposal 16-70.

16-82 Log #716 NEC-P16 **Final Action: Accept**
(770.154(B))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Add titles as shown:

(B) Riser. Cables installed in risers shall be as described in any of the following:

(1) **<u>Cables in Vertical Runs.</u>** Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type OFNR or OFCR. Floor penetrations requiring Type OFNR or OFCR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain. Listed riser optical fiber raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type OFNP, OFCP, OFNR, and OFCR cables shall be permitted to be installed in these raceways.

(2) **<u>Metal Raceways or Fireproof Shafts.</u>** Type OFNG, OFN, OFCG, and OFC cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.

(3) **<u>One- and Two-Family Dwellings</u>** Type OFNG, OFN, OFCG, and OFC cables shall be permitted in one- and two-family dwellings.

FPN: See 300.21 for firestop requirements for floor penetrations.

Substantiation: This is an editorial proposal. (Task Group No. 770-22)

Addition of titles to the subsections in 770.154(B) makes this article editorially consistent with articles 800, 820 and 830.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-83 Log #7 NEC-P16 **Final Action: Accept**
(770.154(B)(1))

Submitter: Stanley Kaufman, CableSafe, Inc.

Recommendation: Revise as follows:

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type OFNR or OFCR. Floor penetrations requiring Type OFNR or OFCR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain.~~ Listed riser optical fiber raceways <u>and listed plenum optical fiber raceways</u> shall be also permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type OFNP, OFCP, OFNR, and OFCR cables shall be permitted to be installed in these raceways.

Substantiation: Plenum raceways should be permitted to substitute for riser and general purpose raceways just as plenum cable is permitted to substitute for riser and general purpose cables.

Section 770.3 requires that "The accessible portion of abandoned optical fiber cables shall be removed." The requirement in to remove all abandoned cables in 770.154(B)(1) is an error from the 1999 NEC that the panel tried to correct in the last code cycle.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-84 Log #717 NEC-P16 **Final Action: Accept**
(770.154(B)(1))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the sentence as shown:

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type OFNR or OFCR. Floor penetrations requiring Type OFNR or OFCR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain.~~ Listed riser optical fiber raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type OFNP, OFCP, OFNR, and OFCR cables shall be permitted to be installed in these raceways.

Substantiation: This proposal is editorial. Task Group No. 770-23)

This requirement is in Section 770.3 which requires that "The accessible portion of abandoned optical fiber cables shall be removed." The removal of all abandoned cables in 770.154(B)(1) is an error from the 1999 NEC that the panel tried unsuccessfully to correct in the last code cycle.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-85 Log #8 NEC-P16 **Final Action: Accept in Principle**

(770.154(C))

Submitter: Stanley Kaufman, CableSafe, Inc.

Recommendation: Revise as follows:

(C) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 770.154(A) and 770.154(B) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways <u>listed riser optical fiber raceways and plenum optical fiber raceways</u> .

Substantiation: Plenum and riser raceways should be permitted to substitute for general purpose raceways just as plenum and riser cables are permitted to substitute for general purpose cables.

Panel Meeting Action: Accept in Principle

Revise 770.154(C) to read as follows:

(C) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 770.154(A) and 770.154(B) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways, <u>listed riser optical fiber raceways, and listed plenum optical fiber raceways</u> .

Panel Statement: The addition clarifies the submitter's intent.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be rejected as this new code language could be confusing to code-users. The revised language allows all of the cables listed to be used in riser and plenum optical fiber raceways. As long as it is clear that these riser and plenum raceways are not being used in riser and plenum applications, the use of those cables in those raceways in not a problem. However, why would anyone want to use the more expensive raceways in " other wiring within buildings" locations? This language is also in conflict with 770.154(A) which states "Only Type OFNP and OFCP cables shall be permitted to be installed in these raceways" and with 770.154 (B) which requires either plenum or riser cables to be installed in riser optical fiber raceways.

16-86 Log #718 NEC-P16 **Final Action: Accept**

(770.154(C))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Change the title as shown:

(C) Other ~~Wiring~~ <u>Cabling</u> Within Buildings. Cables installed in building locations other than the locations covered in 770.154(A) and 770.154(B) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways.

Substantiation: This is an editorial proposal. (Task Group No. 770-24)

There are no optical fiber wires, only cables. Hence, the proposed title change.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-87 Log #2564 NEC-P16 **Final Action: Accept in Principle**

(770.154(D))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for information.

Submitter: Peter Schimmoeller, CSA International

Recommendation: Revise text to read as follows:

770.154

(D) Hazardous (Classified) Locations. Cables installed in hazardous (classified) locations shall be any type indicated in Table 770.154. <u>Cables shall be scaled in accordance with the requirements of Articles 501.15, 502.15, 505.16 or 506.16, as applicable.</u>

Substantiation: The code does not clearly address sealing requirements for Fiber Optic cables used in hazardous locations. There cables can transfer flammable gases and vapors as easily as electrical cables used in similar applications.

Panel Meeting Action: Accept in Principle

Revise text of 770.154(D) to read as follows:

(D) Hazardous (Classified) Locations. Cables installed in hazardous (classified) locations shall be any type indicated in Table 770.154. <u>Cables shall be sealed in accordance with the requirements of 501.15, 502.15, 505.16 or 506.16, as applicable.</u>

Panel Statement: The panel corrected the typo; "scaled" is to be "sealed".

The panel removed "Articles" to comply with the NEC Manual of Style.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-88 Log #3239 NEC-P16 **Final Action: Reject**

(770.154(F))

Submitter: Frank Peri, Communications Design Corporation

Recommendation: Revise 770.154(F), as shown.

(F) Cable Substitutions. The substitutions for optical fiber cables listed in Table 770.154 shall be permitted. <u>Type OFND shall be permitted to substitute for all cables in Table 770.154 and Figure 770.154. Type OFCD shall be permitted to substitute for conductive optical fiber cables in Table 770.154 and Figure 770.154.</u>

Substantiation: This proposal correlates the substitution table and figure with the listing and application requirements for air duct cable.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-89 Log #2528 NEC-P16 **Final Action: Reject**

(770.154(F) and FPN to 770.154(f))

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Revise 770.154(F), as shown.

(F) Cable Substitutions. The substitutions for optical fiber cables listed in Table 770.154 shall be permitted. <u>Types OFN50 and OFC50 very-low-smoke cable shall be permitted to substitute for all optical fiber cables in Table 770.154 to meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.</u>

<u>FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.</u>

Substantiation: This proposal correlates with the proposal to add Types OFN50 and OFC50 to 770.154.

There is a companion proposal for the listing and marking of Types OFN50 and OFC50.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-90 Log #719 NEC-P16 **Final Action: Accept in Principle**
(770.179 and Table 770.179)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Revise 770.179 and transfer Table 770.113 and the Table FPN's to 770.179.

770.179 Optical Fiber Cables.

Optical fiber cables shall be listed in accordance with 770.179(A) through 770.179(D) and shall be marked in accordance with Table 770.179.

Move Table 770.113 and Table FPN's to 770.179 and renumber to Table 770.179.

Substantiation: This change is editorial. (Task Group No. 770-25)

It moves the cable marking requirements from 770.133 to 770.179.

There is a companion proposal to make appropriate changes to 770.113.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-60.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-91 Log #1422 NEC-P16 **Final Action: Accept**
(770.179(C), FPN)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

One method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M-~~1985~~ <u>2001</u> , Test Methods for Electrical Wires and Cables.

Substantiation: The revised wording is an update of the standard reference and not a change in the test method.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-92 Log #1423 NEC-P16 **Final Action: Accept**
(770.179(D), FPN)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.

Recommendation: Revise text to read as follows:

FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the " <u>UL Flame Exposure</u> , Vertical Tray Flame Test" in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords~~ . <u>UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.</u>

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M- ~~1985~~ <u>2001</u> , Test Methods for Electrical Wires and Cables.

Substantiation: The revised wording is an update of the standard references and not a change in the test methods. UL 1581 now references UL 1685 for the text of the test method.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-93 Log #2529 NEC-P16 **Final Action: Reject**
(770.179(E))

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Insert new 770.179(E).

<u>(E) Types OFN50 and OFC50. Types OFN50 and OFC50 optical fiber cables shall be listed as suitable for installation in concealed spaces having restrictive requirements for smoke generation, combustible loading, and flame spread and shall be listed as having very-low-smoke producing characteristics, a low potential heat release value, and low flame spread characteristics.</u>

<u>FPN: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*</u>

<u>FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.</u>

<u>FPN No. 3: Building codes adopted by code jurisdictions may contain restrictions on permissible flame spread index and smoke developed index.</u>

Substantiation: This proposal establishes a listing and marking for cables permitted as an electrical wiring option in concealed spaces where a smoke developed index no greater than 50 is required or large quantities of cable may cause combustible loading. The proposed cable has very-low-smoke-producing characteristics, a low potential heat release value, and low flame spread characteristics. Presently, a number of manufacturers have cables listed to the proposed requirements.

The testing criteria are based on the requirements found in NFPA 13-2003 and the 2003 International Mechanical Code, as revised.

NFPA 13, Section 8.14.1.2.1 follows: "Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum." The proposed cable has a very low heat of combustion. While the term "combustible loading" is not defined, the fuel load can be calculated to determine the potential hazard from large quantities of cable.

The 2003 International Mechanical Code, 602.2.1, requires materials in plenums to be noncombustible or have a flame spread index no greater 25 and a smoke index no greater than 50. At the recent ICC meeting in Detroit, exception #5 to 602.2.1 was revised to include "combustible material (electrical wiring) installed in noncombustible raceways or enclosures." The requirements in IMC 602.2.1.1 permits cables meeting NFPA 262 test requirements. Cables meeting NFPA 262 requirements, according to Fire Protection Research Foundation testing using NFPA 255, have a smoke developed index that varies between 450 and 850. The proposed cable meets the requirements of the base paragraph, 602.2.1.

The following (change is underlined) shows the result of action on IMC public comment on M 77 (floor actions in Detroit, September 2005).

602.2.1 Materials exposed within plenums. Except as required by Sections 602.2.1.1 through 602.2.1.5, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84.

Exceptions:

1. Rigid and flexible ducts and connectors shall conform to Section 603.
2. Duct coverings, linings, tape and connectors shall conform to Sections 603 and 604.

3. This section shall not apply to materials exposed within plenums in one- and two-family dwellings.
4. This section shall not apply to smoke detectors.
5. Combustible materials enclosed in noncombustible raceways or enclosures, approved gypsum board assemblies or enclosed in materials listed and labeled for such application.

602.2.1.1 Wiring. Combustible electrical or electronic wiring methods and materials, optical fiber cable, and optical fiber raceway exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread not greater than 5 feet (1524 mm) when tested in accordance with NFPA 262. Only type OFNP (plenum rated nonconductive optical fiber cable) shall be installed in plenum-rated optical fiber raceways. Wiring, cable, and raceways addressed in this section shall be listed and labeled as plenum rated and shall be installed in accordance with ICC *Electrical Code* .

The Fire Protection Research Foundation report demonstrated that NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* , provides a suitable test method for establishing the cable characteristics (flame spread index & smoke developed index) specified in the FPN.

Establishing a listing and marking for a Type FPL50 cable provides a wiring option for complying with requirements of other standards and building codes. The NEC has previously established listings and markings for cable to correlate with other codes and standards. Additionally, the listing and marking may or may not have a specific application. Specific examples follow:

1. Type CMG cable was included in the 1993 NEC to correlate with the Canadian Electrical Code. The change was proposed by the Chair of NEC TCC, Harold Ware and Roy Hicks from Canada. Type CMG has a listing and marking in the NEC. Article 800 permits "Type CM or Type CMG" to be installed as a general purpose cable. Note: Type CMG does not have a unique application, and neither cable is considered a minimum requirement.
2. Types MP, MPR, and MPP cable was included in the 1990 NEC. The cables had a listing and marking. The multiple-purpose cables were permitted to substitute for similar cables in Articles 725, 760, & 800. Note: Types MP, MPR, and MPP cables do not have a unique application, just a listing and marking.
3. A change to the 1999 NEC permitted Types NPLF, NPLFR, NPLFP, FPL, FPLR, and FPLP to have a "-CI" suffix. The change included only listing and marking requirements. This change to the NEC correlated with NFPA 72, National Fire Alarm Code, requirements for a circuit integrity cable. Note: Cables with a "-CI" suffix did not have an application, until changes were made to the 2005 NEC.
4. A change to the 2005 NEC permitted Types CM, CMR and CMP to have a "-CI" suffix. As of today, no company has a listed circuit integrity using the permitted markings. Note: Types CM-CI, CMR-CI, and CMP-CI do not have an application, just a listing and marking.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide adequate technical substantiation to support a need for a cable listed for concealed spaces.

Concealed spaces should be adequately defined. Seeaction on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

"The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-94 Log #3240 NEC-P16 **Final Action: Reject**
(770.179(E))

Submitter: Frank Peri, Communications Design Corporation

Recommendation: Add new 770.179(E).

(E) Types OFCD and OFND. Types OFND and OFCD air duct cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant, very low smoke-producing characteristics, and very low potential heat release.

FPN No: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1:a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements of Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

The following is an example of air duct cable information from the UL Web Site:

OWKZ.GuideInfoLimited Combustible Cable

Guide Information for Electrical Equipment for Use in Ordinary Locations

GENERAL

This category covers electrical and optical fiber cable that meets the limited combustible and smoke developed requirements for cable in ceiling cavity and raised floor plenums in accordance with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems." This cable also meets the requirements for cable used in ducts, plenums and other spaces used for environmental air in accordance with Articles 725, 760, 770, 800, 820 and 830 of ANSI/NFPA 70, "National Electrical Code".

This cable has a maximum Potential Heat value of 3500 Btu/lb when tested in accordance with NFPA 259, "Standard Test Method for Potential Heat of Building Materials." This cable has a maximum smoke developed index of 50 and a maximum flame spread index of 25 when tested in accordance with UL 723 (NFPA 255), "Test for Surface Burning Characteristics of Building Materials" before and after exposure to elevated temperature and humidity. The cable also meets the requirements for plenum cable in one or more of the following product categories:

· Power-limited Circuit Cable (**QPTZ**) - Types CL2P or CL3P
· Communications Cable (**DUZX**) - Type CMP
· Power-limited Fire Alarm Cable (**HNIR**) - Type FPLP
· Nonpower-limited Fire Alarm Cable (**HNHT**) - Type NPLFP
· Optical Fiber Cable (**QAYK**) - Types OFNP or OFCP
· Community Antenna Television Cable (**DVCS**) - Type CATVP
· Network-powered Broadband Communications Cable (**PWIP**) - Type BLP

PRODUCT MARKINGS

This cable is identified by the marking "Limited Combustible FHC 25/50" on the surface of the jacket or on a marker tape under the jacket. This marking is immediately followed by one of the Type designations shown above. The cable also has the required markings including optional markings as indicated in the product categories referenced above. This cable may also be Verified for transmission performance if authorized in the product categories referenced above, and will bear the appropriate performance verification marking.

ADDITIONAL INFORMATION

For additional information, see Electrical Equipment for Use in Ordinary Locations (**AALZ**).

REQUIREMENTS

The basic requirements used to investigate products in this category are contained in Subject 2424, "Outline of Investigation for Cable Marked 'Limited Combustible.'"

UL MARK

The UL symbol on the product and the Listing Mark of Underwriters Laboratories Inc. on the attached tag, the reel, or the smallest unit container in which the product is packaged is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and the product name "Limited Combustible Cable."

Cable which is also Verified to the UL Data Transmission Performance Category Marking Program has the marking "Verified to UL Performance Category Program," or the UL Verification Mark along with the words "Performance Category Program" together with the Listing Mark information on the tag, the reel, or the smallest unit container. Cable which is also Verified to another transmission performance specification has the marking "Verified in Accordance with [Specification name and/or number]" or the UL Verification Mark along with the applicable Specification name and/or number together with the Listing Mark information on the tag, the reel, or the smallest unit container.

Last Updated on 2004-03-24

Panel Meeting Action: Reject

Panel Statement: "The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-95 Log #3633 NEC-P16 **Final Action: Reject**
(770.179(E) (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Add new text as follows:

<u>**(E) Concealed Space Cables.** Optical fiber cables that meet the requirements for Types OFN and OFC that are also listed as having a low potential heat value, low flame spread characteristics, and low smoke producing characteristics shall be permitted to be listed and marked as concealed space cables Type OFN-CS and OFC-CS.</u>

<u>FPN: One method of defining a low flame spread and low smoke-producing cable is that the cable exhibits a maximum flame spread distance of 1.52 m (5 ft), a maximum peak optical density of 0.5 and a maximum average optical density of 0.15 when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*</u>

Substantiation: The purpose of this proposal is to provide listing and marking for a cable that will be suitable for use in concealed spaces where there are large quantities of cables. Users would have the option of using these cables to avoid establishing a fuel load above the threshold where the quantity of cables would be considered a combustible loading. Also, these cables provide a flame spread index and a smoke developed index that correlate with the requirements for exposed materials within concealed spaces in buildings.

Cables tested using NFPA 255 and 259 establish parameters commonly used in NFPA standards and building codes: smoke developed index, smoke developed index, and heat of combustion. This proposal uses the NFPA 262 test in place of NFPA 255. The Fire Protection Research Foundation's *International Limited Combustible Plenum Cable Fire Test Project* (copy attached) has shown that both of these tests are suitable and provided data (page 18 of the report) for setting equivalent criteria in the two tests. A maximum average optical density of 0.17 in NFPA 262 is equivalent to a smoke developed index of 450 in NFPA 255. This proposal sets the maximum optical density requirement at 0.15 to allow for a margin of error and to correlate with the existing requirements for plenum cable.

NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading. Combustible loading is a function of the density (number) of cables and their potential heat release determined by NFPA 259.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics*** . I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of this article need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or preferably avoid the buildup of combustible cables that would result in a combustible loading. Use of concealed space cables would be an option in a strategy to avoid establishing a combustible loading.

A flame spread index of 25 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

A smoke developed index of 450 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

The following requirements are from NFPA 5000-2003 identify heat of combustion, flame spread, and smoke as major concerns:

Chapter 4 General

4.4.7 Limiting Fire Spread.

4.4.7.1 Interior Finishes. The interior surfaces of the building shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.4.7.2 Concealed Spaces. The construction of concealed spaces shall not contribute to an unacceptable rate of the spread of fire, hot gases, and smoke to areas of the building remote from the fire source and shall limit their spread beyond the immediate area of the origin of the fire.

4.4.7.3 Compartmentation. The building shall be compartmented, as appropriate, by walls and floors, including their associated openings with proper closures, to limit the spread of fire, hot gases, and smoke to an acceptable area beyond the immediate area of fire origin.

Chapter 8 Fire-Resistive Materials and Construction

8.1 General.

8.1.1 The chapter addresses fire protection features intended to restrict or resist the spread of fire and smoke beyond the compartment of fire origin.

8.1.2 Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict or resist the movement of smoke.

8.1.2.1* Fire compartments shall be formed with fire barrier walls that comply with Section 8.4 or horizontal assemblies that comply with Section 8.6, or a combination of both.

8.1.2.2 Smoke compartments shall be formed with smoke barriers that comply with Section 8.11.

8.16 Insulating Materials.

8.16.7 Insulation and Covering on Pipe and Tubing. Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke developed index of not more than 450.

Chapter 10 Interior Finishes

10.3.2* Products required to be tested in accordance with NFPA 255 or ASTM E 84 shall be grouped in the classes described in 10.3.2(A) through 10.3.2(C) in accordance with their flame spread and smoke development, except as indicated in 10.3.3.

(A) Class A Interior Wall and Ceiling Finish. Class A interior wall and ceiling finishes shall be those finishes with a flame spread of 0–25 and smoke development of 0–450 and shall include any material classified at 25 or less on the flame spread test scale and 450 or less on the smoke test scale. Any element thereof, when so tested, shall not continue to propagate fire.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide adequate technical substantiation to support a need for a concealed space listed cable.

Concealed spaces should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-96 Log #720 NEC-P16 **Final Action: Reject**
(770.182)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the changes in the text as shown:

770.182 Optical Fiber Raceways.

Optical fiber raceways shall be listed in accordance with 770.182(A) through 770.182(C) .

(A) Plenum Optical Fiber Raceway s . Plenum optical fiber raceways shall be listed for use in other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining that an optical fiber raceway is a low smoke producing raceway and a fire-resistant raceway is that the raceway exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with the plenum test in UL 2024, *Standard for Optical Fiber Cable Raceway* .

(B) Riser Optical Fiber Raceway s . Riser optical fiber raceways shall be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

FPN: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the raceways pass the requirements of the test for Flame Propagation (riser) in UL 2024, *Standard for Optical Fiber Cable Raceway* .

(C) General-Purpose Optical Fiber ~~Cable~~ Raceway s . General-purpose optical fiber ~~cable~~ raceway s shall be listed as being resistant to the spread of fire.

FPN: One method of defining resistance to the spread of fire is that the raceways pass the requirements of the Vertical-Tray Flame Test (General Use) in UL 2024, *Standard for Optical Fiber Cable Raceway* .

Substantiation: This proposal is a technical change. (Task Group No. 770-26)

It arose because the Task Group noticed that the listing requirements for plenum raceway were not consistent across the CMP-16 articles.

The word "Cable" was changed to "cables" because section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular". Also the word "cable" was deleted from the title of general-purpose raceways for editorial consistency. Furthermore listing these raceways for use in "other space used for environmental air" and not for use in ducts or other plenums in consistent with the requirements of NFPA 90A. The term "other space used for environmental air" is equivalent to the spaces in NFPA 90A as ceiling cavity plenums plus raised floor plenums.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

ARTICLE 780 — CLOSED-LOOP AND PROGRAMMED POWER DISTRIBUTION

10-59 Log #3430 NEC-P10 **Final Action: Accept**
(780)

TCC Action: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action of deleting Article 780.

It was the action of the Technical Correlating Committee that this Proposal be correlated with Code-Making Panel 7 for consideration of how to handle the reference to 780.5 in 334.104. This action will be considered by Code-Making Panel 7 as a public comment.

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

Recommendation: Delete this article.

Substantiation: This article has not proved to be economically viable since it first went into the 1987 NEC. Other than a few demonstration homes, the "Smart House" concept has not been shown to integrate with market realities. The noninterchangeability requirement in 780.7 is a major impediment to acceptance, and yet without that requirement the assumptions that underlie this article are invalid. Unfortunately, the only consequence of this article has been confusion, because many users think it has something to do with "smart" devices that talk to some digital control module using line carrier signaling protocols. Proposal 10-111 of the 1995 cycle was one such example; clearly the proponent thought the article covered programmed power as distinct from closed loop systems. It does not; programmed power systems use conventional overcurrent protective devices and are covered under the customary rules of the Code. Unless there is some compelling need, the article should be withdrawn.

Panel Meeting Action: Accept

Panel Statement: While there were a significant number of product offerings covered by this article at one time, currently there are no such products being manufactured or listed. Both the listings and the product categories have been withdrawn from UL.

The panel agrees to remove the article. Based on the lack of use, this a no longer serves a purpose.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-60 Log #2995 NEC-P10 **Final Action: Reject**
(780.3(A) and 780.6(A))

Submitter: Ole Nilssen, Innovention Center

Recommendation: Add the following statement to 780.3(A)

The term "shall not be energized" shall be interpreted to include a situation where the voltage and/or current available from and outlet shall be manifestly limited so as not to represent a fire-initiation hazard.

Add the following statement to 780.6(A)

For purposes of protection against fire-initiation hazard, the term "Hybrid Cable" shall be deemed suitable for installation under Article 725, Class 3 provided such "Hybrid Cable" is powered from a source manifestly prevented from supplying power to any load other than a load that is continuously supervised and manifestly prevented from constituting a fire-initiation hazard.

Substantiation: Products developed for use under the current Article 780 are not being manufactured. The proposed modification to the standard will permit the development of innovative products and systems that provide a much higher degree of safety with respect to fire initiation hazards than currently

exits under this article, while also providing a dramatic reduction in the installed cost of the system. This will provide an incentive for products to be developed for use under Article 780.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 10-59.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ARTICLE 800 — COMMUNICATIONS CIRCUITS

16-97 Log #1550 NEC-P16 **Final Action: Accept in Part**
(800)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be referred to the Technical Correlating Committee Grounding and Bonding Task Group for comment.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 800 and revise text as shown for the affected NEC sections.

800.90(A)(1)(b):

(b) Where insulated conductors in accordance with 800.50(A) are used to extend circuits to a building from a cable with a ~~n effectively~~ solidly grounded metallic sheath member(s) and where the conductors in the cable or cable stub, or the connections between the insulated conductors and the exposed plant, safely fuse on all currents greater than the current-carrying capacity of the primary protector, or the associated insulated conductors and of the primary protector grounding conductor.

800.90(A)(1)(e):

(e) Where insulated conductors in accordance with 800.50(A) are used to extend circuits to a building from cable with a ~~n effectively~~ solidly grounded metallic sheath member(s), and where (1) the combination of the primary protector and insulated conductors is listed as being suitable for this purpose for application with circuits extending from a cable with a ~~n effectively~~ solidly grounded metallic sheath member(s), and (2) the insulated conductors safely fuse on all currents greater than the current-carrying capacity of the primary protector and of the primary protector grounding conductor.

800.100(B)(2)(2:)

(2) If the building or structure served has no grounding means, as described in 800.100(B)(1) or (B)(2)(1), ~~to an effectively grounded metal structure~~ to any one of the individual electrodes described in 250.52 (A)(6), and (A)(7) or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or air terminal conductors (lightning-rod conductors) shall not be employed as electrodes for protectors.

Substantiation: 800.90(A)(1)(b): The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." The proposal suggests replacing "effectively" with "solidly" to emphasize that cable has to be grounded solidly.

800.90(A)(1)(e): The proposal suggests replacing "effectively" with "solidly" to emphasize that cable has to be grounded solidly.

800.100(B)(2)(2): The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

The deleted phrase is replaced by reference to underground systems and plate electrodes in 250.52.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept in Part

Accept the proposed revision to 800.100(B)(2)(2).

Reject the proposed revisions to 800.90(A)(1)(b) and 800.90(A)(1)(e).

Panel Statement: The term "effectively grounded" should remain unchanged in NEC sections 800.100 (A) (1)(b) and 800.100 (A)(1)(e).

The National Electrical Safety Code uses this term in Section 215(C)(I) where it is stated: "Metal or metal-reinforced supporting structures, including...cable sheaths, messengers.... shall be effectively grounded". This has been the telecommunications utility practice for many, many years. Use of the term "effectively grounded" provides for consistency between the NEC and the NESC. It promotes the understanding that grounding is to be accomplished in a manner sufficient to safely carry anticipated fault current while minimizing voltages that may be developed during fault conditions.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-98 Log #651 NEC-P16 **Final Action: Accept**
(800.1)

TCC Action: The Technical Correlating Committee advises that Article Scope statements and titles are the responsibility of the Technical Correlating Committee.

The Technical Correlating Committee "Rejects" the Panel Action and directs that the Proposal be reported as "Accept". This proposal was developed to resolve a scope/correlation issue between Articles 725 and 800.

The Technical Correlating Committee reaffirms that the scope of Article 800 is not based upon the wire or cable to be used, but upon the application.
Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Revise 800.1, Scope as follows:

800.1 Scope. This Article covers ~~telephone, telegraph (except radio), outside wiring for fire alarm and burglar alarm, and similar central station systems ; and telephone systems not connected to a central station system but using similar type of equipment, method of installation, and maintenance~~ communications circuits and equipment.

FPN No. 1: For further information for fire alarm, sprinkler waterflow, and sprinkler supervisory systems, see Article 760.

FPN No. 2: For installation requirements of optical fiber cables, see Article 770.

FPN No. 3: For installation requirements for network-powered broadband communications circuits, see Article 830.

FPN No. 4: For installation requirements for equipment and circuits in an information technology equipment room, see Article 645.

FPN No. 5: For further information on remote-control, signaling, and powerlimited circuits, see Article 725.

Add the following definition of "Communications Circuit" to 800.2:

800.2 Communications Circuit (new). The circuit that extends voice, audio, video, data, interactive services, telegraph (except radio), outside wiring for fire alarm and burglar alarm from the communications utility to the customer's communications equipment .

Substantiation: The term "telephone" implies a single, limited medium for the transmission of voice that is no longer valid in today's complex world of telecommunications. "Telephone" has evolved to the point where it is a communications system transporting information in various forms including voice, data, audio, video, and interactive services, and using varied technologies including copper wire, coaxial cable, optical fiber, and radio links, as well as high frequency carrier systems and advanced data processing and switching techniques. The proposed revision is needed to convey the concept of modern-day telecommunications to the user of the NEC. The addition of the definition of "communications circuit" helps clarify the scope as covering communications services and equipment provided by a communications utility, including the associated services.

Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The focus needs to be based on the wire/cable and the wiring method applied to the wire/cable rather than on individual applications.
Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRUNSSEN, J.: This proposal should be accepted. This proposal was an effort by a task group (TG) formed by the Technical Correlating Committee and charged with the review and possible revision of the scope of Articles 725 and 800. The TG deemed the scope of 725 to be adequate as currently written, but endeavored to encompass modern communications technology in the proposed revised 800.1, Scope, as contained in this proposal. The term "telephone" as used in the current text of 800.1 implies a single, limited medium for the transmission of voice. This limited view is no longer applicable in today's world of complex communications circuits that include voice, data, alarm, audio, video and interactive services. The TG attempted to encompass all aspects of a modern communications circuit by proposing a very broad, yet simple, scope statement: "This Article covers communications circuits and equipment." The TG then proceeded to define a modern "communications circuit" through the proposed new definition. While the proposed revised scope statement and new definition of communications equipment may not be "perfect", the combination of the two provide a major improvement in conveying the true scope of Article 800 to the reader.

16-99 Log #2657 NEC-P16 **Final Action: Reject**
(800.2)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Delete the following text:
~~**800.2 Air Duct.** A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum. [NFPA 97:1.2.6]~~
Substantiation: Air duct is not a term used in Article 800. This was an apparent miss in the 2005 editorial review under the Standards Council mandate to remove content related to "air duct cable".
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) was misunderstood.
We agree with deleting the term "air duct" as it was evidently an oversight that it was not removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 800. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".
OHDE, H.: We do not believe that the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) would prohibit this definition of Air Duct from being deleted. We do believe that expansion of or new definition of Air Duct would be in violation of NFPA Standards Council Long Decision 05-24 (SC #05-7-4). This proposal should have been accepted.
This proposal was to remove the definition of "Air Duct" from 800.2 as this term is not used in Article 800.

16-100 Log #2694 NEC-P16 **Final Action: Reject**
(800.2)

Submitter: Harold C. Ohde, IBEW #134
Recommendation: Delete the following:
~~800.2 Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum [NFPA 97:1.2.6]~~
Substantiation: This is an editorial proposal to remove the term "air duct" as this term is not used in Article 800. the term "air duct" should not be defined in the article, as per the National Electrical Code Style Manual.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) was misunderstood.
We agree with deleting the term "air duct" as it was evidently an oversight that it was not removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 800. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".
OHDE, H.: See my Explanation of Negative on Proposal 16-99.

16-101 Log #2359 NEC-P16 **Final Action: Reject**
(800.2.Abandoned Communications Cable)

Submitter: John H. Schmidt, ABC Television Network
Recommendation: In the definition for Abandoned Communications Cable, after the words "and not identified for future use with a tag" add the words "or in a database."
Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.
Panel Meeting Action: Reject
Panel Statement: The AHJ is unlikely to have access to the database for every building under his/her jurisdiction. The majority of communications technicians (installation/repair) work at a multiplicity of locations. Database administrative responsibility is not identified in the proposal. Maintaining and referencing a database for every location is cumbersome, unwieldy, and impractical.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-102 Log #2366 NEC-P16 **Final Action: Reject**
(800.2.Abandoned Communications Cable)

Submitter: John H. Schmidt, ABC Television Network
Recommendation: In the definition for Abandoned Communications Cable, after the words "and not identified for future use with a tag" add the words "or in a database."
Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.
Panel Meeting Action: Reject
Panel Statement: The AHJ is unlikely to have access to the database for every building under his/her jurisdiction. The majority of communications technicians (installation/repair) work at a multiplicity of locations. Database administrative responsibility is not identified in the proposal. Maintaining and referencing a database for every location is cumbersome, unwieldy, and impractical.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-103 Log #2680 NEC-P16 **Final Action: Reject**
(800.2. Abandoned Communications Cable)

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Recommendation: Revise 800.2 Abandoned Communications Cable to read:
Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag which is of a material impervious to the deleterious effects of temperature and dampness. The tag shall be resistant to the effects of gnawing by rodents. The tag shall contain the following information:
(1) Date tag was installed.
(2) Date of intended use of disconnected cable.
(3) Drawing or file number containing information relating to intended future use of disconnected cable.
The date of intended use of disconnected cable shall not exceed 90 days from date of disconnection.

Substantiation: Abandoned cables are a growing problem in the industry. These cables are left for others to deal with when present users discontinue their operation. Understanding this problem, the removal of abandoned cables, is required by Articles 640, 645, 725, 760, 770, 800, 820, and 830. 800.3(C) requires the removal of abandoned communications cables. Tagging of cables intended for future use without a method of ensuring the intention of future use invites tagging of cables to avoid the responsibility of their proper removal.
Panel Meeting Action: Reject
Panel Statement: While the submitter makes the point that the "tagging" requirements may be used to circumvent abandoned cable removal, the proposed additional requirements are impractical, burdensome, and preclude the pre-wiring of buildings. For example, buildings are often "pre-wired" for telecommunications. While the current tenant may not require all the communications pre-wiring, future tenants may have additional needs and require the additional wiring. Allowing only "90 days" is insufficient to support pre-wiring. A tag that is immune to temperature, dampness and rodents needs to be of special material and would likely require special means to mark the tag. Adding a file number implies the existence of a database. No suggestion is provided as to who is responsible for populating and maintaining the database.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-104 Log #3012 NEC-P16 **Final Action: Reject**
(800.2.Abandoned Communications Cable)

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
800.2 Definitions.
Abandoned Communications Cable. Installed communications cable that is not terminated at ~~both ends at a connector or other~~ equipment and not identified for future use with a tag.
Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:
640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.
725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.
The additional wording in this definition causes confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-1.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be accepted as submitted. The submitter substantiates that the definitions of abandoned cables in Articles 640, 645, 725, 760, 770, 800, 820, and 830 should be identical. This proposal deletes unnecessary language in the present definitions and provides consistent language throughout the above articles mentioned. The panel statement does not explain the reason for rejecting this proposal other than to see panel action on Proposal 16-1.

16-105 Log #2656 NEC-P16 **Final Action: Reject**
(800.2.Block)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Delete the following text:
~~**Block.** A square or portion of a city, town, or village enclosed by streets, including the alleys so enclosed but not any street.~~
Substantiation: This is a companion proposal to BICSI 800.47(B) and 800.90. If these proposals are accepted, this definition will no longer be needed because the concept of "block" will be removed.
Panel Meeting Action: Reject
Panel Statement: This is a companion proposal to 16-148, which was rejected.
See panel action on Proposal 16-148.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-106 Log #3173 NEC-P16 **Final Action: Accept**
(800.2.Communications Equipment)

Submitter: Ronald Marts, Telcordia Technologies / Rep. BellSouth,Cincinnati Bell, SBC, Ameritech, PacBell, Qwest, Southern New England Telephone
Recommendation: Relocate the definition of "Communications Equipment" from 800.2 to Article 100, Definitions.
Substantiation: The definition of "Communications Equipment" now resides in 800.2. The term "communications equipment" appears in Articles 90, 800 and 830. In order to comply with the requirements set forth in 2.2.2.1, the definition of "communications equipment" should be relocated to Article 100.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-107 Log #1868 NEC-P16 **Final Action: Accept**
(800.2.Communications Equipment)

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Relocate the definition of " **Communications Equipment** " from 800.2 to Article 100, Definitions.
Substantiation: The NEC Technical Correlating Committee (TCC) has assigned responsibility to the individual Code-making panels for Article 100 definitions under their purview. The definition of " **Communications Equipment** " now resides in 800.2. However, the term "communications equipment" appears in Articles 90, 800 and 830. The ***NEC Style Manual*** , section 2.2.2.1, states: "In general, Article 100 shall contain definitions of terms that appear in two or more other articles of the NEC". Thus, the definition of "communications equipment" rightfully belongs in Article 100.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-108 Log #47 NEC-P16 **Final Action: Accept in Principle**
(800.2. Communications Raceway (New))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
<u>**Communications Raceway.** A raceway designed for enclosing and routing listed communications wires and cables.</u>
<u>FPN: See Article 100 for a definition of raceway.</u>
Substantiation: Optical Fiber Raceway is defined in Article 770. Communications raceway should be defined too.
Panel Meeting Action: Accept in Principle
Add new definition to 800.2 as follows:
<u>Communications Raceway. A raceway for enclosing and routing communications wires and cables.</u>
<u>FPN: See Article 100 for a definition of raceway.</u>
Panel Statement: The panel added a new definition.
Removed "design", as specification does not belong in a definition.
Removed "listed", as specification does not belong in a definition per NEC Manual of Style.
The changes meet the submitter's intent.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:
HUGHES, R.: The Panel action should have been to "reject". The definition for "Optical Fibers Raceway" was created specifically to define Innerduct. Innerduct is used only for Optical Fibers and nothing else. The definition of "raceway" in Article 100 is adequate and there is no reason to create a specific definition "Communication Raceway".
JENSEN, R.: Propose to remove the FPN from the definition, thereby extending the committee action of "Accept in Principle".
CMP 16 accepted proposal 16-5 to harmonize 770.2, 800.2, 8202, and 830.2 by including a normative reference to "See Article 100". Adding a FPN to again "See Article 100" is redundant, especially since this FPN will be a few lines down from the identical wording in normative text. Additionally, the 2003 NEC Style Manual specifically states to avoid redundant use of references.
OHDE, H.: This definition would require that any raceway that is used for enclosing and routing communications wires and cables be listed to the requirements shown 800.182. This section states "Communications raceways shall be listed in accordance with 800.182(A) through 800.182(C)."There are metal raceways, for example, that are allowed to enclose communications cables but are not required to be listed plenum raceways or riser raceways. These listings are typically for nonmetallic raceways.
In addition, Section 90.1 (C) of the NEC states "T *his Code is not intended as a design specification or an instruction manual for the untrained persons* ." The addition of the FPN referencing Article 100 for the definition of raceway is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-109 Log #723 NEC-P16 **Final Action: Accept in Principle**
(800.2.Communications Raceway (New))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add a definition as follows:

Communications Raceway. A raceway designed for enclosing and routing listed communications cables.

Substantiation: This proposal is technical. (Task Group No.800-03)

Optical fiber raceway is defined in Article 770 and should also be defined here. It will add a definition parallel to that in Article 770.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-108.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

HUGHES, R.: The Panel action should have been to "reject". The definition for "Optical Fibers Raceway" was created specifically to define Innerduct. Innerduct is used only for Optical Fibers and nothing else. The definition of "raceway" in Article 100 is adequate and there is no reason to create a specific definition "Communication Raceway".

OHDE, H.: See my Explanation of Negative on Proposal 16-108.

16-110 Log #25 NEC-P16 **Final Action: Reject**
(800.2. Concealed Space)

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

Concealed Space. That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and in whose size might normally range from 44.45 mm (1 3/4 in.) stud spaces to 2.44 m (8 ft) interstitial truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting. [NFPA 96:3.3.42.1] 0

Substantiation: The term concealed space is used in 800.154(A). This definition is an extract from NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. It is the only definition of concealed space in the NFPA Glossary.

Panel Meeting Action: Reject

Panel Statement: The definition may involve combustible material in environmental air spaces and, therefore, may fall under the Standards Council Decision 05-24 (SC #05-7-4).

The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions since the submitter is trying to define the term "concealed spaces". We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-111 Log #48 NEC-P16 **Final Action: Accept in Principle**
(800.2. Exposed)

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

~~**Exposed.** A circuit that is in such a position that, in case of failure of supports and insulation, contact with another circuit may result.~~
~~FPN: See Article 100 for two other definitions of *Exposed* .~~

Exposed to Accidental Contact with Electric Light or Power Conductors. A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result.

Substantiation: This revision will make the definition of exposed consistent with Article 830 except that "Electrical Light or Power Conductors" has been changed to "Electric Light or Power Conductors" for editorial consistency with the usage in the Code.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-115.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-112 Log #65 NEC-P16 **Final Action: Accept in Principle**
(800.2. Exposed)

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

~~**Exposed.** A circuit that is in such a position that, in case of failure of supports and insulation, contact with another circuit may result.~~
~~FPN: See Article~~ 100 ~~for two other definitions of *Exposed* .~~

Exposed to Accidental Contact with Electrical Light or Power Conductors. A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result.

Substantiation: This revision will make the definition of exposed consistent with Article 830 except that "Electrical Light or Power Conductors" has been changed to "Electric Light or Power Conductors" for editorial consistency with the usage in the Code.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-115.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-113 Log #722 NEC-P16 **Final Action: Accept in Principle**
(800.2.Exposed)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Revise the definition of "Exposed" as follows:

" **Exposed (to Accidental Contact)** . A circuit in such a position that, in case of failure of supports ~~and~~ or insulation, contact with another circuit may result."

Substantiation: This proposal is a clarification. (Task Group No. 800-02)

It clarifies the term "Exposed" as used in Article 800 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. This is a companion proposal to 770.2, 820.2 and 830.2.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-115.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-114 Log #1866 NEC-P16 **Final Action: Accept in Principle**
(800.2.Exposed (to Accidental Contact))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: Revise the definition of "Exposed" as follows:

" **Exposed (to Accidental Contact)** . A circuit in such a position that, in case of failure of supports ~~and~~ or insulation, contact with another circuit may result."

Substantiation: The proposed revision clarifies the term "Exposed" as used in Article 800 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. This is a companion proposal to 770.2, 820.2 and 830.2.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-115.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-115 Log #1939 NEC-P16 **Final Action: Accept**
(800.2.Exposed (to Accidental Contact))

Submitter: Stanley D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise the definition of "Exposed" as follows:
"Exposed (to Accidental Contact). A circuit in such a position that, in case of failure of supports ~~and~~ or insulation, contact with another circuit may result."
FPN: See Article 100 for two other definitions of Exposed.
Substantiation: This proposal is a clarification. (Task Group No. 800-02A)
It clarifies the term "Exposed" as used in Article 800 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. This is a companion proposal to 770.2; 820.2; and 830.2 and provides consistency and correlation in the definition of "exposed" across 770; 800; 820 and 830.
This is one of a group of proposals prepared by the CMP 16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related articles such that similar requirements are stated the same way in each article;
3) make the articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-116 Log #49 NEC-P16 **Final Action: Accept in Principle**
(800.2. Point of Entrance)

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the proposal with respect to the Fine Print Notes. It is the intention of Fine Print Notes to provide explanatory information and they are not intended as a vehicle to provide unnecessary cross-references. This action will be considered by the panel as a public comment.
Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
Point of Entrance. Within a building, the point at which the wire or cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) grounded to an electrode in accordance with 800.100(B).
FPN: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).
FPN: See 344.2 for a definition of Rigid Metal Conduit (Type RMC).
Substantiation: The addition of a fine print notes pointing installers to the definitions of intermediate metal conduit and rigid metal conduit will help installers who are not Code experts. Use of the type designations will promote consistency throughout the code.
Panel Meeting Action: Accept in Principle
The Panel accepts the submitter's proposal with the following revisions:
Number the FPNs.
Panel Statement: Multiple FPNs are required to be numbered per the NEC Manual of Style.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states "T *his Code is not intended as a design specification or an instruction manual for the untrained persons* ." The addition of the two FPN's referencing the definitions of IMC raceway in 342.2 and RMC raceway in 344.4 is not needed nor warranted. In the submitter's substantiation he states this FPN's will help installers who are not Code experts. A trained installer will know the Code content and how the Code book is to be used.

16-117 Log #724 NEC-P16 **Final Action: Accept in Principle**
(800.2. Point of Entrance)

TCC Action: It was the action of the Technical Correlating Committee that the panel reconsider the proposal with respect to the Fine Print Notes. It is the intention of Fine Print Notes to provide explanatory information and they are not intended as a vehicle to provide unnecessary cross-references. This action will be considered by the panel as a public comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change the wording as shown:
Point of Entrance. The point within ~~Within~~ a building ~~, the point~~ at which the wire or cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode in accordance with 800.100(B) .
Substantiation: This proposal is editorial. (Task Group No. 800-04)
It will make the definition of "Point of Entrance" editorially consistent with the definitions in articles 820 and 830. A corollary proposal has been submitted for article 770.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Principle
Change 800.2 Point of Entrance to read as follows:
Point of Entrance. The point within ~~Within~~ a building ~~, the point~~ at which the wire or cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) ~~grounded~~ connected by a grounding conductor to an electrode in accordance with 800. 100(B) 800.100(B).
FPN No 1: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).
FPN No.2: See 344.4 for a definition of Rigid Metal Conduit (Type RMC).
Panel Statement: The text inserted by the panel, "connected by a grounding conductor, provides for editorial consistency across Articles 770, 800, 820 and 830. In the submitter's proposal the text "800.100(B)" was unnecessarily underlined; it is existing text. See panel action on Proposal 16-116.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: See my Explanation of Negative on Proposal 16-116.
Comment on Affirmative:
JENSEN, R.: The panel action regarding FPN No. 2 for Rigid Metal Conduit should refer to 344.2, not 344.4.

16-118 Log #3661 NEC-P16 **Final Action: Reject**
(800.2 Air Duct)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Delete the following text:
~~**800.2 Air Duct.** A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum.~~
Substantiation: The term "air duct" is not used in article 800 and should not be defined in the article, as per the manual of style of the National Electrical Code.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

We agree with deleting the term "air duct" as it was evidently an oversight that it was not removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 800. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

OHDE, H.: See my Explanation of Negative on Proposal 16-99.

16-119 Log #46 NEC-P16 **Final Action: Accept**
(800.2, FPN (New))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Add a fine print note to the definition of Abandoned Communications Cable

Abandoned Communications Cable. Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag.

FPN: See Article 100 for a definition of equipment.

Substantiation: The addition of a fine print note alerting installers that equipment is defined in Article 100 will help installers who are not Code experts.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

JENSEN, R.: Propose to "Reject".

CMP 16 accepted proposal 16-5 to harmonize 770.2, 800.2, 820.2, and 830-. by including a normative reference to "See Article 100". Adding a FPN to again "See Article 100" is redundant, especially since this FPN will be a few lines down from the identical wording in normative text. Additionally, the 2003 NEC Style Manual specifically states to avoid redundant use of references.

OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing Article 100 for the definition of equipment is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-120 Log #725 NEC-P16 **Final Action: Accept**
(800.3)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the following:

800.3 Other Articles.

Installations of communications circuits and equipment shall comply with 800.3(A) through 800.3(D).

Substantiation: This proposal is editorial. (Task Group No. 800-05)

Section 800.3 does not have a lead-in sentence as 770.3, 820.3 and 830.3 do. One is needed to make the text parallel.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-121 Log #727 NEC-P16 **Final Action: Accept**
(800.3(A) and (B))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting and that this Proposal be reconsidered and correlated with the action on Proposal 16-221.

The Technical Correlating Committee directs that the panel consider not only the division applications, but also the zone applications.

In addition, the Technical Correlating Committee understands that the word "and" in (A) of the Proposal was not "Accepted."

This action will be considered by the Panel as a Public Comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:

(B ~~A~~) Hybrid Power and Communications Cables. The provisions o f 780.6 shall apply for listed hybrid power and communications cables in closed-loop and programmed power distribution.

FPN: See 800.179 (~~J~~ I) for hybrid power and communications cable in other applications.

(A ~~B~~) Hazardous (Classified) Locations. Communications circuits and equipment installed in a location that is classified in accordance with ~~Article~~ 500 .5 and shall comply with the applicable requirements of Chapter 5.

Substantiation: This proposal is editorial. (Task Group No. 800-07)

It re-letters 800.3(A) and (B) so the hazardous locations requirements will be in the same place in the CMP-16 Articles. The definitions of hazardous locations are in 500.5. The reference in the FPN was changed due to renumbering when multipurpose cable was deleted.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

DORNA, G.: The panel should have accepted this proposal in part. The relettering of 800.179(J) to 800.179(I) was intended to correlate with the acceptance of Proposal 16-221. Proposal 16-221 was rejected.

KAHN, S.: This proposal should have been "accepted in part" as the renumbering of 800.179(J) to 800.179(I) was intended to correlate to Proposal 16-221 which was rejected.

16-122 Log #1016 NEC-P16 **Final Action: Accept in Principle**
(800.3(B))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "Article 500" to "500.5."
Substantiation: To conform to Style Manual requirements.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-121.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-123 Log #1383 NEC-P16 **Final Action: Reject**
(800.3(C))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete text concerning abandoned cables

800.3 Other Articles.

(A) Hybrid Power and Communications Cables. The provisions of 780.6 shall apply for listed hybrid power and communications cables in closed-loop and programmed power distribution.

FPN: See 800.179(J) for hybrid power and communications cable in other applications.

(B) Hazardous (Classified) Locations. Communications circuits and equipment installed in a location that is classified in accordance with Article 500 shall comply with the applicable requirements of Chapter 5.

(C) Spread of Fire or Products of Combustion. Section 300.21 shall apply. ~~The accessible portion of abandoned communications cables shall not be permitted to remain.~~

(D) Equipment in Other Space Used for Environmental Air. Section 300.22(C) shall apply.

Substantiation: The NEC is an installation standard, not a maintenance standard. Because of this, this rule should not be a part of the NEC. Furthermore, this provision does not accomplish its intent, as the code is not a retroactive document. To require abandoned cables to be removed is similar to requiring facilities to update their receptacles to the new GFCI provision every three years. With that said, the only time this rule applies is when an installer creates an abandoned cable. Also, this provision does not fall within the purpose of the NEC 90.1(A). The NEC is concerned with the hazards created from the use of electricity…this rule seems to imply that a cable with a voltage applied to it is safe, but a cable with no voltage applied to it is dangerous.

This proposal is also being made to 725.3(B), 760.3(A), 770.3(A), 820.3(A) and 830.3(A).
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-26.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-124 Log #1867 NEC-P16 **Final Action: Accept in Principle**
(800.3(C))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 800.3 (C) as follows:

(C) Spread of Fire or Products of Combustion. Section 300.21 shall apply. The accessible portion of abandoned communications cables shall ~~not be permitted to remain~~ be removed .

Substantiation: The proposed revision provides consistency with 640.3(A), 725.3(B), 760.3(A), 770.3(A), 820.3(A) and 830.3(A).
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-128.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-125 Log #2808 NEC-P16 **Final Action: Accept in Part**
(800.3(C))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-128. This action will be considered by the Panel as a Public Comment.
Submitter: Harold C. Ohde, IBEW #134
Recommendation: Revise text to read as follows:
800.3 Other Articles. No change.
(C) Spread of Fire or Products of Combustion. ~~Section~~ 300.21 shall apply . ~~The accessible portion of abandoned communications cables shall be removed.~~
Substantiation: The requirements for removal of abandoned communications cables would be better suited in appropriate code section within Article 800. I have submitted another proposal that would move the abandoned communications cables requirements to 800.24 - Mechanical Execution of Work. The abandoned communications cables requirements are out of place in 800.3 - Other Articles. The requirements are not part of another Article as they are part of Article 800 and are located within Article 800.
The deletion of the word “Section” is an editorial change to comply the National Electrical Code Style Manual.
Similar proposals have been submitted for 640.3, 725.3, 760.3, 770.3, 820.3, and 830.3 to revise these sections as well.
Panel Meeting Action: Accept in Part
The panel accepts the part that deletes the second sentence of 800.3(C) concerning abandoned cables. The panel rejects the proposed revisions to the first sentence.
Panel Statement: The panel agrees that the requirement to remove abandoned cable does not belong in 800.3 and should be relocated. A direct reference to 300.21 is inappropriate, as it applies to electrical installations and not communications installations. See panel action on Proposal 16-128 that relocates the requirement to remove abandoned cable to 800.25 (new) and restates the spread of fire requirements in communications terms in 800.26 (new).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should have been accepted as originally submitted. The panel statement seems to be in conflict as it states the provisions of 300.21 will work well in the new proposed section 800.26 but not in 800.3(C) where it has always been properly located. The panel accepted the same 300.21 requirements whose concern is the spread of fire and products of combustion in hollow spaces, vertical shafts and ventilation and air- handling ducts caused by electrical installations and located them in 800.26.

16-126 Log #3008 NEC-P16 **Final Action: Reject**
(800.3(C))

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
800.2 Definitions.
Abandoned Communications Cable. Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag.
800.3 Other Articles.
(C) Spread of Fire or Products of Combustion. Section 300.21 shall apply. ~~The accessible portion of abandoned~~ Abandoned optical fiber cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components.
Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in “inaccessible spaces”. This is not conducive to safe electrical practice; this the key change is the elimination of the words “the accessible portion of”.
If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.
Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.
For information, see the relevant definitions in the NEC.
Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.
Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.
Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.
Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.
Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-28.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We concur with submitter’s substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article.

16-127 Log #3104 NEC-P16 **Final Action: Reject**
(800.3(C))

Submitter: Donald Hall, Corning Cable Systems
Recommendation: Revise text to read as follows:
800.3 Other Articles.
(C) Spread of Fire or Products of Combustion. Section 300.21 shall apply. ~~The accessible portion of a~~ Abandoned communications cables shall be removed.
Also, add the following FPN to 800.3(C):
FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.
Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.
The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.
Panel Meeting Action: Reject
Panel Statement: The proposal would require all abandoned cable to be removed, irrespective of accessibility, presenting a compliance conundrum to installers. Without access, it is impossible to remove cables that are securely fastened without damaging the building or adjacent cables. The submitter’s substantiation states: “It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.” However, the panel previously imposed additional securing and supporting requirements by referencing 300.11 in 800.24. Gaining access may sometimes require disassembly of part of the building. This is not the intent of the panel. The current requirement to remove only the accessible portion is reasonable. The submitter further proposes to add an FPN following 800.3(C) that is already contained in 800.24.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We concur with submitter’s substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article. The FPN that the submitter submitted is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.

16-128 Log #728 NEC-P16 **Final Action: Accept in Principle**
(800.3(C), 800.25 (new) & 800.26 (new))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Delete 800.3(C) and replace with new 800.25 and 800.26 as follows:
~~**800.3(C) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned communications cables shall not be permitted to remain~~ .
800.25. Abandoned Cables. The accessible portion of abandoned communications cables shall be removed.
800.26 Spread of Fire or Products of Combustion. Installations of communications cables and communications raceways in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially

increased. Openings around penetrations of communications cables and communications raceways through fire-resistantÐrated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistanceÐrated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 800.26 can be found in building codes, fire resistance directories, and product listings.

Substantiation: This proposal is editorial and technical. (Task Group No. 800-08)

The title of Section 800.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 800. It is out of place in section 800.3. This proposal will move it to a new section of Article 800 and make it editorially consistent with Articles 770 and 820 by substituting "shall be removed" for "shall not be permitted to remain". Rather than refer section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 800 which should be familiar to communications installers. The text of proposed section 800.26 is based on section 300.21 but modified to apply to communications cables and raceways.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

D elete 800.3(C).

Reorder subsections.

Add new 800.25 and 800.26 as submitted.

Panel Statement: The panel accepts the deletion of 800.3(C) and the addition of new 800.25 and 800.26.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 800.3(C) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.

The substantiation provided to delete 800.3(C) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 800.26 is based on the requirements of 300.21. There was no substantiation submitted for this change. In addition there is no need for the FPN to be mentioned as the language in 800.3(C) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.

16-129 Log #2775 NEC-P16 **Final Action: Accept in Principle in Part (800.3(C), 800.25 (new) & 800.26 (new))**

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Delete 800.3(C) and replace with new 800.25 and 800.26 as follows:

~~**800.3(C) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned communications cables shall not be permitted to remain~~ .

800.25. Abandoned Cables. The accessible portion of abandoned communications cables shall be removed.

800.26 Spread of Fire or Products of Combustion. Installations of communications cables and communications raceways in hollow spaces, concealed spaces, vertical shafts and air ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of communications cables and communications raceways through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 800.26 can be found in building codes, fire resistance directories, and product listings.

FPN No. 2: FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The title of Section 800.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 800. It is out of place in section 800.3. This proposal will move it to a new section of Article 800 and make it editorially consistent with Articles 770 and 820 by substituting "shall be removed" for "shall not be permitted to remain". Rather than refer to section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 800 which should be familiar to communications installers. The text of proposed section 800.26 is based on section 300.21 but modified to apply to communications cables and raceways. For clarity, "ventilation or air-handling ducts" has been simplified by replacing it with "air ducts". Also, "concealed spaces" have been added to the list of areas requiring fire protection vigilance (hollow spaces, vertical shafts, and air ducts) to correlate with NFPA 13, *Installation of Sprinkler Systems*, which has requirements for protecting concealed spaces. A FPN is included to refer users to the NFPA 13 requirements.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: The panel accepts the submitter's deletion of 800.3(C), the addition of 800.25 (new) and the addition of 800.26 (new), but revises "air ducts" to "ventilation or air handling duct" in keeping with the existing NEC text. The panel accepts FPN No. 1.

See panel Action on Proposal 16-128.

The Panel rejects the addition of FPN No. 2 because it introduces undefined terminology. "Concealed spaces" should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 800.3(C) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.

The substantiation provided to delete 800.3(C) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 800.26 is based on the requirements of 300.21 but modified to apply to communications cables and raceways. There was no substantiation submitted for this change. In addition there is no need for the FPN No.1 to be mentioned as the language in 800.3(C) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.

We believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-130 Log #3313 NEC-P16 **Final Action: Accept in Principle in Part (800.3(C), 800.25 (new) & 800.26 (new))**

Submitter: William E. Koffel, Koffel Assoc., Inc. / Rep. Society of the Plastics Industry

Recommendation: Delete 800.3(C) and replace with new 800.25 and 800.26 as follows:

~~**800.3(C) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned communications cables shall not be permitted to remain~~ .

800.25 Abandoned Cables. The accessible portion of abandoned communications cables shall be removed.

800.26 Spread of Fire or Products of Combustion. Installations of communications cables and communications raceways in hollow spaces, concealed spaces, vertical shafts and air ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of communications cables and communications raceways through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 800.26 can be found in building codes, fire resistance directories, and product listings.

FPN No. 2: FPN: See 8.14.1 of NFPA 13, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The title of Section 800.3 is “Other Articles”. The requirement for the removal of abandoned cables is not in another article; it is in Article 800. It is out of place in Section 800.3. This proposal will move it to a new section of Article 800 and make it editorially consistent with Articles 770 and 820 by substituting “shall be removed” for “shall not be permitted to remain”. Rather than refer to Section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 800 which should be familiar to communications installers. The text of proposed Section 800.26 is based on Section 300.21 but modified to apply to communications cables and raceways. For clarity, “ventilation or air-handling ducts” has been simplified by replacing it with “air ducts”. Also, “concealed spaces” have been added to the list of areas requiring fire protection vigilance (hollow spaces, vertical shafts, and air ducts) to correlate with NFPA 13, *Installation of Sprinkler Systems*, which has requirements for protecting concealed spaces. A FPN is included to refer users to the NFPA 13 requirements. It should be noted that the section number may need to be revised once the 2006 Edition of NFPA 13 is published.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the submitter’s deletion of 800.3(C), the addition of 800.25 (new), and the addition of 800.26 (new), but revises “air ducts” to “ventilation or air handling duct” in keeping with the existing NEC text. The panel accepts FPN No. 1, but rejects the addition of FPN No. 2.

Panel Statement: See panel action on Proposal 16-128.

The panel rejects the addition of FPN No. 2 because it introduces undefined terminology. “Concealed spaces” should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: See my Explanation of Negative on Proposal 16-129.

16-131 Log #729 NEC-P16 **Final Action: Accept**

(800.3(D))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the change as shown:

(C ~~D~~) Equipment in Other Space Used for Environmental Air. Section 300.22(C) s hall apply.

Substantiation: This proposal is editorial. (Task Group No. 800-09)

It re-letters 800.3(D) to (C) so the “Equipment in Other Space Used for Environmental Air” requirements will be in the same place in panel sixteenÕs articles.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-132 Log #730 NEC-P16 **Final Action: Accept**

(800.21)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the changes as shown:

800.21 Access to Electrical Equipment Behind Panels Designed to Allow Access.

Access to electrical equipment shall not be denied by an accumulation of communications wires and cables that prevents removal of panels, including suspended ceiling panels.

Substantiation: This is an editorial proposal. (Task Group No. 800-10)

It creates consistency among parallel articles and references the specific medium used in this article.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-133 Log #1384 NEC-P16 **Final Action: Reject**

(800.24)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete requirement to comply with 300.4(D)

800.24 Mechanical Execution of Work.

Communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with ~~300.4(D) and~~ 300.11.

Substantiation: There is no reason to protect limited energy circuits from accidental contact with nails or screws. Limited energy circuits are considered to be inherently safe from a fire and electric shock perspective, hence the allowances of lesser wiring methods and allowances for open splicing with out boxes. The protection of these circuits is a design and/or performance issue, not a safety issue. The requirement found in the existing *Code* text does not fit into the purpose of the NEC, as addressed in 90.1(A).

Panel Meeting Action: Reject

Panel Statement: Compliance with 300.4(D) has been a Code requirement for many years, resulting in an exemplary safety record. While the submitter points out that communications circuits are energy-limited circuits and “…considered, to be inherently safe from a fire and electric shock perspective”, it is inappropriate and poor workmanship to permit the potential energization of nails, screws, or other construction/decorative attachment devices at any level.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-134 Log #1385 NEC-P16 **Final Action: Accept in Principle**

(800.24)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Add “Cable Ties” to the list of supporting methods

800.24 Mechanical Execution of Work.

Communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, cable ties, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.

Substantiation: This is being proposed in an effort to create uniform language with the chapter three cable wiring method support sections, specifically, 230.30(A), 330.30(A) and 334.30. Similar proposals are also being made to 725.8, 640.6, 760.8, 770.24, 820.24 and 830.24

Panel Meeting Action: Accept in Principle

Change 800.24 to read as follows:

800.24 Mechanical Execution of Work. Communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by listed hardware including straps, staples, cable ties , hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.

Panel Statement: The panel accepted the requirement for listing in accordance with Proposal 16-137 and includes a clear requirement for listed hardware.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 11 Negative: 3 Abstain: 1

Explanation of Negative:

BOYER, J.: NEMA does not believe that all such product used for the securement of communications circuits need be listed. Code Panel 8 has steadily rejected similar proposals relating to the support of conduit and cables. UL 1565 provides requirements for listed cable ties intended for primary support of flexible conduits and cables in accordance with the NEC. Such cable ties must have a minimum loop tensile strength rating of 23 kg (50 lbs) or greater. NEMA proposes that the panel reconsider its action and ACCEPT the proposal in principle and in part with the following action. Accept the proposed addition of "cable ties" in the third sentence, reject the requirement that all such hardware be "listed", and add the following new fourth sentence. " Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.)"

BRUNSSEN, J.: See my explanation of negative vote on Proposal 16-43.

DORNA, G.: See my explanation of negative vote on Proposal 16-45.

Explanation of Abstention:

KAHN, S.: Though I agree with the proposal and the submitter's intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

16-135 Log #1869 NEC-P16 **Final Action: Reject**
(800.24)

TCC Action: The Technical Correlating Committee notes that neither the panel statement nor the revised statement shown in the affirmative vote are responsive to the submitter's substantiation for the recommendation. The Technical Correlating Committee directs the panel to act on the merits of the recommendation. This action will be considered by the Panel as a Public Comment.

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: In the final sentence, delete the reference to 300.11 as follows:

"The installation shall also conform with 300.4(D) ~~and 300.11~~ ."

Substantiation: The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for communications conductors. The Fine Print Note associated with 800.24 presently directs the reader to the appropriate installation practices for communications wiring and cabling. Section 300.11 is directed toward power cable assemblies that are heavier, larger and operate at greater voltage and current levels than communications cables. A communications cable used for premises wiring is typically less than one-quarter inch in diameter, contains four separately insulated 26 AWG conductors, and operates at 48 volts DC with available power of less than 100 volt-amperes. Deletion of the reference to 300.11 will yield consistency throughout the NEC as Panel 3 did not see fit to adopt this reference in Articles 760 and 725.

Panel Meeting Action: Reject

Panel Statement: The requirements of 300.11 are applicable to optical fiber cables.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for communications cables. The Fine Print Note associated with 800.24 directs the reader to the appropriate installation standards. The Panel has enhanced the Fine Print Note during this cycle by the addition of three new references covering the installation of communications cables (see Proposal 16-139). These references are all that is necessary and sufficient for such cables without imposing the burdensome requirements of 300.11. Section 300.11 is directed toward power cable assemblies that are heavier and larger than communications cables, operate at much greater power levels, and present a greater risk of injury if not properly installed.

JOHNSON, S.: I agree with the submitter's points in his proposal. 300.11 deals with cables that are larger and heavier than communications cables. Referencing 300.11 also creates an inconsistency with Sections 760 and 725, which deal with similar sized cables and do not make this reference. I vote against the Panel's action to reject.

Comment on Affirmative:

JENSEN, R.: The panel statement should read:

The requirements of 300.11 are applicable to communications cables.

This appears as though it was copied from another panel statement regarding optical fiber.

STENE, S.: The panel statement should be revised to state "The requirements of 300.11 are applicable to ~~optical fiber cables~~ communication cables. "

16-136 Log #2658 NEC-P16 **Final Action: Accept in Principle**
(800.24)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Add:

FPN: One way to determine accepted industry practice is to refer to nationally recognized standards such as ANSI/TIA—570—B—2004, Residential Telecommunications Infrastructure Standard, or other ANSI-approved installation standards.

Substantiation: Currently there is no guidance for installations in residences.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-139.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BOYER, J.: This proposal would provide a Fine Print Note referencing the reader to ANSI (and other unspecified) standards. NEMA considers that this material would be more appropriate in an NEC handbook (if at all) and is unnecessary in the Code. For consistency with other similar panels actions, this proposal must also be rejected.

PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

16-137 Log #3053 NEC-P16 **Final Action: Accept in Principle in Part**
(800.24)

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Revise 800.24 as follows:

800.24 Mechanical Execution of Work

(A) Neat and Workmanlike Manner. Communications equipment, cables, and circuits shall be installed in a neat and workmanlike manner.

(B) Installation of Communications Cables. Communications cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the communications cables will not be damaged by normal building use. Such cables shall be secured by listed straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D) and 300.11.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling,* and other ANSI- approved installation standards.

(C) Abandoned Communications Cables. Abandoned communications cables shall be removed.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI- approved standards which provide cable installation that facilitates the removal of abandoned cables.

Substantiation: This proposal revises this section into a practical working tool which will assist in making 800.24 a clear, usable and enforceable code. Each first level subdivision contains a code rule that requires action and the required action has been presented in clear, usable and enforceable manner.

In the electrical industry, the electrician, contractor and AHJ have been taught the importance and significance of the concept of mechanical execution of work. I am an electrical instructor who teaches this important concept to the people involved. This is one of the basis for 90.1(A) which serves as the purpose of this Code. The Code's purpose is to provide a safe installation from hazards arising from the use of electricity.

The revised text in 800.24(A) will require all communications equipment, cables and circuits to be installed in a neat and workmanlike manner.

800.24(B) is an editorial change with additional language to require the means of securing and supporting to be listed for the purpose.

The addition of 820.24(C) would replace the requirements that were located in 800.3(C), 800.154(A), and 800.154(B). It makes sense to have the requirements of both the installation of cable and the removal of cable in the same Code section. This would provide the proper guidance to everyone involved. The installer, contractor and the AHJ would gain from this revised section as the rules are centrally located in one Code section. If communications cables are installed properly then the removal of communications cables should be no problem if it is not needed anymore or abandoned. The proposed FPN will provide useful guidance and information to everyone involved regarding correct installation practices which would facilitate the removal of the cable as well

Similar proposals have been submitted for 640.6, 725.8, 760.8, 770.24, 820.24, and 830.24.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the incorporation of the term "listed".

See panel action on Proposal 16-134.

The panel accepts in principle the part of the proposal that recommends relocating requirements for abandoned cable. See panel action on Proposal 16-128 for the correct text.

The panel does not accept the breaking up of 800.24 and the changes to the FPN.

Panel Statement: See panel action on Proposals 16-134 and 16-128.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 10 Negative: 4 Abstain: 1

Explanation of Negative:

BRUNSSEN, J.: See my explanation of negative vote on Proposal 16-43.

DORNA, G.: See my explanation of negative vote on Proposal 16-45.

OHDE, H.: This proposal should have been accepted in part. The FPN located after 800.24 (C) is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.

PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

Explanation of Abstention:

KAHN, S.: Though I agree with the proposal and the submitter's intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

16-138 Log #2275 NEC-P16 **Final Action: Reject**
(800.24, FPN)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Update the publication date of the referenced standard as follows:

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved installation standards.

Substantiation: ANSI/NECA/BISCI 568-2001 is currently being revised, and the 2008 NEC should reference the latest edition.

ANSI/NECA/BICSI 568-2006 will be completed prior to the Public Comment deadline.

Panel Meeting Action: Reject
Panel Statement: The panel cannot act on ANSI/NECA/BICSI 568-2006, as it has not yet been issued.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-139 Log #2336 NEC-P16 **Final Action: Accept in Principle**
(800.24, FPN)

Submitter: James W. Romlein, MV Labs LLC / Rep. TIA
Recommendation: Add an FPN to read:

FPN: Accepted industry practices are described in:

ANSI/TIA/EIA-568-B.1 2004 - Part 1 General Requirements Commercial Building Telecommunications Cabling Standard, ANSI/TIA-569-B 2004 - Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA-570-B - Residential Telecommunications Infrastructure.

(List Other Documents Here) and other ANSI-approved installation standards.

Substantiation: TIA standards contain the source specifications that drive the performance-related industry practices. These TIA documents have a long history of demonstrated successful guidance to the installation, inspection, and network ownership communities. TIA wiring standards have been recognized by the Federal Communications Commission since before 2000 as the appropriate industry standards to be used for new and revised wiring, and are encouraged to be called out in building codes. (See, "Third Report and Order" in CC Docket No. 88-57 (FCC 99-405) (2000), released January 10, 2000, and 47 CFR section 68.213(c) of the FCC Rules.)

Panel Meeting Action: Accept in Principle

Change FPN to read as follows:

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568–2001, Standard for Installing Commercial Building Telecommunications Cabling; ANSI/TIA/EIA-568-B.1 2004 - Part 1, General Requirements Commercial Building Telecommunications Cabling Standard; ANSI/TIA-569-B--2004, Commercial Building Standard for Telecommunications Pathways and Spaces; ANSI/TIA-570-B, Residential Telecommunications Infrastructure, and other ANSI-approved installation standards.

Panel Statement: The panel combined the submitter's FPN with the existing text.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

BOYER, J.: See NEMA's negative comment on Proposal 16-136.

PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

16-140 Log #2889 NEC-P16 **Final Action: Reject**
(800.24, FPN)

Submitter: Ron Alley, ELECTRICO
Recommendation: Delete the following FPN:

~~FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI approved installation standards.~~

Substantiation: Numerous consensus standards from organizations such as Electronics Industry Association (EIA), Telecommunication Industry Association (TIA), Underwriters Laboratories Inc. (UL), NEMA, IEEE, and IEC/ISO could be added as a Fine Print Note throughout the Code to assist the reader of the NEC as the existing FPN notes do. There are just as many publications such as Telecommunications Cabling Installation, Network Cabling, Telecommunications Cable Splicing, Communications Cabling, Telecommunications Internetworking and too many others to mention, that could be listed in a FPN that would benefit the reader. Also, there are safety regulations, pertaining to telecommunication systems such as OSHA 1910 and OSHA 1926 that could be added as a Fine Print Note to assist readers to make their companies and workers safer. Adding a Fine Print Note for the purpose of informing the reader of all related standard and publications would be cumbersome. The FPN should be deleted unless it lists all pertinent standards and publications.

The particular standard mentioned in the FPN, (ANSI/NECA/BICSI 568-2001 (Installing Commercial Building Telecommunications Cabling) contains only 46 pages. The Standard mentioned in the FPN is very basic. It lists only a small percentage of the terminations used in the industry. Also, only a limited number of communications cables are shown and their limitations are not discussed. The standard does not contain enough information to be used as a stand alone document without the use of other standards and text books that are not mentioned in the FPN. In my opinion the ANSI standard listed in the FPN should never be used instead of manufacturer's instructions.

Manufacturer's instructions are sometimes required to be included as a condition of listing or labeling of telecommunications equipment and are sent wit the listed or labeled products or can be requested from the manufacturer prior to installation. The FPN in the 2005 Code most likely will not be as up to date as the manufacturer's instructions.

If the committee decides to keep the FPN, please consider modifying the FPN as follows:

ANSI/NECA/BICSI 568-2001 Standard for Installing Commercial Building Telecommunications Cabling is one source of many that can be used along with manufacturer's instructions.

Panel Meeting Action: Reject
Panel Statement: The references provided in the FPN provide guidance for installation in a neat and workmanship like manner.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

OHDE, H.: This proposal should have been accepted. The submitter substantiates that there are numerous consensus standards from reputable organization that also could be added to assist the reader of the NEC as existing FPN do. The ANSI/NECA/BICSI 568-2001 Standard is also a very basic and non-informative document that does not provide much guidance to the installer.

PREZIOSO, L.: The proposal removes a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly the proposal should be accepted and the FPN should be removed.

16-141 Log #1762 NEC-P16 **Final Action: Reject**
(800.24 Exception)

TCC Action: The Technical Correlating Committee notes that neither the panel statement nor the revised statement shown in the affirmative vote are responsive to the submitter's substantiation for the recommendation. The Technical Correlating Committee directs the panel to act on the merits of the recommendation. This action will be considered by the Panel as a Public Comment.
Submitter: Percy E. Pool, Verizon NS
Recommendation: Add the following exception to 800.24:
"Exception: 300.11(C) shall not apply."
Substantiation: 300.11(C) is clearly not applicable to communications cabling. communications cables are typically lashed together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. Communications cables are physically smaller, lighter and carry less voltage and current than power cables. It is overly restrictive to prohibit lashing of communications cables together to form a cable assembly. Communications cables secured in this manner have adequate support (see 300.11(A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.
Panel Meeting Action: Reject
Panel Statement: The requirements of 300.11(C) are applicable to optical fiber cables.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
BRUNSSEN, J.: This proposal should be accepted. If the Panel continues to support the addition of the requirements of 300.11 to 800.24, then at the very least, the requirements of 300.11(C) should be waived. Section 300.11(C) is clearly not applicable to communications cables. Installation practice is to lash communications cables together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. Communications cables are physically smaller and lighter than power cables, operate at much lower voltages and are power-limited. Application of 300.11(C) is overly restrictive and will preclude lashing of communications cables together to form a cable assembly. Communications cables secured in this manner have adequate support (see 300.11 (A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.
JOHNSON, S.: I agree with the submitter's points in his proposal. There is no safety issue that should preclude the long-standing practice of lashing an additional communication drop cable to an existing bundle that is already installed and supported properly where it is owned by the same entity. These cables are lightweight, and carry much less voltage and current than power cables. No evidence has been shown that this practice has not been used safely and successfully in the past and should not continue to be allowed. I vote against the Panel's action to reject.
Comment on Affirmative:
JENSEN, R.: The panel statement should read:
The requirements of 300.11 are applicable to communications cables.
This appears as though it was copied from another panel statement regarding optical fiber.
STENE, S.: The panel statement should be revised to state "The requirements of 300.11 are applicable to ~~optical fiber cables~~ communication cables."

16-142 Log #55 NEC-P16 **Final Action: Accept in Principle**
(800.25 (New), 800.26 (New), & 800.3(C))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
800.25. Abandoned Cables. The accessible portion of abandoned communications cables shall be removed.
FPN: See Article 100 for a definition of "accessible"
800.26 Spread of Fire or Products of Combustion. Installations of communications cables and communications raceways in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of communications cables and communications raceways through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
FPN: See Article 100 for the definition of "approved".
~~**800.3(C) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned communications cables shall not be permitted to remain.~~
Substantiation: The title of Section 800.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 800. It is out of place in section 800.3. This proposal will move it to a new section of Article 800 and make it editorially consistent with Articles 770 and 820 by substituting "shall be removed" for "shall not be permitted to remain". Rather than refer section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 800 which should be familiar to communications installers. The text of proposed section 800.26 is based on section 300.21 but modified to apply to communications cables and communications raceways. The fine print notes pointing to definitions are intended to assist installers who are not code experts and may not be aware of Article 100. The fine print note in 300.21 was not copied because does not provide sufficient guidance for a communications cable installer.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-128.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 800.3(C) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.
The substantiation provided to delete 800.3(C) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 800.26 is based on the requirements of 300.21 but modified to apply to communications cables and raceways. There was no substantiation submitted for this change.
In addition, Section 90.1(C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states these FPN's will help installers who are not Code experts. The addition of the FPN following 800.25 referencing Article 100 for the definition of accessible the FPN following 800.26 referencing Article 100 for the definition of approved is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-143 Log #2659 NEC-P16 **Final Action: Accept in Principle in Part**
(800.30)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Consolidated from various areas to a new section:
800.30 Abandoned Cables. The accessible portion of abandoned communications cables shall be removed.
Remove wording in 800.3(C) "The accessible portion of abandoned communications cables shall not be permitted to remain."
Remove wording in 800.154(A), "Abandoned cables shall not be permitted to remain."
Remove wording in 800.154(B)(1), "Abandoned cables shall not be permitted to remain."
Substantiation: The title of Section 800.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 800. It is out of place in section 800.3. This proposal will move it to a new section of Article 800. The deletion of the requirements to remove abandoned cable in 800.154(A) and (B) corrects an error.
Panel Meeting Action: Accept in Principle in Part
See panel actions on Proposals 16-128 and 16-201.
Panel Statement: The panel accepts the change pertaining to 800.3(C).
The panel accepts in principle the recommendation to move the abandoned cable requirements. See panel action on Proposal 16-128.
The panel rejects the submitter's action on 800.154(A) and accepts the change to 800.154(B)(1). See panel action on Proposal 16-201.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: We agree with the submitter's intent to locate all abandoned cable requirements to a new section in Part 1- General within the Article. Part 1- General applies to the entire article and therefore would reduce the confusion. We believe that not just the accessible portion of abandoned cables but all abandoned cables be removed to reduce the fuel load.

16-144 Log #2660 NEC-P16 **Final Action: Reject**
(800.47(B))

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Revise text to read:
800.47 Underground Circuits Entering Buildings.
~~(B) Underground Block Distribution. Where the entire street circuit is run underground and the circuit within the block is placed so as to be free from the likelihood of accidental contact with electric light or power circuits of over 300 volts to ground, the insulation requirements of 800.50(A) and 800.50(C) shall not apply, insulating supports shall not be required for the conductors, and bushings shall not be required where the conductors enter the building.~~

Substantiation: Section 800.47(B) is not in keeping with workmanlike manner as defined in section 800-24. There should never be an exception to 800.50(A) which requires listed drop wire. This section is an outdated exception to good practice in 800.50.
Panel Meeting Action: Reject
Panel Statement: There continues to exist today many urban communities and neighborhoods where dwellings are served from an underground communications plant that is contained within a block, circuits are unexposed to possible contact with power, and lightning exposure is minimal. No increase in safety is achieved by requiring such communications circuits to meet the insulation requirements of 800.50(A) and (C).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-145 Log #29 NEC-P16 **Final Action: Accept in Principle**
(800.48 (New) & 800.113, Exception No. 2)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
800.48. Unlisted Cables Entering Buildings. Unlisted outside plant communications cables shall be permitted in building spaces other than risers, air ducts, concealed spaces, plenums and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure or on a listed primary protector.
FPN No. 1: Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.
FPN No. 2: This section limits the length of unlisted outside plant cable to 15 m (50 ft), while 800.90(B) requires that the primary protector be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.
FPN No, 3: See 800.2 for the definition of point of entrance.
FPN No. 4: See 800.2 for the definition of air duct.
FPN No. 5: See Article 100 for the definition of plenum.
FPN No. 6: See 300.22(C) for information on other space used for environmental air.
800.113 Exception No. 2: *As permitted in 800.48.* L ~~*isting and marking shall not be required where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure or on a listed primary protector.*~~
~~FPN No. 1 to Exception No. 2:~~
~~Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.~~
~~FPN No. 2 to Exception No. 2:~~
~~This exception limits the length of unlisted outside plant cable to 15 m (50 ft), while 800.90(B) requires that the primary protector be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.~~
Substantiation: Part II of Article 800 covers “Wires and Cables Outside and Entering Buildings”. Part VI covers “Communications Wires and Cables Within Buildings”. Exception No. 2 to 800.113 deals with cables entering buildings and logically belongs in Part II.
In addition to editorially changing the exception to positive language and moving it to Part II, this proposal deals with the issue of the fire hazard of unlisted outside plant cables in buildings. Unlisted outside plant entrance cables are sometimes run in risers, air ducts, concealed spaces and plenums. When the 50-foot exemption for outside plant cable was adopted, it was assumed that the entrance cable would go into an equipment room. It was not envisioned that the unlisted cable, which is not fire resistant, would run up a riser, in an air duct, in concealed spaces or a plenum. The proposed new fine print notes (3, 4, 5 & 6) are provided to help the reader by pointing to the definitions of “point of entrance”, “air duct” and “plenum” and a description of “other space used for environmental air”.
Panel Meeting Action: Accept in Principle
The panel accepts the submitter’s proposal with the following revisions:
800.48 to read as follows:
800.48. Unlisted Cables Entering Buildings. Unlisted outside plant communications cables shall be permitted to be installed in locations as described in 800.154(E) where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure or on a listed primary protector.
Delete FPNs 4, 5, and 6.
Change 800.113 Exception No. 2: to be Exception.
Panel Statement: The panel made changes to the submitter’s text to correlate with the language in the remainder of the article.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-146 Log #731 NEC-P16 **Final Action: Accept in Principle**
(800.48, (New) & 800.113, Exception No.2)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:
800.48. Unlisted Cables Entering Buildings. Unlisted outside plant communications cables shall be permitted in building spaces other than risers, air ducts, plenums and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure or on a listed primary protector.
FPN No. 1: Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.
FPN No. 2: This section limits the length of unlisted outside plant cable to 15 m (50 ft), while 800.90(B) requires that the primary protector be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.
FPN No, 3: See 800.2 for the definition of point of entrance.
FPN No. 4: See 800.2 for the definition of air duct.
FPN No. 5: See Article 100 for the definition of plenum.
FPN No. 6: See 300.22(C) for information on other space used for environmental air.
800.113 Exception No. 2: *As permitted in 800.48.* ~~*Listing and marking shall not be required where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure or on a listed primary protector.*~~
~~FPN No. 1 to Exception No. 2:~~
~~Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.~~
~~FPN No. 2 to Exception No. 2:~~
~~This exception limits the length of unlisted outside plant cable to 15 m (50 ft), while 800.90(B) requires that the primary protector be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.~~
Substantiation: This is an editorial and technical proposal. (Task Group No. 800-11)
It is a companion proposal to similar ones made for articles 770 and 820. Part II of Article 800 covers “Wires and Cables Outside and Entering Buildings”. Part VI covers “Communications Wires and Cables Within Buildings”. Exception No. 2 to 800.113 deals with cables entering buildings and logically belongs in Part II.
The proposed new fine print notes (3, 4, 5 & 6) are provided to help the reader by pointing to the definitions of “point of entrance”, “air duct” and “plenum” and a description of “other space used for environmental air”.
The technical portion is a requirement prohibiting outside plant cables from running in risers or in the air distribution system; thereby correcting an omission in the current code.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 145.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-147 Log #732 NEC-P16 **Final Action: Accept**
(800.50(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the underlined:
(A) Insulation, Wires, and Cables. Communications wires and cables without a metallic shield, running from the last outdoor support to the primary protector, shall be listed in accordance with 800.173 .
Substantiation: This proposal is an editorial clarification. (Task Group No.800-12)
The listing requirements are in 800.173.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-148 Log #2661 NEC-P16 **Final Action: Reject**
(800.90)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Revise text as follows:
800.90 Protective Devices.
(A) Application. A listed primary protector shall be provided on each circuit entering a building. Installation of primary protectors shall also comply with 110.3(B).
Remove FPN #1 and 2.
Substantiation: Utility companies are providing protection on entrance cables to buildings whereas unregulated and private companies use this as an escape from providing protection where it is needed.
All circuits have the potential to be exposed to one or more of the following: 1) accidental contact with power conductors, 2) lightning, and; 3) above-normal voltages induced by fault currents on power circuits in proximity to the communications circuit.
Induction typically involves power conductors that are run parallel to communications cabling. Power cables typically are routed in the same path as communications cables even after communications cables are installed, causing induction issues.
Even if there is no direct lightning exposure, induction is enough of an issue to require protection.
The current provisions of 800.90A are too complex for many of the nontelco personnel. Even though the telephone companies routinely install primary protection on all their circuits, many nontelco personnel do not, even though they should be. Consequently, the requirement for primary protection needs to be greatly simplified by requiring it on all circuits. This problem is recognized by BICSI, which represents 20,000 designers, installers and manufacturers.
Panel Meeting Action: Reject
Panel Statement: Communications utilities install primary protection based upon the exposure of communications utility plant serving the customer and exposure of the customer's premises (e.g., campus wiring). Where exposure to contact with power conductors operating at over 300 volts to ground (and/or lightning – note that the NEC only incidentally covers lightning protection) is possible, electrical protection is provided. In many urban areas communications plants or customers are not exposed to power contact (e.g., are contained within a block) and primary protection is unnecessary and is not provided. This practice, in effect for many years, has produced an exemplary safety record. In urban areas, power induction is not an issue, as "parallel" runs of power and communications distribution cables are short. Further, all equipment that is connected to a telecom network is required to be listed (see 800.170). Listing standards ensure that telecom ports of such equipment demonstrate a significant level of power contact/induction and lightning immunity. It is unconscionable to penalize communications utilities that faithfully observe the NEC requirements in order to police unscrupulous individuals/companies that pursue shortcuts at the expense of safety. This is not a technical issue, but an enforcement issue that must be pursued from an inspection/enforcement perspective.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-149 Log #2829 NEC-P16 **Final Action: Reject**
(800.90(A))

Submitter: John Kacpenski, Western Telecommunications Consutling (WTC)
Recommendation: Revise text to read as follows:
800.90 Protective Devices.
FPN No. 1: ~~On a circuit not exposed to accidental contact with power conductors, providing a listed primary protector in accordance with this article helps protect against other hazards, such as lightning and above normal voltages induced by fault currents on power circuits in proximity to the communications circuit.~~
~~FPN No. 2:~~ Interbuilding circuits are considered to have a lightning exposure unless one or more of the following conditions exist:
(1) Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.
(2) ~~Interbuilding cable runs of 42 m (140 ft) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is bonded to each building grounding electrode system.~~
~~(3) Areas having an average of five or fewer thunderstorm days per year and earth resistively of less than 100 ohm meters. Such areas are found along the Pacific coast.~~
NFPA 780 (Standard for the Installation of Lighting Protection Systems - 2004 Edition) is to be referenced for lightning risk assessment.
Substantiation: The information in what was FPN No. 1 needs to be removed. All circuits have the potential to be exposed to utility service power from induction. Even if utility service power is not present at the time of communications-cable installation, the communications cables need to be protected because experience teaches that there is a high probability that power service in the immediate proximity of the communications cables at a later date.
Sneak current and indirect lighting strikes are also potential exposure issues.
The NFPA 780 Working Group members are the subject matter experts in this area; we need to pull from their many years of research and investigation in this area of electric hazard.
Panel Meeting Action: Reject
Panel Statement: FPN No. 1 is informative and alerts the reader that application of a primary protector may protect against overvoltages resulting from lightning and power fault induction. It should not be removed. It is not universally true that all circuits are exposed to power fault induction. There are instances where it is unlikely that power will be overbuilt, such as a campus environment.
FPN No. 2, item (2) is an important electrical protection consideration. Extensive computer modeling at Bell Telephone Laboratories, Inc. in the mid '80s established that underground or direct buried inter-building shielded cable runs of 42 ft or less in length are not exposed to lightning. The results of this modeling have been employed extensively by telecom companies for many years with exemplary results. FPN No. 2, item (3) should not be deleted. This has been the definition of lightning exposure that has been employed successfully by the telecom industry for many years with an outstanding safety record in lightning protection. Finally, Section 4.2 or the 2003 NEC Style Manual prohibits references to other standards in mandatory Code text.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-150 Log #1871 NEC-P16 **Final Action: Accept in Principle**
(800.90(A)(1)(b))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 800.90(A)(1)(b) as follows:
"(b)...or the connections between the insulated conductors and the ~~exposed~~ plant exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground , safely fuse on all currents greater...".
Substantiation: Clarification is necessary to distinguish 'exposed on a surface' from 'exposed to accidental contact with electric light or power conductors'. This is a companion proposal to 800.2, revised definition of "Exposed".
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-153.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-151 Log #1872 NEC-P16 **Final Action: Accept**
(800.90(A)(1)(c)(2))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 800.90(A)(1)(c)(2) as follows:
"...and (2) the connections of the insulated conductors to the ~~exposed~~ plant exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground or the conductors of the ~~exposed~~ plant exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground safely fuse on all currents greater than the current-carrying capacity of the primary...".
Substantiation: Clarification is necessary to distinguish 'exposed on a surface' from 'exposed to accidental contact with electric light or power conductors."
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-152 Log #1873 NEC-P16 **Final Action: Accept**
(800.90(A)(1)(d))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 800.90(A)(1)(d) as follows:
"(d) Where insulated conductors in accordance with 800.50(A) are used to extend circuits aerially to a building from ~~an unexposed~~ a buried or underground circuit that is unexposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground .
Substantiation: Clarification is necessary to distinguish 'exposed to view or touch' from 'exposed to accidental contact with electric light or power conductors."
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-153 Log #733 NEC-P16 **Final Action: Accept**
(800.90(A)(1)b.)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise 800.90(A)(1)(b) as follows:
"(b) ….. or the connections between the insulated conductors and the ~~exposed~~ plant exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground , safely fuse on all currents greater …..."

Substantiation: This proposal is a technical clarification. (Task Group No.800-13)
Clarification is necessary to distinguish 'exposed on a surface' from 'exposed to accidental contact with electric light or power conductors'. This is a companion proposal to 800.2, revised definition of "Exposed".
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-153a Log #CP1600 NEC-P16 **Final Action: Accept**
(800.90 (B))

Submitter: Code-Making Panel 16,
Recommendation: 800.90 (B) Location. The primary protector shall be located in, on, or immediately adjacent to the structure or building served and as close as practicable to the point of entrance.
FPN: See 800.2 for the definition of *point of entrance* .
For purposes of this section, primary protectors located at mobile home service equipment located ~~in sight from and not more than~~ within 9.0 m (30 ft) ~~from~~ of the exterior wall of the mobile home it serves, or at a mobile home disconnecting means connected to an electrode by a grounding conductor ~~grounded~~ in accordance with 250.32 and located ~~in sight from and not more than~~ within 9.0 m (30 ft) ~~from~~ of the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.
Substantiation: Improves clarity. The existing, double-negative wording is difficult to interpret. This editorial change makes the text easier to interpret and clarifies the requirements.
For purposes of grounding or bonding telecommunications equipment, being able to see the power disconnection point is immaterial. Where as "in sight from" may be critical for disconnecting power in an emergency, maintaining a reasonable length grounding conductor is the key in a telecommunications application. This proposal does not affect service equipment placement requirements. It only clarifies where the telecommunications grounding will be done based on where the service equipment is already placed
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-154 Log #734 NEC-P16 **Final Action: Accept**
(800.90(C))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change the general reference to Article 500 to the specific section that applies as shown:
(C) Hazardous (Classified) Locations. The primary protector shall not be located in any hazardous (classified) location as defined in ~~Article~~ 500 500.5 or in the vicinity of easily ignitible material.
Exception: As permitted in 501.150 , 502.150 , and 503.150 .
Substantiation: This proposal is editorial. (Task Group No. 800-14)
The definitions of hazardous locations are in 500.5. This change is in accordance with the style manual in that references to other Articles should be specific as to the section that is applicable.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-155 Log #1189 NEC-P16 **Final Action: Accept in Principle**
(800.90(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "Article 500" to "500.5."
Substantiation: Edit. to conform to Style Manual requirements.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-154.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-156 Log #1870 NEC-P16 **Final Action: Accept**
(800.90(D), FPN)

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 800.90 (D) FPN as follows:
"FPN: Secondary protectors on ~~exposed~~ circuits exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground are not intended for use without primary protectors."
Substantiation: Clarification is necessary to distinguish 'exposed on a surface' from 'exposed to accidental contact with electric light or power conductors."
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-157 Log #735 NEC-P16 **Final Action: Accept**
(800.93)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise 800.93 as follows:
800.93 Cable Grounding. The metallic sheath of communications cables entering buildings shall be grounded as close ~~as practicable~~ to the point of entrance as practicable or shall be interrupted as close to the point of entrance as practicable by an insulating joint or equivalent device.
Substantiation: This proposal is editorial. (Task Group No. 800-15)
The suggested editorial change will provide consistency between 770.93, 800.93, 820.93 and 830.93. This is a companion proposal to 770.93, 820.93 and 830.93.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-158 Log #736 NEC-P16 **Final Action: Accept in Part**
(800.93)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise 800.93 as follows:
800.93 ~~Cable~~ Grounding or Interruption of Metallic Sheath Members of Communications Cables Entering Buildings . The metallic sheath members of communications cables entering buildings shall be grounded as close ~~as practicable~~ to the point of entrance as practicable or shall be interrupted as close to the point of entrance as practicable by an insulating joint or equivalent device.
Substantiation: This proposal is editorial. (Task Group No. 800-16)
It provides consistency between 770.93, 800.93, 820.93 and 830.93. This is a companion proposal to 770.93, 820.93 and 830.93.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Part

Revise 800.93 as follows:

800.93 ~~Cable~~ Grounding or Interruption of Metallic Sheath Members of Communications Cables. The metallic sheath members of communications cables entering buildings shall be grounded as close ~~as practicable~~ to the point of entrance as practicable or shall be interrupted as close to the point of entrance as practicable by an insulating joint or equivalent device.

Panel Statement: "Entering Buildings" is inappropriate, as the cable may not actually enter the building.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-159 Log #1310 NEC-P16 **Final Action: Accept**

(800.100)

Submitter: Steven C. Johnson, Time Warner Cable / Rep. National Cable Telecommunications Association

Recommendation: Revise as follows:

800.100 Cable and Primary Protector Grounding. The primary protector and the metallic member(s) of the cable sheath ~~, where required to be grounded by 800.93, and primary protectors~~ shall be grounded as specified in 800.100(A) through 800.100(D).

Substantiation: Prior to 2002, the NEC listed criteria where grounding was required, such as exposure to lightning, exposure to accidental contact with power conductors, etc. The 2002 code removed these qualifications and just specified that the installation be grounded. Since 800.93 requires grounding without exception, the phrase "where required to be grounded by 800.93" is redundant.

Primary protectors are listed first in the requirement to avoid any misinterpretation that "metallic member" applies to primary protectors in addition to cable sheaths.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-160 Log #3509 NEC-P16 **Final Action: Reject**

(800.100)

Submitter: Paul Dobrowsky, Holley, NY

Recommendation: Revise as Follows:

800.100 Cable and Primary Protector Grounding. The metallic member(s) of the cable sheath, where required to be grounded by 800.93, and primary protectors shall be grounded as specified in 800.100(A) through 800.100(D).

(A) Grounding Electrode Conductor.

(1) Insulation. The grounding electrode conductor shall be insulated and shall be listed as suitable for wet locations ~~the purpose~~.

(2) Material. The grounding electrode conductor shall be copper or other corrosion-resistant conductive material, stranded or solid.

(3) Size. The grounding electrode conductor shall not be smaller than 14 AWG.

(4) Length. The primary protector grounding electrode conductor shall be as short as practicable. In one- and two-family dwellings, the primary protector grounding electrode conductor shall be as short as practicable, not to exceed 6.0 m (20 ft) in length.

FPN: Similar grounding electrode conductor length limitations applied at apartment buildings and commercial buildings help to reduce voltages that may be developed between the building's power and communications systems during lightning events.

Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum primary protector grounding electrode conductor length of 6.0 m (20 ft), a ~~separate~~ communications ground rod meeting the minimum dimensional criteria of 800.100(B)(2)(2) shall be driven, the primary protector shall be grounded to the communications ground rod in accordance with 800.100(C), and the communications ground rod shall be bonded to the power grounding electrode system in accordance with 800.100(D).

(5) Run in Straight Line. The grounding electrode conductor shall be run to the grounding electrode in as straight a line as practicable.

(6) Physical Damage. Where necessary, the grounding electrode conductor shall be guarded from physical damage. Where the grounding electrode conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding electrode conductor or the same terminal or electrode to which the grounding electrode conductor is connected.

(B) Electrode. The grounding electrode conductor shall be connected in accordance with 800.100(B)(1) and (B)(2).

(1) In Buildings or Structures with Grounding Means. To the nearest accessible location on the following:

(1) The building or structure grounding electrode system as covered in 250.50

(2) The grounded interior metal water piping system, within 1.5 m (5 ft) from its point of entrance to the building, as covered in 250.52

(3) The power service accessible means external to enclosures as covered in 250.94

(4) The metallic power service raceway

(5) The service equipment enclosure

(6) The service, system, building or structure grounding electrode conductor or the grounding electrode conductor metal enclosure

(7) The grounding electrode conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in 250.32

For purposes of this section, the mobile home service equipment or the mobile home disconnecting means, as described in 800.90(B), shall be considered accessible.

(2) In Buildings or Structures Without Grounding Means. If the building or structure served has no grounding means, as described in 800.100(B)(1), the grounding conductor shall be connected to either of the following:

(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)

(2) If the building or structure served has no grounding means, as described in 800.100(B)(1) or (B)(2)(1), to an effectively grounded metal structure or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (½ in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or air terminal conductors (lightning-rod conductors) shall not be employed as electrodes for protectors.

(C) Electrode Connection. Connections to grounding electrodes shall comply with 250.70.

(D) Bonding of Electrodes. A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the communications grounding electrode and power grounding electrode system at the building or structure served where separate electrodes are used.

Exception: At mobile homes as covered in 800.106.

FPN No. 1: See 250.60 for use of air terminals (lightning rods).

FPN No. 2: Bonding together of all separate electrodes limits potential differences between them and between their associated wiring systems.

Substantiation: The concept of listed for the purpose needs to be explained. If being suitable for a wet location is not the intent, then please describe what is.

The term grounding conductor should be replaced with grounding electrode conductor. A proposal was submitted to Article 100 to modify the existing definition of grounding electrode and to delete the term grounding conductor. to clarify this issue. The Term Grounding conductor is sometimes used to describe a connection to the earth and other times to describe any of the different types of conductors that use the term "grounding". Separate grounding electrodes are already required to be bonded together by 250.50.

Panel Meeting Action: Reject

Panel Statement: The term "grounding electrode conductor" specifically applies to the conductor that connects the grounding electrode(s) to the equipment grounding conductor or to the grounded conductor, or both at the electric service to the building. The conductor connecting the metallic members of the cable sheath and the primary protector grounding terminal to the building grounding means is not a "grounding electrode conductor", but a "grounding conductor" as determined by the TCC Grounding & Bonding Task Group.

The listing of a grounding electrode conductor does not include a special investigation for a wet location.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-161 Log #846 NEC-P16 **Final Action: Reject**

(800.100(A)(1))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

800.100 Cable, and Primary Protector Grounding.

The metallic member(s) of the cable sheath, where required to be grounded by 800.93, and primary protectors shall be grounded as specified in 800.100(A) through 800.100(D).

(A) Grounding Conductor

(1) Insulation. The grounding conductor shall be insulated and shall be listed and marked as a grounding protector wire. ~~as suitable for the purpose.~~

Substantiation: Under the category KDER and the UL White Book, Protector Grounding wires are addressed. The guide card information indicates that this wire is required to be marked with the manufacturer's name, size, and the words "protector grounding wire". In step with the directives to address the term listed or listed as suitable for the purpose, this proposal is an effort to be more specific in the rule to require a conductor specifically listed and marked for this purpose.

Panel Meeting Action: Reject

Panel Statement: There is nothing special about the conductor used to ground the protector. The communications industry has used listed wire to ground the protector universally and safely for many years. There is no need to specifically mark this conductor "as a grounding protector wire". Such marking may lead to confusion and misinterpretation. The submitter has demonstrated no safety issue with the present practice.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-162 Log #859 NEC-P16 **Final Action: Accept**
(800.100(A)(1))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
800.100 Cable, and Primary Protector Grounding.
The metallic member(s) of the cable sheath, where required to be grounded by 800.93, and primary protectors shall be grounded as specified in 800.100(A) through 800.100(D).
(A) Grounding Conductor
(1) Insulation. The grounding conductor shall be insulated and shall be listed. ~~as suitable for the purpose.~~
Substantiation: Listed insulated conductors are currently being used for this purpose and there doesn't appear to be insulated conductors listed specifically for the purpose of accomplishing the grounding required by this section.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-163 Log #372 NEC-P16 **Final Action: Reject**
(800.100(A)(6))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
" ~~Physical~~ damage Where necessary, the grounding conductor shall be guarded from ~~physical~~ damage...".
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The grounding conductor is potentially subject to multiple sources of damage: electrical, physical, and environmental. The word "physical" is necessary to specifically identify the type of damage that the section is addressing.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-164 Log #737 NEC-P16 **Final Action: Accept**
(800.100(A)(6))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:
(6) Physical Damage. Where ~~necessary, the grounding conductor shall be guarded from~~ <u>subject to</u> physical damage <u>, the grounding conductor shall be adequately protected</u> . Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or the same terminal or electrode to which the grounding conductor is connected.
Substantiation: This proposal is editorial. (Task Group No. 800-17)
It provides editorial consistency between similar requirements in Articles 800, 820 and 830.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-165 Log #738 NEC-P16 **Final Action: Accept**
(800.100(A)(6))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change title to "Physical Protection".
Substantiation: This is an editorial proposal. (Task Group No. 800-18)
The term "protection" is more descriptive of the material contained in the paragraph and is consistent with the titles of similar paragraphs in Sections 820.100 and 830.100.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-166 Log #858 NEC-P16 **Final Action: Accept**
(800.100(A)(6))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-164. This action will be considered by the Panel as a Public Comment.
Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(6) Physical Damage. <u>The grounding conductor shall be protected where exposed to physical damage.</u> ~~Where necessary, the grounding conductor shall be guarded from physical damage~~ . Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or the same terminal or electrode to which the grounding conductor is connected.
Substantiation: The current wording is subjective and could lead to inconsistencies in the field. The proposed changes are an effort to provide consistency between 820.110(A)(6), 810.21(d), and 830.100(A)(6). The purpose of the requirement in each of these sections is the same, so the same text should be used. This is a companion proposal to others to provide clarity and consistency between articles that include identical requirements.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-167 Log #1890 NEC-P16 **Final Action: Accept**
(800.100(B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the use of the word "and" in the sentence "The grounding conductor shall be connected in accordance with 800.100(B)(1), (B)(2), and (B)(3)." This action will be considered by the Panel as a Public Comment.
It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-20. This action will be considered by the Panel as a Public Comment.
Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 800.100(B) **Cable and Primary Protector Grounding (Electrode)** as follows:
(B) Electrode. The grounding conductor shall be connected in accordance with 800.100(B)(1), ~~and~~ (B)(2) <u>and (B)(3).</u>
<u>**(1) In Buildings or Structures with an Intersystem Grounding Termination.** If the building or structure served has an intersystem grounding termination the grounding conductor shall be connected to the intersystem grounding termination.</u>
~~(1)~~ <u>(2)</u> In Buildings or Structures with Grounding Means. <u>If the building or structure served has no intersystem grounding termination, the grounding conductor shall be connected</u> to the nearest accessible location on the following:
....
.................Retain existing list and text.
....
~~(2)~~ (3) In Buildings or Structures Without <u>Intersystem Grounding Termination or</u> Grounding Means. If the building or structure served has no <u>intersystem grounding termination or</u> grounding means ~~,~~ as described in 800.100(B)(~~1~~ <u>2</u>), the grounding conductor shall be connected to either of the following:.
(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)

(2) If the building or structure served has no intersystem grounding termination or has no grounding means, as described in 800.100(B)(~~1~~ 2) or (B)(~~2~~ 3)(1), to an effectively grounded metal structure or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or air terminal conductors (lightning-rod conductors) shall not be employed as electrodes for protectors.

Substantiation: This is one of several correlated proposals (100 Definitions, 250.95, Chapter 8 Articles) to improve the requirements related to intersystem bonding and grounding of communication systems. The intent is to create a dedicated and well-defined location for terminating the grounding conductors required in Chapter 8 Articles and 770.93. These grounding conductors also provide between communication and power systems (intersystem bonding). The proposed termination would have sufficient capacity to handle multiple communication systems (telecom, satellite, CATV) on premises. The proposed revision makes the intersystem bonding terminal the preferred destination for grounding conductor in Article 800. See the figures I have provided.

Intersystem bonding accomplished by connection of a communication grounding conductor to the power system is an important safety measure to prevent occurrences of voltages between communication system and power system. However, the existing requirements are not adequate. Bonding is becoming difficult to implement due to changes in building construction practices such as increased prevalence of flush construction and use of PVC conduits. Frequently, in new construction, the grounding electrode, the raceway and the grounding electrode conductor are hidden behind walls and not accessible for bonding connection.

Even in older construction with accessible equipment, the requirement for installation of intersystem bonding connection is subject to varying interpretation because there is not a clearly defined dedicated bonding location. The connection to the power system is sometimes haphazard. Installers are sometimes confused over where the connection should be made especially if multiple Communication Systems are present on premises.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-168 Log #1991 NEC-P16 **Final Action: Accept in Principle**

(800.100(B))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-167 and the comments expressed in the voting on 16-168. This action will be considered by the Panel as a Public Comment.

It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group

Recommendation: Add these two sentences after the last sentence of 800.100(B):

A device intended to provide a termination point for the grounding conductor (inter-system bonding) shall be prohibited from use when the installation of such device interferes with opening a service or metering equipment enclosure. An inter-system bonding device shall not be installed on an enclosure cover.

Substantiation: Poor grounding practices by installers of CATV, telephone, satellite and other communication systems using termination devices that clamp to enclosure covers have resulted in interruption of grounding continuity. This is a companion proposal to proposals to add this requirement to 810.21(F), 820.100(B), and 830.100(B).

Panel Meeting Action: Accept in Principle

Add the following after the last sentence of 800.100(B):

A device intended to provide a termination point for the grounding conductor shall not interfere with the opening of an equipment enclosure. A bonding device shall be mounted on non-removable parts. A bonding device shall not be mounted on a door or cover even if the door or cover is non-removable.

Panel Statement: The panel accepts the intent of the submitter and has reworded the text for clarity. It is requested that the TCC forward to Panel 5 for take similar action as applicable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRUNSSEN, J.: The submitter's text, as modified by the Panel, should be placed following the existing text of 800.100(B)(5) rather than at the end of 800.100(B). Section 800.100(B)(5) specifically addresses connection to the service equipment enclosure and that is the issue that the submitter intended to address.

16-169 Log #1182 NEC-P16 **Final Action: Reject**

(800.100(D))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise as follows:

A bonding jumper shall be copper not smaller than 6 AWG ~~copper~~ or ~~equivalent~~ equally conductive corrosion-resistant material shall be...(remainder unchanged).

Substantiation: "Equivalent" is not specific whether it refers to size or material. The grounding conductor of 800.100(A)(2) is specified to be copper.

Panel Meeting Action: Reject

Panel Statement: The present text is clear. The bonding jumper can be "… not smaller than 6 AWG copper or equivalent …". An equivalent conductor is one with at least the same ampacity and corrosion-resistance capability and could be of different material and/or larger in size (AWG). The panel notes that the submitter did not see the necessity to revise "equivalent" in his proposals on similar requirements in 820.100(A)(3) and 830.100(D), Proposals 16-296 and -398.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-170 Log #1312 NEC-P16 **Final Action: Accept in Principle**

(800.106(A))

Submitter: Steven C. Johnson, Time Warner Cable / Rep. National Cable Telecommunications Association

Recommendation: Revise as follows:

800.106 Bonding and Grounding at Mobile Homes.

(A) Grounding. Grounding shall comply with (1) and (2).

(1) Where there is no mobile home service equipment located ~~in sight from, and not more~~ within 9.0 m (30 ft) of the exterior wall of the mobile home it serves , the primary protector ground shall be in accordance with 800.100(B)(2).

(2) Where ~~or~~ there is no mobile home disconnecting means grounded in accordance with 250.32 and located ~~within sight from, and not more~~ within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, the primary protector ground shall be in accordance with 800.100(B)(2).

Substantiation: Improves clarity. The existing, double-negative wording is difficult to interpret. This editorial change makes the text easier to interpret and clarifies the requirements.

For purposes of grounding or bonding telecommunications equipment, being able to see the power disconnection point is immaterial. Whereas "in sight from" may be critical for disconnecting power in an emergency, maintaining a reasonable length grounding conductor is the key in a telecommunications application. This proposal does not affect service equipment placement requirements. It only clarifies where the telecommunications grounding will be done based on where the service equipment is already placed.

Panel Meeting Action: Accept in Principle

Revise the submitter's text as follows:

(A) Grounding. Grounding shall comply with 800.106(A) (1) and (A) (2).

(1) Where there is no mobile home service equipment located ~~in sight from, and not more than~~ within 9 m (30 ft) ~~from,~~ of the exterior wall of the mobile home it serves , the primary protector ground shall be connected to a grounding conductor in accordance with 800.100(B)(2).

(2) Where there is no mobile home disconnecting means grounded in accordance with 250.32 and located within ~~sight from, and not more than~~ 9 m (30 ft) ~~from,~~ of the exterior wall of the mobile home it serves, the primary protector ground shall be connected to a grounding conductor in accordance with 800.100(B)(2).

Panel Statement: The changes made by the panel provide conformance to Section 4.2.1 of the NEC Style Manual in referencing sections of the NEC, incorporate revisions made to similar 820.106(A) by the TCC Grounding and Bonding Task Group (see panel action on Proposal 16-4, 820.106(A)), and provide editorial consistency across Articles 800, 820, and 830.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-171 Log #62 NEC-P16 **Final Action: Accept in Principle**

(800.110)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

800.110 Raceways for Communications Wires and Cables.

Where communications wires and cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or listed plenum communications raceway, listed riser communications raceway, or listed general-purpose communications raceway installed in accordance with 800.154, and ~~a listed nonmetallic raceway complying with 800.182, and installed in accordance~~ with 362.24

through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.

Exception: Conduit fill restrictions shall not apply.

Substantiation: This is a corollary proposal to one being submitted for Article770. Specifically mentioning each plenum, riser and general-purpose raceway, rather that using the term "nonmetallic raceway" is more user-friendly. The installation requirements are in 800.154 so the reference to 820.182 (which is listing requirements) was changed to 820.154 since this section deals with installation.

Panel Meeting Action: Accept in Principle

Change 800.110 to read as follows:

800.110 Raceways for Communications Wires and Cables.

Where communications wires and cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or listed plenum communications raceway, listed riser communications raceway, or listed general-purpose communications raceway installed in accordance with 800.154, and a listed nonmetallic raceway complying with 800.182, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply. The raceway fill tables of Chapter 3 and Chapter 9 shall not apply.

Panel Statement: The panel changed the submitter's text to positive language to further clarify the requirements.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be modified. Change the last part of the first sentence of the new 800.110 as follows: "and installed in accordance with <u>362.10, 362.12 and</u> 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply".

The Chapter 3 raceways must be installed in accordance with all of the requirements of Chapter 3. These raceways (general-purpose, riser) should also have to be installed in accordance with 362.10 and 362.12 since they have the same or similar characteristics to ENT.

Also not that the submitter had crossed out the existing text: " *a listed nonmetallic raceway complying with 800.182 and installed in accordance with….* " This phrase still appears in the report on the panel action and should be removed.

Comment on Affirmative:

BRUNSSEN, J.: Under the Panel Meeting Action, revise the text of **800.110 Raceways for Communications Wires and Cables** as follows: "… general-purpose communications raceway installed in accordance with 800.154, ~~and a listed nonmetallic raceway complying with 800.182,~~ and installed in accordance with 362.24 through 362.56, where …". This text is in error and is redundant. Section 800.182 contains the listing requirements for plenum, riser and general-purpose communications raceways.

DORNA, G.: There is an error in the panel action "and a listed nonmetallic raceway complying with 800.182" should be deleted because it is redundant. 800.182 contains the listing requirements for plenum, riser and general-purpose communications raceways.

KAHN, S.: There appears to be an error in the panel action. The proposer replaced the phrase "a listed nonmetallic raceway compiling with 800.182" with "listed plenum communication communications raceway, listed riser communications raceway, or listed general purpose communications raceway". The panel action retained the deleted phrase which is redundant.

16-172 Log #721 NEC-P16 **Final Action: Accept**
(800, Part V)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Change title:

From V. Communications Wires and Cables Within Buildings

To V. Installation Methods Within Buildings

Substantiation: This proposal is editorial. (Task Group No.800-01)

The sections included under V. include more than cables and the recommended change is more descriptive. This title is consistent with similar recommendations for Articles 770, 820 and 830.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-173 Log #739 NEC-P16 **Final Action: Accept**
(800.110)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-171. This action will be considered by the Panel as a Public Comment.

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Add the specific paragraph references as shown:

800.110 Raceways for Communications Wires and Cables.

Where communications wires and cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or a listed nonmetallic raceway complying with 800.182 <u>(A), (B) or (C)</u> , <u>as applicable,</u> and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.

Exception: Conduit fill restrictions shall not apply.

Substantiation: This is an editorial proposal. (Task Group No. 800-19)

This change will make 800.110 editorially consistent with 820.110,

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-174 Log #986 NEC-P16 **Final Action: Reject**
(800.110 Exception)

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Change "conduit" to "raceways".

Substantiation: Edit. Other types of raceways should be included.

Panel Meeting Action: Reject

Panel Statement: Fill requirements apply to conduit. The correct term is "conduit".

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-175 Log #10 NEC-P16 **Final Action: Accept**
(800.113)

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

800.113 Installation and Marking of Communications Wires and Cables. Listed communications wires and cables ~~and listed multipurpose cables~~ shall be installed as wiring within buildings. Communications cables and undercarpet communications wires shall be marked in accordance with Table 800.113. The cable voltage rating shall not be marked on the cable or on the undercarpet communications wire.

Substantiation: The panel tried to eliminate multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-176 Log #752 NEC-P16 **Final Action: Accept**
(800.113)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the reference to multipurpose cables as shown:

800.113 Installation and Marking of Communications Wires and Cables. Listed communications wires and cables ~~and listed multipurpose cables~~ shall be installed as wiring within buildings. Communications cables and undercarpet communications wires shall be marked in accordance with Table 800.113. The cable voltage rating shall not be marked on the cable or on the undercarpet communications wire.

Substantiation: This is an editorial proposal. (Task Group No. 800-32)

The panel tried to eliminate multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-177 Log #2383 NEC-P16 **Final Action: Reject**
(800.113)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Add a sentence at the end of 800.113.

The temperature rating shall be marked on the cable .

Substantiation: It is important for the system designer, installer, local authority, and building owners to know the temperature rating of cables for proper application.

Panel Meeting Action: Reject

Panel Statement: The Code presently permits the temperature rating to be marked on the cable. See UL 444.

The AHJ does not have the authority to require the manufacturer to mark the temperature rating on the cable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-178 Log #743 NEC-P16 **Final Action: Accept in Principle**
(800.113, 800.179 and Table 800.179)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 16-145 and 16-209. This action will be considered by the Panel as a Public Comment.

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Revise 800.179 and transfer Table 800.113 and the Table FPNs to 800.179.

800.179 Communications Wires and Cables.

Communications wires and cables ~~shall have a voltage rating of not less than 300 volts and~~ shall be listed in accordance with 800.179(A) through 800.179(J) and marked in accordance with Table 800.179. Conductors in communications cables, other than in a coaxial cable, shall be copper. Communications wires and cables shall have a voltage rating of not less than 300 volts. The cable voltage rating shall not be marked on the cable or on the undercarpet communications wire.

FPN No. 1: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1, electric light, and power applications.

Exception No. 1: Voltage markings shall be permitted where the cable has multiple listings and voltage marking is required for one or more of the listings.

FPN No. 2 : See 800.170 for listing requirement for equipment.

800.113 Installation ~~and Marking~~ of Communications Wires and Cables.

Listed communications wires and cables and listed multipurpose cables shall be installed as wiring within buildings. ~~Communications cables and undercarpet communications wires shall be marked in accordance with Table 800.113.~~ ~~The cable voltage rating shall not be marked on the cable or on the undercarpet communications wire.~~

~~FPN: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1, electric light, and power applications.~~

~~*Exception No. 1: Voltage markings shall be permitted where the cable has multiple listings and voltage marking is required for one or more of the listings.*~~

Exception No. 2: Listing and marking shall not be required where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure or on a listed primary protector.

FPN No. 1 to Exception No. 2:

Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.

FPN No. 2 to Exception No. 2:

This exception limits the length of unlisted outside plant cable to 15 m (50 ft), while 800.90(B) requires that the primary protector be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.

Substantiation: This proposal is editorial. (Task Group No. 800-23)

It moves the cable marking requirements from 800.113 to 800.179. There are other proposals concerning 800.113.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

The Panel accepts the submitter's proposal.

"Exception No. 2" to 800.113 to be relabeled "Exception"

FPNs of 800.113 to read as follows:

FPN No. 1 to Exception:

Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.

FPN No. 2 to Exception: This exception limits the length of unlisted outside plant cable to 15 m (50 ft), while 800.90(B) requires that the primary protector be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.

Panel Statement: The Panel accepts the submitter's proposal.

Editorial changes are made to "Exception No. 2" and the FPNs to 800.113.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-179 Log #1874 NEC-P16 **Final Action: Accept in Principle**
(800.113 Exception No. 2)

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: Revise 800.113, Exception No. 2 as follows:

Exception No. 2: Unlisted outside plant communications cables shall be permitted within buildings in spaces other than risers, air ducts, plenums, and other spaces used for environmental air. ~~Listing and marking shall not be required where the~~ The length of the unlisted cable permitted within the building, measured from its point of entrance, ~~does~~ shall not exceed 15 m (50 ft) . ~~and the~~ The unlisted cable ~~enters~~ shall enter the building from the outside and ~~is~~ shall be terminated in an enclosure or on a listed primary protector.

Substantiation: The NEC presently permits up to 50 ft of unlisted outside plant communications cable to be run into a building, but places no restriction on installing the unlisted cables in air handling spaces where they could contribute to fire and smoke hazard. This proposal adds that restriction, further contributing to fire and smoke safety. This is a companion proposal and is intended to correlate with similar proposals for 770.113 Ex. No. 1 and 820.113 Ex. No. 2.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-145.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-180 Log #1288 NEC-P16 **Final Action: Accept**
(800.133(A)(1))

Submitter: Gerald Lee Dorna, Belden CDT. Inc.

Recommendation: Revise text to read:

(A) (1) In Raceways, Cable Trays, Boxes, and Cables.

(a) Other Power-Limited Circuits. Communications cables shall be permitted in the same raceway , cable tray or enclosure with cables of any of the following:

(1) Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725

(2) Power-limited fire alarm systems in compliance with Article 760

(3) Nonconductive and conductive optical fiber cables in compliance with Article 770

(4) Community antenna television and radio distribution systems in compliance with Article 820

(5) Low-power network-powered broadband communications circuits in compliance with Article 830

Substantiation: Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray. Stating that these cables are allowed "in the same cable tray" will avoid having the user assume that they are not permitted to be installed together in the same cable tray. It clarifies the use in the Code. Article 770, in section 770.133(B), has text similar to that proposed here. This is one of five similar proposals that are being submitted for Articles 725, 760, 800, 820 and 830.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

JONES, R.: The submitter is obviously in error with the assertion "Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray." O NLY cABLES LISTED FOR INSTALLATION IN CABLE TRAYS CAN BE INSTALLED IN CABLE TRAYS.

16-181 Log #11 NEC-P16 **Final Action: Accept**
(800.133(A)(1)(b))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
(b) Class 2 and Class 3 Circuits. Class 1 circuits shall not be run in the same cable with communications circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall meet the requirements of this article. The cables shall be listed as communications cables ~~or multipurpose cables~~ .
Substantiation: The panel tried to eliminate multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-182 Log #753 NEC-P16 **Final Action: Accept**
(800.133(A)(1)b.)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Delete the reference to multipurpose cable as shown:
(b) Class 2 and Class 3 Circuits. Class 1 circuits shall not be run in the same cable with communications circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall meet the requirements of this article. The cables shall be listed as communications cables ~~or multipurpose cables.~~
Substantiation: This is an editorial proposal. (Task Group No. 800-33)
The panel tried to eliminate multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-183 Log #3431 NEC-P16 **Final Action: Reject**
(800.133(A)(1)c. Exception No. 1)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the phrase "listed divider" at the end; substitute the words "a securely installed barrier identified for the use."
Substantiation: This wording correlates with the changes made by CMP 9 to an equivalent rule in 404.8(B) in response to an equivalent proposal from the same submitter. The problem is that Article 314 does not require conventional steel outlet boxes to be listed, and therefore not all steel box dividers manufactured for this purpose are listed. In addition, none of these barriers (for outlet boxes) are permanently installed; but they certainly can be securely installed, and they certainly meet the provisions of the Article 100 definition of identified, in that they are recognizable as suitable for this purpose. This wording refers to the identical products and should therefore correlate with Article 314 requirements.
Panel Meeting Action: Reject
Panel Statement: This situation is not the same as 404.8(B). Secrion 404.8(B) deals with the grouping of snap switches with other snap switches and similar devices such as receptacles. The barriers described in 404.8(B) are used to separate these similar devices containing similar circuits.
800. 133(A)(1)c. Exception No. 1, 820. 133(A)(1)2. Exception No. 1 and 830.133(A)(1)d. Exception No. 1 deal with the separation of communications, CATV and broadband circuits from electric light, power and Class 1 circuits.
A permanent barrier as currently permitted is okay, as it is a physical part of the metal box or listed plastic boxs and its suitability can be determined by the AHJ or is covered by the listing. There are concerns associated with a non-permanent barrier or divider that cannot be easily dealt with at the point of installation. For example, compatibility with the box (fit and secureness), compatibility with the installed hardware such as power receptacles materials, ease of installation, clarity of proper installation procedures, affect on wiring space inside the box, and the like, need to be investigated and listed.
These articles do not only cover metal boxes. The proposal would allow non-listed barriers in metal and listed non-metallic boxes, voiding the listing of a non-metallic box.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-184 Log #3092 NEC-P16 **Final Action: Accept in Principle**
(800.133(B))

Submitter: Donald Hall, Corning Cable Systems
Recommendation: Revise text as follows:
(B) Cable Trays. Types CMP, CMR, CMG, and CM communications cables shall be permitted to be installed in cable trays. Communications raceways, as described in ~~800.179~~ 800.182 shall be permitted to be installed in cable trays.
Substantiation: 800.182 is the correct reference.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-185.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-184a Log #CP1601 NEC-P16 **Final Action: Accept**
(800.133(B))

Submitter: Code-Making Panel 16,
Recommendation: Re-letter 800.133(D) to 800.133(C).
Substantiation: This proposal is editorial. The panel accepted a series of proposals for the CMP 16 Special Editorial Task group to editorially rearrange this section. Re-lettering on 800.133(D) is required because acceptance of proposal 16-185 moved 800.133(B) to 800.133(D).
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-185 Log #740 NEC-P16 **Final Action: Accept**
(800.133(B) and 800.154 (D))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Delete 800.133(B) as follows:
~~**(B) Cable Trays.** Types CMP, CMR, CMG, and CM communications cables shall be permitted to be installed in cable trays. Communications raceways, as described in 800.179, shall be permitted to be installed in cable trays.~~
Revise 800.154 (D) as follows:
(D) Cable Trays. Types CMP, CMR, CMG, and CM communications cables shall be permitted to be installed in cable trays. Communications raceways, as described in 800.182, shall be permitted to be installed in cable trays.
Substantiation: This is an editorial proposal. (Task Group No. 800-20)
It corrects an oversight wherein cable tray requirements were incorrectly and redundantly placed in Section 800.133(B). Cable tray requirements are more appropriately contained in Section 800.154, "Applications".
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 16-184a (Log #CP 1601).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-186 Log #2629 NEC-P16 **Final Action: Reject**
(800.135 (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add a new section to read as follows:
800.135 Communication Device and Equipment Mounting.
Communication devices or equipment shall be mounted in listed boxes, brackets or assemblies designed for the purpose, and such boxes or assemblies shall be securely fastened in place. Boxes or brackets can be completely enclosed or backless.
(A) Communication Devices and Equipment Mounted to Boxes or Brackets. Communication devices or equipment shall be mounted to listed boxes or bracket and installed per 314.20.
(B) Communication Devices and Equipment Mounted on Covers. Communication device and equipment mounted to and supported by a cover shall be held rigidly against the cover which is mounted to the box or bracket.
Substantiation: This proposal adds a new section to Article 800 addressing the mounting of devices or equipment to listed boxes and brackets. Currently, depending on the quality of workmanship, Communication devices or equipment have not been mounted to boxes or brackets that can support them. After several years, device and/or covers that are mounted directly to the dry wall will become hazard because they have become loose and exposed. Communication cable can become energized by coming in incidental contact with electrical conductors.

800.135 was only a suggestion for the location of this new section. (A) addresses devices mounted directly to boxes or devices where as (B) addresses devices mounted to covers.

Panel Meeting Action: Reject

Panel Statement: The submitter has provided no data supporting an existing hazard. The submitter offers only an individual opinion that, depending on the quality of workmanship, equipment or devices mounted directly to drywall may, over time, loosen and become a hazard. The addition of listed boxes or assemblies will not, in itself, guarantee a hazard-free installation. The same quality of workmanship is necessary to help ensure a hazard-free equipment installation whether or not listed boxes are used.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: I concur with submitter's recommendation which addresses the mounting of equipment or devices to listed boxes and brackets. However the submitter has not provided CMP 16 member any technical substantiation or data supporting the existing hazard. The submitter should resubmit the proposal in the 2008 ROC and provide CMP 16 members with such data.

16-187 Log #754 NEC-P16 **Final Action: Accept**
(800.154)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation:

Include NEC L754_rec HERE

Substantiation: This proposal is editorial. (Task Group No. 800-34)

It will align similar paragraphs in Sections 770.154, 800.154, 820.154 and 830.154. It will provide consistency between similar sections in the affected four articles and improve usability of the Code. This is a companion proposal to similar proposals concerning Sections 770.154, 820.154 and 830.154.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Panel Statement: See panel action on CP-1602.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

DORNA, G.: CP 1602 is Proposal 16-411a.

KAHN, S.: The panel statement requires correction as the proper reference is to Proposal 16-411a (which is the same as CP 1602).

16-188 Log #2530 NEC-P16 **Final Action: Reject**
(800.154)

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Add the following sentence to 800.154:

Communications cables shall comply with the requirements of 800.154(A) through 800.154(F) or where cable substitutions are made in accordance with 800.154(G). <u>Type CM50 very-low-smoke cable shall be permitted to be installed meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.</u>

Substantiation: NFPA 13-2002 has requirements for installation of sprinklers where a concealed space has combustible loading. Type CM50 cable has a heat release that is significantly lower than combustible plenum cable listed using NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces* .

The 2003 International Mechanical Code (IMC), 602.2.1 requires a smoke developed index less than 25 and a smoke developed index less than 50 for materials in plenums.

The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).

NFPA 13-2002, Installation of Sprinkler Systems, requires installation of a sprinkler system in concealed spaces where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:

"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:

(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.

(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."

"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."

The definition of combustible, from NFPA 5000 is:

"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."

During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because communications cables are permitted to substitute for Class 2 and Class 3 circuit cables, it is important to have parallel requirements in both NEC Sections. Additionally, the Fine Print Note applies to all concealed spaces.

In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied.

There is a companion proposal for the listing and marking of Type CM50.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-189 Log #2654 NEC-P16 **Final Action: Reject**
(800.154)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Delete the following text:

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: This FPN is being misinterpret and used in aggressive marketing attempts to require the installation of "limited combustible cable" (one such example is found at http://www.dupont.com/cablingsolutions/products/codes.html). The FPN has had a profound effect in which it is used in misleading the AHJ to require limited combustible cable, conduit, or a sprinkler system to be installed within the concealed space.

As an example, an AHJ Massachusetts would not provide a certificate of occupancy until the communications cabling was either replaced with limited combustible cable, the CMP cable was placed in conduit, or a sprinkler system installed above the suspended ceiling.. Although the installer had met the requirements of the NEC, the FPN misled the AHJ causing project delays and the potential of inordinate cost to the project. A plea to the NFPA aided the communications installer in which clarification was given that the CMP cabling was indeed sufficient to meet code and that NFPA 13 allowed some quantities (which is not defined) of communications cabling within concealed spaces. The installation of the CMP cable was allowed.

To further the removal of this FPN, the Report on Proposals A2006 from NFPA 13 (see attached), the NFPA committee specifically added an annex A.8.14.1.2.1 in 13-284 log #551 stating that, "Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection."

In addition to the above, Panel 3 rejected the last minute introduction of this proposal that was made in the ROC stage. BICSI, which represents 24,000 installers, designers and manufacturers, feels that this last minute interjection of a FPN was not sufficiently vetted to industry and that the TCC should review this matter.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted fro the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: We do not believe that the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) would prohibit this Fine Print Note from being deleted. We do believe that expansion of or new Fine Print Notes referencing NFPA 13 would be in violation of NFPA Standards Council Long Decision 05-24 (SC #05-7-4). This proposal should have been accepted. This Fine Print Note referencing NFPA 13 offers no value to the user of NFPA 70 and in fact misleads the user and AHJ.

16-190 Log #3007 NEC-P16 **Final Action: Reject**
(800.154)

Submitter: Marcelo M. Hirschler, GBH International

Recommendation: Revise text to read as follows:

800.2 Definitions.

Abandoned Communications Cable. Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag.

800.154 Applications of Listed Communications Wires and Cables and Communications Raceways.

Communications wires and cables shall comply with the requirements of 800.154(A) through 800.154(F) or where cable substitutions are made in accordance with 800.154(G)

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned communications wires and cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components. ~~not be permitted to remain.~~ Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.

FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.

(B) Riser. Cables installed in risers shall comply with 800.154(B)(1), (B)(2), or (B)(3).

(1) Cables in Vertical Runs. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CMR. Floor penetrations requiring Type CMR shall contain only cables suitable for riser or plenum use. Abandoned communications wires and cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components. ~~not be permitted to remain.~~ Listed riser communications raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CMR and CMP cables shall be permitted to be installed in these raceways.

Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in "inaccessible spaces". This is not conducive to safe electrical practice; this the key change is the elimination of the words "the accessible portion of".

If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.

Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.

For information, see the relevant definitions in the NEC.

Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.

Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.

Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.

Panel Meeting Action: Reject

Panel Statement: See panel action on Proposal 16-28.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article.

16-191 Log #2288 NEC-P16 **Final Action: Reject**
(800.154, 800.179 & 800.182)

Submitter: Frank Peri, Communications Design Corporation

Recommendation: In 800.154 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Also revise (G) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Air Ducts. Cables installed in air ducts shall be Type CMD and shall be associated with the air distribution system and shall be as short as practicable. Types CMD, CMP, CMR, CMG, CM, and CMX cables and listed communications wires installed in raceway that is installed in compliance with 300.22(B) shall also be permitted.

(B ~~A~~) Plenum. Cables installed in ~~ducts,~~ plenums ~~,~~ and other space ~~s~~ used for environmental air shall be Type CMD or CMP. Abandoned cables shall not be permitted to remain. Types CMD, CMP, CMR, CMG, CM, and CMX cables and communications wire s installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ~~ducts and~~ plenums as described in 300.22(B) and in other space ~~s~~ used for environmental air as described in 300.22(C). Only Type s CMD and CMP cable s shall be permitted to be installed in listed plenum communications raceways.

FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

(H ~~G~~) Cable Substitutions. The uses and permitted substitutions for communications cables listed in Table 800.154 shall be considered suitable for the purpose and shall be permitted.

FPN: For information on Types CMD, CMP, CMR, CMG, CM, and CMX cables, see 800.179.

Cable Type	Use	Permitted Substitutions
CMP	Communications plenum cable	CMD
CMR	Communications riser cable	CMD, CMP
CMG, CM	Communications general-purpose cable	CMD, CMP, CMR
CMX	Communications cable, limited use	CMD, CMP, CMR, CMG, CM

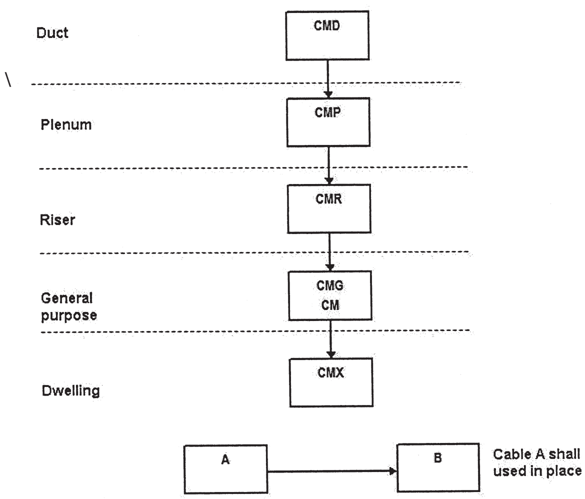

Figure 800-154 Cable substitution hierarchy.

In 800.179 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Type CMD. Type CMD communications air duct cables shall be listed as suitable for use in air ducts and shall be rated for continuous use at 121 o C. Type CMD communications air duct cables shall also be listed as having a low potential heat value, low flame spread characteristics, and very low smoke-producing characteristics.

FPN: One method of defining a low potential heat cable is establishing an acceptable value of potential heat when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials* , to a maximum potential heat value not exceeding 8141 kJ/kg (3500 BTU/lb). One method of defining low flame spread cable is establishing an acceptable value of flame spread when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to a maximum flame spread index of 25, with the cable unslit (intact) and slit. Similarly, one method of defining very low smoke-producing cable is establishing an acceptable value when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to maximum smoke developed index of 50, with the cable unslit (intact) and slit. These test methods and resultant values correlate with the requirements of NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems* for materials installed in ducts and plenums . *For additional testing information see Underwriters Laboratories Subject 2424, Outline of Investigation For Cable Marked Limited Combustible.*

(B ~~A~~) Type CMP. Type CMP communications plenum cable s shall be listed as being suitable for use in ~~ducts,~~ plenums , and other space ~~s~~ used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262 -2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces* .

Revise 800.182(A) as shown below:

(A) Plenum Communications Raceways. Plenum communications raceways listed as plenum optical fiber raceways shall be permitted for use in ~~ducts,~~ plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining that an optical fiber raceway is a low smoke producing raceway and a fire-resistant raceway is that the raceway exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with the plenum test in UL 2024, *Standard for Optical Fiber Cable Raceway* .

Substantiation: Summary

This proposal is submitted to accomplish four things:

1.) Change the code to not allow the dangerous practice of using air ducts as a cable pathway.

2.) Code recognition that there may be instances where a small amount of in-duct cable is necessary for air handling equipment, dampers, security, temperature control, fire protection, etc.

3.) Establish minimum requirements for flame spread, smoke, and potential heat for in-duct (CL2D, CL3D, FPLP, OFND, OFCD, CMD and CATVD) cables used in this special hazard space.

4.) Include air duct “D” cables as permissible substitute for plenum “P” cables for installation in ceiling cavity and raised floor plenums (other space used for environmental air).

This proposal correlates with a TIA that I submitted for NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems.* Similar proposals have been submitted for Articles 725, 760, 770, 800 and 820.

The substantiation for the TIA is shown below:

“This TIA is being submitted in accordance with Section 5 of the *2005 NFPA REGULATIONS GOVERNING COMMITTEE PROJECTS.* In particular, it addresses a hazard meeting the criteria of section 5-2(d), which states:

(d) The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

The purpose of this TIA is to address the dangerous practice of installing combustible communications/data cables in air ducts.

NFPA 90A-2002 does not have explicit requirements for electrical wiring in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cable into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This TIA would greatly reduce the amount of wiring in air ducts by only permitting wiring and raceways associated with the air distribution system and also requiring that they be as short as practicable. It would require that the wiring and nonmetallic raceway in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A permits the supplied air to be at 121^{o} C (250^{o} F). The permitted wiring and nonmetallic raceway would be required to have initial flame spread and smoke requirements identical to those for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). In addition to these initial requirements, there are slitting and aging requirements to assure that the cables installed in air ducts meet the flame spread, smoke and potential heat requirements equivalent to those for limited combustible materials. Essentially they would be required to be listed to the UL 2424.

Combustible plenum cable is unsuitable and dangerous for this application. Typically, combustible plenum cable has a temperature rating of 60 ^{o}C, which is significantly less that the 121^{o} C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests, these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

It is essential that these requirements be adopted now in NFPA 90A.”

Section 800.154(A) in the 2005 NEC permits unlimited amounts of Type CMP cable in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of an air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cables into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This proposal would greatly reduce the amount of wiring in air ducts by only permitting wiring associated with the air duct and as short as practicable. It would require that the wiring in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* permits the supplied air to be at 121^{o} C (250^{o} F). The permitted wiring would be required to have flame spread and smoke requirements identical to those in NFPA 90A-2002 section 4.3.3.1 for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). Essentially they would be required to be listed to the UL 2424, *Outline of Investigation For Cable Marked Limited Combustible* (copy attached) .

“P” type plenum cables are unsuitable and dangerous for this application. Typically, they have a temperature rating of 60^{o} C, which is significantly less that the 121^{o} C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests (copy attached), these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

"D" type air duct cables will meet the NFPA 90A listing requirements for use in ceiling cavity and raised floor plenums (other space used for environmental air) and therefore will be able to safely substitute for "P" type plenum cables. "D" type air duct cables have approximately 1/20 the smoke production of "P" type plenum cables.

In order to be consistent with the applications of plenum cable, this proposal will also prohibit the installation of plenum communications raceways in air ducts.

The cable substitution table and figure have been revised to permit air duct cables to substitute for plenum cables since air duct cables are superior cables. "D" type air duct cables also meet the requirements in NFPA 90A for use in ceiling cavity plenums and raised floor plenums (other space used for environmental air).

Some of the applications that require the installation of cables in air ducts are fire alarm (Article 760), temperature sensing and control (Article 725), security (Articles 725 and 820) and communications (Article 800). Optical fiber cables (Article 770) could be used in place of copper conductor cables. Communications cables are permitted to substitute for Class 2 & 3, fire alarm and CATV cables. I am submitting similar proposals for each of these articles.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-192 Log #12 NEC-P16 **Final Action: Reject**
(800.154(A))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. ~~Abandoned cables shall not be permitted to remain.~~ Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in <u>these</u> raceways.

Substantiation: Section 800.3(C) requires that "The accessible portion of abandoned communications cables shall not be permitted to remain.." The requirement in to remove all abandoned cables in 800.154(A) is an error from the 1999 NEC that the panel tried to correct in the last code cycle. The word "these" was added to the last sentence for editorial clarity.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-193 Log #741 NEC-P16 **Final Action: Reject**
(800.154(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the sentence as shown:

(A) Plenum <u>s</u> . Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. ~~Abandoned cables shall not be permitted to remain.~~ Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.

Substantiation: This is an editorial proposal. (Task Group No. 800-21)

Section 800.3(C) requires that "The accessible portion of abandoned communications cables shall not be permitted to remain." The requirement in to remove all abandoned cables in 800.154(A) is an error from the 1999 NEC that the panel tried to correct in the last code cycle.

The singular "Plenum" in the title was changed to the plural "Plenums" in order to be consistent with parallel sections in other articles.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-194 Log #820 NEC-P16 **Final Action: Reject**
(800.154(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the phrase as shown:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned cables shall not be permitted to remain. Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed ~~in ducts and plenums as described in 300.22(B) and~~ in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.

Substantiation: This is a technical proposal. (Task Group No. 800-35)

It is a corollary proposal to the Task Group proposal to have the listing requirements for plenum communications raceway changed to be for use in other space used for environmental air only.

The applications of communications plenum raceways should be consistent with the listing requirements.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2)improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3)make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-195 Log #2999 NEC-P16 **Final Action: Reject**
(800.154(A))

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
800.154 Applications of Listed Communications Wires and Cables and Communications Raceways.
Communications wires and cables shall comply with the requirements of 800.154(A) through 800.154(F) or where cable substitutions are made in accordance with 800.154(G)
(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned cables shall not be permitted to remain. Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.
~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~
Substantiation: This is one of three references to NFPA 13 (it is repeated identically in articles 770, 800 and 820) included in the code that is a meaningless reference. Other references to NFPA 13, in Article 362, are properly included in mandatory sections of the code (section 362.10). Whenever a jurisdiction adopts NFPA 13 they need to adopt it for mandatory sections and not for an unenforceable FPN in one section, which is intended to mislead the user. In fact, there have been several documented examples already of misrepresentation in that authorities having jurisdiction have been told that this means that sprinklers are required in plenum areas unless "limited combustible cable" is installed. I have been personally involved in two cases to date, and have heard of many more cases where this is being stated.
Section 8.14.1 of NFPA 13 (2002) reads as follows:
8.14.1 Concealed Spaces.
8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.
8.14.1.2 Concealed Spaces Not Requiring Sprinkler Protection.*
8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
8.14.1.2.2 Noncombustible and limited combustible concealed spaces with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
8.14.1.2.3 Concealed spaces formed by studs or joists with less than 6 in. (152 mm) between the inside or near edges of the studs or joists shall not require sprinkler protection. (See Figure 8.6.4.1.5.1.)
8.14.1.2.4 Concealed spaces formed by bar joists with less than 6 in. (152 mm) between the roof or floor deck and ceiling shall not require sprinkler protection.
8.14.1.2.5 Concealed spaces formed by ceilings attached directly to or within 6 in. (152 mm) of wood joist construction shall not require sprinkler protection.
8.14.1.2.6 Concealed spaces formed by ceilings attached to composite wood joist construction either directly or onto metal channels not exceeding 1 in. in depth, provided the joist channels are firestopped into volumes each not exceeding 160 ft3 (4.53 m3) using materials equivalent to the web construction and at least 3½ in. of batt insulation is installed at the bottom of the joist channels when the ceiling is attached utilizing metal channels, shall not require sprinkler protection.*
8.14.1.2.7 Concealed spaces entirely filled with noncombustible insulation shall not require sprinkler protection.
8.14.1.2.8 Concealed spaces within wood joist construction and composite wood joist construction having noncombustible insulation filling the space from the ceiling up to the bottom edge of the joist of the roof or floor deck, provided that in composite wood joist construction the joist channels are firestopped into volumes each not exceeding 160 ft3 (4.53 m3) to the full depth of the joist with material equivalent to the web construction, shall not require sprinkler protection.
8.14.1.2.9 Concealed spaces over isolated small rooms not exceeding 55 ft2 (4.6 m2) in area shall not require sprinkler protection.
8.14.1.2.10 Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread rating of 25 or less and the materials have been demonstrated not to propagate fire in the form in which they are installed shall not require sprinkler protection.
8.14.1.2.11 Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703, Standard for Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Materials, shall not require sprinkler protection.
8.14.1.2.12 Noncombustible concealed spaces having exposed combustible insulation where the heat content of the facing and substrate of the insulation material does not exceed 1000 Btu/ft2 (11,356 kJ/m2) shall not require sprinkler protection.
8.14.1.2.13 Concealed spaces below insulation that is laid directly on top of or within the ceiling joists in an otherwise sprinklered attic shall not require sprinkler protection.
8.14.1.2.14 Vertical pipe chases under 10 ft2 (0.93 m2), where provided that in multifloor buildings the chases are fire stopped at each floor using materials equivalent to the floor construction, and where such pipe chases shall contain no sources of ignition, piping shall be noncombustible, and pipe penetrations at each floor shall be properly sealed and shall not require sprinkler protection.
8.14.1.2.15 Exterior columns under 10 ft2 in area formed by studs or wood joist, supporting exterior canopies that are fully protected with a sprinkler system, shall not require sprinkler protection.
8.14.1.3 Concealed Space Design Requirements. Sprinklers in concealed spaces having no access for storage or other use shall be installed in accordance with the requirements for light hazard occupancy.
8.14.1.4 Heat Producing Devices with Composite Wood Joist Construction. Where heat-producing devices such as furnaces or process equipment are located in the joist channels above a ceiling attached directly to the underside of composite wood joist construction that would not otherwise require sprinkler protection of the spaces, the joist channel containing the heat-producing devices shall be sprinklered by installing sprinklers in each joist channel, on each side, adjacent to the heat-producing device.
8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:
(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.
(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (3.7 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction.
8.14.1.6 Sprinklers used in horizontal combustible concealed spaces (with a slope not exceeding 2 in 12) having a combustible upper surface where the assembly or supporting members channel heat and where the depth of the space is less than 36 in. from deck to deck or with double wood joist construction with a maximum of 36 in. between the top of the bottom joist and the bottom of the upper joist shall be listed for such use.*
Moreover, the NFPA13 ROP indicates the following change:
8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15 and 8.14.6.
8.14.1.2.1 Concealed spaces of noncombustible and limited combustible construction with minimal combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum. (For additional information on combustible loading See 8.14.1.2.1)*
8.14.1.2.2 Conceal d spaces of noncombustible and limited combustible construction with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
A.8.14.1.2.1 Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection.
This FPN is being misinterpreted by authorities having jurisdiction to indicate that these concealed spaces require sprinkler protection. Moreover, I have come across at least two cases (one in Massachusetts and one in California), where the authority having jurisdiction was informed by a vendor that the only cabling alternative to using sprinklers was the installation of "limited combustible cable". In fact, in one case I have worked on, the concealed space was an 8 inch high underfloor space of totally non combustible construction, which had no ducts or other parts of an air distribution system, and yet the code official had been led to the belief that cables could only be used if the space was sprinklered or the cable was "limited combustible cable".
Examples of misinformation exist and some are attached for committee members' use.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo

in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a

OHDE, H.: See my Explanation of Negative on Proposal 16-189.

16-196 Log #3089 NEC-P16 **Final Action: Reject**
(800.154(A))

Submitter: Donald Hall, Corning Cable Systems

Recommendation: Revise text as follows:

(A) Plenum. Cables installed in ducts, plenum, and other spaces used for environmental air shall be Type CMP. Abandoned cable shall not be permitted to remain. Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceway shall be permitted to be installed in ducts, plenum as described in 300.22(B) and other spaces used for environmental air as described by 300.22(C). Only Type CMP cable shall be permitted to be installed in <u>these</u> raceways.

Substantiation: Since 300.22(C) lists various metallic raceways, this editorial change will eliminate confusion about which raceways this sentence refers to. This will also harmonize it with other similar sections such as 770.154(A).

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-197 Log #3097 NEC-P16 **Final Action: Reject**
(800.154(A))

Submitter: Donald Hall, Corning Cable Systems

Recommendation: This is a companion proposal to two similiar proposals addressing the same NFPA 13 reference in Articles 770 and 820.

Delete FPN text as follows:

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: The reference to 8.14.1 of NFPA 13 is misleading and should be removed for the following reasons:

(1) The reference is related to sprinkler protection of combustible concealed spaces and their stored content. The use of a concealed space as a pathway for cables and raceway in a manner permitted by the NEC does not constitute a storage condition.

(2) The Technical Committee for NFPA 13 has never provided any <u>useful</u> guidance to indicate what quantity of cable/raceway or other circumstance might trigger requirement for communications cables to be protected by sprinklers. The Technical Committee for NFPA 13 proposed a new annex for addition to the next revision of NFPA 13 (shown below). The proposed annex is non binding, contains vague terminology, and does not add any new clarifying information, because it is identical to the existing language of the NFPA 13 Handbook. For normal circumstances in which cables and raceway are installed in accordance with the NEC and are listed by a Nationally Recognized Test Laboratory <u>"as suitable for use in ducts, plenums, and other spaces used for environmental air and as having adequate fire resistant and low smoke producing characteristics"</u> it is understood that these cables and raceways are safe and do not require additional protection from sprinklers.

(3) The cited portion of NFPA 13 is broadly applicable to all concealed spaces, not just those which handle environmental air. The selective placement of this FPN within three sections of the NEC all pertaining to plenum spaces, creates a perceived encumbrance to the permitted use of plenum cables and plenum cables alone. This perceived encumbrance is being aggressively exploited through the marketing efforts of multiple commercial interests to create a new market for their products.

NFPA 13 ROP indicates the following proposed change:

A.8.14.1.2.1 Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a

OHDE, H.: See my Explanation of Negative on Proposal 16-189.

16-198 Log #3241 NEC-P16 **Final Action: Reject**
(800.154(A))

Submitter: Frank Peri, Communications Design Corporation

Recommendation: Revise 800.154(A), as shown.

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be <u>Type CMD or</u> Type CMP. Abandoned cables shall not be permitted to remain. Types <u>CMD,</u> CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type <u>s CMD, or</u> CMP cable shall be permitted to be installed in raceways.

FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1: a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements in Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-199 Log #2812 NEC-P16 **Final Action: Accept in Part**
(800.154(A) and (B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal and that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Delete the wording "Abandoned cables shall not be permitted to remain." in the following areas:

800.154 Applications of Listed Communications Wires and Cables and Communications Raceways. No change.

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. ~~Abandoned cables shall not be permitted to remain.~~

Types CMP, CMR, CMG, CM and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and on other spaces used for environmental air as described in 300.22(C). Only Type CMP cable shall be permitted to be installed in raceways.

(B) Riser. Cables installed in risers shall comply with 800.154(B)(1), (B)(2), or (B)(3).

(1) Cables in Vertical Runs. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CMR Floor penetrations requiring Type CMR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain.~~ Listed riser communications raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CMR and CMP cables shall be permitted to be installed in these raceways.

(2) No change.

(3) No change.

Substantiation: I have submitted a proposal that would move the abandoned communications cables requirements to a more appropriate and central section within Article 800. The abandoned communications cables requirements belong in 800.24 - Mechanical Execution of Work. 800.24 is located within Part I, General which would apply to the entire Article 800.

Panel Meeting Action: Accept in Part

The panel accepts the submitter's deletion of subsection (B).

The panel rejects the submitter's revision of subsection (A).

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

See panel action on Proposal 16-143.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRUNSSEN, J.: Under "Panel Meeting Action:", revise the first sentence as follows: "The panel accepts the submitter's deletion of <u>the sentence 'Abandoned cables shall not be permitted to remain.' in</u> subsection (B)." It was this sentence that was deleted, not the entire subsection (B).

DORNA, G.: The panel statement contains an error. The panel accepted the deletion in subsection (B), not of subsection (B).

KAHN, S.: The panel statement requires correction as the panel accepted the submitter's deletion in subsection (B), not the deletion of subsection (B).

16-200 Log #2818 NEC-P16 **Final Action: Reject**
(800.154(A), FPN)

Submitter: Ronald E. Hackett, Village of Buffalo Grove

Recommendation: Delete the FPN text that follows 800.154(A).

~~FPN: See 8.14.1 of NFPA 13 (2002). Installation of Sprinkler Systems for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: As chief electrical inspector of Buffalo Grove, I do not see any reason or any technical support as why this FPN referencing 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles was added to the 2005 NEC. This FPN is very misleading and inappropriate as well. MY own personal experience as the AHJ has found that this FPN being a negative effect on the National Electrical Code which is used as an installation documentation to be in conflict with the NFPA 13.

NFPA 13 Technical Committee added new Annex A8.14.1.2.1 in the 2006 ROP #13-284, Log# 551 which should provide guidance to both the installer and AHJ for cabling in concealed spaces.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a

OHDE, H.: See my Explanation of Negative on Proposal 16-189.

16-201 Log #13 NEC-P16 **Final Action: Accept**
(800.154(B)(1))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise to read as follows:

(1) Cables in Vertical Runs. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CMR. Floor penetrations requiring Type CMR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain~~ . Listed riser communications raceways <u>and listed plenum communications raceways</u> shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CMR and CMP cables shall be permitted to be installed in these raceways.

Substantiation: Plenum raceways should be permitted to substitute for riser and general purpose raceways just as plenum cable is permitted to substitute for riser and general purpose cables.

Section 800.3(C) requires that "The accessible portion of abandoned communications cables shall not be permitted to remain.." The requirement in to remove all abandoned cables in 800.154(B) is an error from the 1999 NEC that the panel tried to correct in the last code cycle. The word "these" was added to the last sentence for editorial clarity.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-202 Log #742 NEC-P16 **Final Action: Accept**
(800.154(B)(1))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the sentence as shown:

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CMR. Floor penetrations requiring Type CMR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain.~~ Listed riser communications raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CMR and CMP cables shall be permitted to be installed in these raceways.

Substantiation: This proposal is editorial. (Task Group No. 800-22)
The requirement is in Section 800.3(C) which states that "The accessible portion of abandoned communications cables shall be removed." The removal of all abandoned cables in 800.154(B)(1) is an error from the 1999 NEC that the panel tried unsuccessfully to correct in the last code cycle
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 16-201.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-203 Log #14 NEC-P16 **Final Action: Accept**
(800.154(D)(1))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal and that further consideration be given to the comments expressed in the affirmative comments on voting. This action will be considered by the Panel as a Public Comment.
Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
(1) General. Cables shall be Type CMG or Type CM. Listed communications general-purpose raceways , listed riser communications raceways and listed plenum communications raceways shall be permitted. Only Types CMG, CM, CMR, or CMP cables shall be permitted to be installed in these ~~general-purpose~~ communications raceways.
Substantiation: Plenum and riser raceways should be permitted to substitute for general purpose raceways just as plenum and riser cables are permitted to substitute for general purpose cables.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should have been rejected by the panel as there is no 800.154(D)(1) in the 2005 NEC.
Comment on Affirmative:
BRUNSSEN, J.: The secion number as indicated on this proposal, 800.15(D)(1), is incorrect. The correct section number is 800.154.(E)(1).

16-204 Log #15 NEC-P16 **Final Action: Accept in Principle**
(800.154(E) and 800.154(E)(1))

TCC Action: The Technical Correlating Committee assumes that this proposal is directed to Article 770.
Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
(E) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 770.154(A) and 770.154(B) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways, listed riser optical fiber raceways and plenum optical fiber raceways .
(1) General. Cables shall be Type CMG or Type CM. Listed communications general-purpose raceways , listed riser communications raceways and plenum communications raceways shall be permitted. Only Types CMG, CM, CMR, or CMP cables shall be permitted to be installed in these ~~general-purpose~~ communications raceways.
Substantiation: Plenum and riser raceways should be permitted to substitute for general purpose raceways just as plenum and riser cables are permitted to substitute for general purpose cables.
Panel Meeting Action: Accept in Principle
Revise as follows:
(E) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 770.154(A) and 770.154(B) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways, listed riser optical fiber raceways, and listed plenum optical fiber raceways .
(1) General. Cables shall be Type CMG or Type CM. Listed communications general-purpose raceways , listed riser communications raceways, and listed plenum communications raceways shall be permitted. Only Types CMG, CM, CMR, or CMP cables shall be permitted to be installed in these ~~general-purpose~~ communications raceways.
Panel Statement: The addition clarifies the submitter's intent.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected as this new code language could be confusing to code-users. The revised language allows all of the cables listed to be used in riser and plenum optical fiber raceways. As long as it is clear that these riser and plenum raceways are not being used in riser and plenum applications, the use of those cables in those raceways in not a problem. However, why would anyone want to use the more expensive raceways in " other wiring within buildings" locations? This language is also in conflict with 800.154(A) which states "Only Type CMP cables shall be permitted to be installed in these raceways" and with 800.154(B)(1) which requires either plenum or riser cables to be installed in riser communications raceways.

16-205 Log #3242 NEC-P16 **Final Action: Reject**
(800.154(G))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Revise text to read:
(G) Cable Substitutions. The uses and permitted substitutions for communications cables listed in Table 800.154 shall be considered suitable for the purpose and shall be permitted. Type CMD shall be permitted to substitute for all cables in Table 800.154 and Figure 800.154.
FPN: For information on Types CMD, CMP, CMR, CMG, CM, and CMX cables, see 800.179.
Substantiation: This proposal correlates the substitution table and figure with the listing and application requirements for air duct cable.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-206 Log #2531 NEC-P16 **Final Action: Reject**
(800.154(G) and FPN to 800.154(G) (New))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 800.154(G) as shown:
(G) Cable Substitutions. The uses and permitted substitutions for communications cables listed in Table 800.154 shall be considered suitable for the purpose and shall be permitted. Type CM50 very-low-smoke cable shall be permitted to substitute for all cables in Table 800.154(G) to meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.
FPN No. 1 : For information on Types CMP, CMR, CMG, CM, and CMX cables see 800.179.
FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation: This proposal correlates with the proposal to add Type CM50 to 800.154.
There is a companion proposal for the listing and marking of Type CM50.
Panel Meeting Action: Reject
Panel Statement: Thepanel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.
This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this*

section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-207 Log #2655 NEC-P16 **Final Action: Accept in Principle in Part (800.156)**

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Add new text to read:

800.156 Dwelling Unit Communications Outlets. For new construction, a minimum of two communications outlet shall be installed; one within the master bedroom and one within the living room or kitchen, and cabled to the service provider demarcation point.

Substantiation: Currently there is no requirement for a communications outlet in a dwelling unit. A communications outlet in the home is needed for many reasons, but most important is for emergency services such as a simple call for police, fire or rescue squad.

This proposal only affects newly constructed dwelling units. In addition to the problem it solves for communications needs in a dwelling, the proposal is also targeted at safety of technicians and emergency responding personnel while enhancing the 5 key NFPA strategies to reduce fatal home fires.

1. Reduces the safety risk of electrocution to technicians where extended length drill bits (54 to 72 inches) are typically used to install cables and penetrate unseen electrical cables in the attic, wall and ceiling space. (See pictures at end of this proposal)
2. Reduces the tripping hazard for fire protection personnel during a fire.
3. Reduces the need for home wiring for communications after occupancy which typically involves tracing, handling, and snaking through electrical cable pathways and spaces such as in attics and wall cavities which creates potentially greater hazard (e.g., electrocution).
4. Increases the use of home protection systems and automation which typically includes fire detection and direct dial-up remote monitoring systems.
5. This proposal ties directly to one of the 5 key NFPA strategies to reduce fatal home fires (see attached "Fire Loss in the United States During 2002", Michael J Karter, Jr., Fire Analysis and Research Division, NFPA).
6. Places communications outlets in homes to address fire safety needs of young high user communications groups, older adults, and ADA affected.
7. A fine print note is used as a reference to a standard that specifies installation requirements such as minimum separation from power cabling and minimum requirements for cabling in support of the FCC mandate for category 3 cable or better. In addition, this standard references several NEC Articles for meeting minimum requirements.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle in Part

Add new text to 800.156 to read as follows:

800.156 Dwelling Unit Communications Outlet. For new construction, a minimum of one communications outlet shall be installed within the dwelling and cabled to the service provider demarcation point.

Panel Statement: The requirement for at least one outlet within the dwelling meets the submitter's intent.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-208 Log #2297 NEC-P16 **Final Action: Accept (800.170, FPN)**

Submitter: Thomas J. Burke, Jr., Underwriters Laboratories

Recommendation: Revise text to read as follows:

800.170 Equipment. Communications equipment shall be listed as being suitable for electrical connection to a telecommunications network.

FPN: One way to determine applicable requirements is to refer to UL ~~1950 1993~~ 60950-1-2003 , *Standard for Safety of Information Technology Equipment* , ~~*Including Electrical Business Equipment,*~~ ~~third edition~~ ; UL 1459-1995, *Standard for Safety, Telephone Equipment,* ~~third edition;~~ or UL 1863- ~~1995~~ 2004 , *Standard for Safety, Communications Circuit Accessories* , ~~second edition~~ . For information on listing requirements for communications raceways, see UL 2024 ~~1995~~ 2004 , *Standard for Optical Fiber and Communication Cable Raceways.*

Substantiation: UL 60950-1 has replaced UL 1950 for safety of information technology equipment (ITE). The title of the Standard also has been revised. UL 1863 and UL2024 also have later editions than currently indicated.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-209 Log #1880 NEC-P16 **Final Action: Accept (800.179)**

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: Revise first paragraph of 800.179 **Communications Wires and Cables** , as follows:

800.179 Communications Wires and Cables. Communications wires and cables shall have a voltage rating of not less than 300 volts and shall be listed in accordance with 800.179(A) through 800.179(J). The insulation for the individual conductors shall be rated for 300 volts minimum. Conductors in communications cables, other than in a coaxial cable, shall be copper.

Substantiation: This proposal clarifies the requirement and establishes consistent wording with 830.179(A)(1) and 830.179(A)(2). The wording in 830 is more explicit and clear. The required rating has to coordinate with the requirement for provision of a listed primary protector in 800.90. Section 800.90 requires a primary protector if the circuit is exposed to accidental contact with electric light or power conductors operating at over 300 volts to ground. This means that the insulation rating of individual conductors is the relevant parameter in this section.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-210 Log #3285 NEC-P16 **Final Action: Reject (800.179)**

Submitter: Sanford Egesdal, Egesdal Associates PLC

Recommendation: Revise 800.179 and reformat as shown.

Communications wires and cables shall have a voltage rating of not less than 300 volts , a conductor insulation rating of not less than 60ºC, and shall be listed in accordance with 800.179(A) through 800.179(J). Conductors in communications cables, other than in a coaxial cable, shall be copper. Communications cables shall be marked with the temperature rating of the insulation immediately following the Type designation.

FPN No. 1 : See 800.170 for listing requirement for equipment.

FPN No. 2: For more information, see 310.10 Temperature Limitation of Conductors.

FPN No. 3: Building codes may have a cable insulation temperature requirement as high as 200ºC.

FPN No. 4: An example of the marking is CMP 200ºC indicating a plenum cable rated at 200ºC.

Substantiation: Presently, this article does not have a temperature rating requirement on conductor insulation.

Communications cables on the market today are typically listed with a 60ºC temperature rating on the conductors. Some building codes require a temperature rating as high as 200ºC.

Communications cables are permitted to substitute for fire alarm cables so need to be permitted to have the same rating requirements as power-limited fire alarm cables.

UL 444 Communications Cables standard provides for testing and marking the conductor insulation rating: 60ºC to 250ºC.

By referencing to 310.10, users will be aware that a cable with a temperature rating higher than 60ºC is required to meet a high temperature application. For information 310.10 follows:

310.10 Temperature Limitation of Conductors.

No conductor shall be used in such a manner that its operating temperature exceeds that designated for the type of insulated conductor involved. In no case shall conductors be associated together in such a way, with respect to type of circuit, the wiring method employed, or the number of conductors, that the limiting temperature of any conductor is exceeded.

FPN No. 1: The temperature rating of a conductor (see Table 310.13 and Table 310.61) is the maximum temperature, at any location along its length, that the conductor can withstand over a prolonged time period without serious degradation. The allowable ampacity tables, the ampacity tables of Article 310 and the ampacity tables of Annex B, the correction factors at the bottom of these tables, and the notes to the tables provide guidance for coordinating conductor sizes, types, allowable ampacities, ampacities, ambient temperatures, and number of associated conductors.

The principal determinants of operating temperature are as follows:

(1) Ambient temperature — ambient temperature may vary along the conductor length as well as from time to time.

(2) Heat generated internally in the conductor as the result of load current flow, including fundamental and harmonic currents.

(3) The rate at which generated heat dissipates into the ambient medium. Thermal insulation that covers or surrounds conductors affects the rate of heat dissipation.

(4) Adjacent load-carrying conductors — adjacent conductors have the dual effect of raising the ambient temperature and impeding heat dissipation.

FPN No. 2: Conductors installed in conduit exposed to direct sunlight in close proximity to rooftops have been shown, under certain conditions, to experience a temperature rise of 17°C (30°F) above ambient temperature on which the ampacity is based.

Panel Meeting Action: Reject

Panel Statement: Manufacturers have the option to mark cables that meet a higher standard.

The panel sees no reason to make this change, since the existing requirement, which has been in existance for a long time is well established.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-211 Log #744 NEC-P16 **Final Action: Accept**
(800.179(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change cable to cables as shown:
(A) Type CMP. Type CMP communications plenum cable s shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.
FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces* .
Substantiation: This is a editorial proposal. (Task Group No. 800-24)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular".
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

(Note: Sequence 16-212 was not used)

16-213 Log #745 NEC-P16 **Final Action: Accept**
(800.179(B))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change cable to cables as shown:
(B) Type CMR. Type CMR communications riser cable s shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.
FPN: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-2002, *Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.*
Substantiation: This is an editorial proposal. (Task Group No. 800-25)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular".
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-214 Log #1428 NEC-P16 **Final Action: Accept**
(800.179(C), FPN)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
FPN: One method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M- ~~1985~~ 2001 , Test Methods for Electrical Wires and Cables.
Substantiation: The revised wording is an update of the standard references and not a change in the test method.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-215 Log #746 NEC-P16 **Final Action: Accept**
(800.179(D))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change cable to cables as shown:
(D) Type CM. Type CM communications cable s shall be listed as being suitable for general-purpose communications use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire.
FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* . Another method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, *Test Method for Electrical Wires and Cables* .
Substantiation: This is an editorial proposal. (Task Group No. 800-26)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular".
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-216 Log #747 NEC-P16 **Final Action: Accept**
(800.179(D))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change cable to cables as shown:
((D) Type CM. Type CM communications cable s shall be listed as being suitable for general-purpose communications use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire.
FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* . Another method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, *Test Method for Electrical Wires and Cables* .
Substantiation: This is an editorial proposal. (Task Group No. 800-27)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular".
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-217 Log #1427 NEC-P16 **Final Action: Accept**
(800.179(D), 800.179(I), and 800.179(J) FPNs, FPN)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the " UL Flame Exposure , Vertical Tray Flame Test" in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords.~~ UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.
Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M- ~~1985~~ 2001 , Test Methods for Electrical Wires and Cables.
Substantiation: The revised wording is an update of the standard references and not a change in the test methods. UL 1581 now references UL 1685 for the text of the test method.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-218 Log #2384 NEC-P16 **Final Action: Reject**
(800.179(E))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Revise as follows:
(E) Type CMX. Until January 1, 2011, Type CMX limited-use communications cable shall be permitted to be listed as being suitable for use

in dwellings and for use in raceway and shall also be listed as being resistant to flame spread.

FPN: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords.*

Substantiation: The Society of the Plastics Industry, Inc. (SPI) has a long history of supporting enhanced fire safety through our participation in codes and standards development. Type CMX cable is at the bottom of the cable fire resistance hierarchy. It has very limited use in the NEC. Elimination of CMX will simplify cable selection and reduce the potential for misuse of this minimally fire-resistant cable. Cable technology has moved beyond this cable; it's an anachronism. This proposal, if accepted, gives manufacturers, distributors and installers plenty of time to comply. If this proposal is accepted, Type CM cable will be the minimum acceptable cable from a fire resistance viewpoint.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided sufficient technical substantiation.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-219 Log #748 NEC-P16 **Final Action: Accept**

(800.179(F))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Change cable to cables as shown:

(F) Type CMUC Undercarpet Wire and Cable. Type CMUC undercarpet communications wire s and cable s shall be listed as being suitable for undercarpet use and shall also be listed as being resistant to flame spread.

FPN: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords*

Substantiation: This is an editorial proposal. (Task Group No. 800-28)

Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular".

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-220 Log #17 NEC-P16 **Final Action: Reject**

(800.179(G))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Delete as follows:

~~**(G) Multipurpose (MP) Cables.** Until July 1, 2003, cables that meet the requirements for Types CMP, CMR, CMG, and CM and also satisfy the requirements of 760.82(B) for multiconductor cables and 760.82(H) for coaxial cables shall be permitted to be listed and marked as multipurpose cable Types MPP, MPR, MPG, and MP, respectively.~~

Substantiation: The panel tried to eliminate multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.

Panel Meeting Action: Reject

Panel Statement: See panel action on Proposal 16-221.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-221 Log #749 NEC-P16 **Final Action: Reject**

(800.179(G))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the following:

~~**(G) Multipurpose (MP) Cables.** Until July 1, 2003, cables that meet the requirements for Types CMP, CMR, CMG, and CM and also satisfy the requirements of 760.82(B) for multiconductor cables and 760.82(H) for coaxial cables shall be permitted to be listed and marked as multipurpose cable Types MPP, MPR, MPG, and MP, respectively.~~

Re-letter the remaining subsections as shown:

(G ~~H~~) Communications Circuit Integrity (CI) Cable. Cables suitable for use in communications systems to ensure survivability of critical circuits during a specified time under fire conditions shall be listed as circuit integrity (CI) cable. Cables identified in 800.90(A) , (B), (C), (D), and (E) that meet the requirements for circuit integrity shall have the additional classification using the suffix "CI."

FPN: One method of defining circuit integrity (CI) cable is by establishing a minimum 2-hour fire resistance rating for the cable when tested in accordance with UL 2196-1995, *Standard for Tests of Fire Resistive Cables* .

(H ~~I~~) Communications Wires. Communications wires, such as distributing frame wire and jumper wire, shall be listed as being resistant to the spread of fire.

FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* . Another method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, *Test Methods for Electrical Wires and Cables* .

(I ~~J~~) Hybrid Power and Communications Cable. Listed hybrid power and communications cable shall be permitted where the power cable is a listed Type NM or NM-B conforming to the provisions of Article 334 , and the communications cable is a listed Type CM, the jackets on the listed NM or NM-B and listed CM cables are rated for 600 volts minimum, and the hybrid cable is listed as being resistant to the spread of fire.

FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* . Another method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, *Test Methods for Electrical Wires and Cables* .

Substantiation: This proposal is editorial. (Task Group No. 800-29)

Multipurpose cables are no longer recognized. The panel tried to eliminate multipurpose cables in the last code cycle and succeeded in removing most references to multipurpose cables. This is a cleanup proposal to remove the remaining traces.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: Although the listing requirements for multipurpose cables only permitted listing until July 1, 2003, the panel is not able to accept the deletion of the text dealing with multipurpose cables, because of the directives of NFPA staff and NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

STENE, S.: This proposal is editorial. This subsection should have been deleted during the removal of the other items related to multipurpose cables during the last code cycle.

16-222 Log #750 NEC-P16 **Final Action: Accept**

(800.179(J))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Change cable to cables as shown:

(J) Hybrid Power and Communications Cable s . Listed hybrid power and communications cable s shall be permitted where the power cable is a listed Type NM or NM-B conforming to the provisions of Article334, and the communications cable is a listed Type CM, the jackets on the listed NM or NM-B and listed CM cables are rated for 600 volts minimum, and the hybrid cable is listed as being resistant to the spread of fire.

FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* . Another method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, *Test Methods for Electrical Wires and Cables* .

Substantiation: This is an editorial proposal. (Task Group No. 800-31)

Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular".

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-223 Log #2532 NEC-P16 **Final Action: Reject**
(800.179(K))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Insert new 800.179(K)
(K) Type CM50. Type CM50 cables shall be listed as suitable for installation in concealed spaces having restrictive requirements for smoke generation, combustible loading, and flame spread and shall be listed as having very-low-smoke producing characteristics, a low potential heat release value, and low flame spread characteristics.
FPN: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*
FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
FPN No. 3: Building codes adopted by code jurisdictions may contain restrictions on permissible flame spread index and smoke developed index.
Substantiation: This proposal establishes a listing and marking for cable permitted as an electrical wiring option in concealed spaces where a smoke developed index no greater than 50 is required or large quantities of cable may cause combustible loading. The proposed cable has very-low-smoke-producing characteristics, a low potential heat release value, and low flame spread characteristics. Presently, a number of manufacturers have cables listed to the proposed requirements.

The testing criteria are based on the requirements found in NFPA 13-2003 and the 2003 International Mechanical Code, as revised.

NFPA 13, Section 8.14.1.2.1 follows: "Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum." The proposed cable has a very low heat of combustion. While the term "combustible loading" is not defined, the fuel load can be calculated to determine the potential hazard from large quantities of cable.

The 2003 International Mechanical Code, 602.2.1, requires materials in plenums to be noncombustible or have a flame spread index no greater 25 and a smoke index no greater than 50. At the recent ICC meeting in Detroit, exception #5 to 602.2.1 was revised to include "combustible material (electrical wiring) installed in noncombustible raceways or enclosures." The requirements in IMC 602.2.1.1 permits cables meeting NFPA 262 test requirements. Cables meeting NFPA 262 requirements, according to Fire Protection Research Foundation testing using NFPA 255, have a smoke developed index that varies between 450 and 850. The proposed cable meets the requirements of the base paragraph, 602.2.1.

The following (change is underlined) shows the result of action on IMC public comment on M 77 (floor actions in Detroit, September 2005).

602.2.1 Materials exposed within plenums. Except as required by Sections 602.2.1.1 through 602.2.1.5, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84.

Exceptions:

1. Rigid and flexible ducts and connectors shall conform to Section 603.
2. Duct coverings, linings, tape and connectors shall conform to Sections 603 and 604.
3. This section shall not apply to materials exposed within plenums in one- and two-family dwellings.
4. This section shall not apply to smoke detectors.
5. Combustible materials enclosed in noncombustible raceways or enclosures, approved gypsum board assemblies or enclosed in materials listed and labeled for such application.

602.2.1.1 Wiring. Combustible electrical or electronic wiring methods and materials, optical fiber cable, and optical fiber raceway exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread not greater than 5 feet (1524 mm) when tested in accordance with NFPA 262. Only type OFNP (plenum rated nonconductive optical fiber cable) shall be installed in plenum-rated optical fiber raceways. Wiring, cable, and raceways addressed in this section shall be listed and labeled as plenum rated and shall be installed in accordance with ICC *Electrical Code* .

The Fire Protection Research Foundation report demonstrated that NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* , provides a suitable test method for establishing the cable characteristics (flame spread index & smoke developed index) specified in the FPN.

Establishing a listing and marking for a Type FPL50 cable provides a wiring option for complying with requirements of other standards and building codes. The NEC has previously established listings and markings for cable to correlate with other codes and standards. Additionally, the listing and marking may or may not have a specific application. Specific examples follow:

1. Type CMG cable was included in the 1993 NEC to correlate with the Canadian Electrical Code. The change was proposed by the Chair of NEC TCC, Harold Ware and Roy Hicks from Canada. Type CMG has a listing and marking in the NEC. Article 800 permits "Type CM or Type CMG" to be installed as a general purpose cable. Note: Type CMG does not have a unique application, and neither cable is considered a minimum requirement.
2. Types MP, MPR, and MPP cable was included in the 1990 NEC. The cables had a listing and marking. The multiple-purpose cables were permitted to substitute for similar cables in Articles 725, 760, & 800. Note: Types MP, MPR, and MPP cables do not have a unique application, just a listing and marking.
3. A change to the 1999 NEC permitted Types NPLF, NPLFR, NPLFP, FPL, FPLR, and FPLP to have a "-CI" suffix. The change included only listing and marking requirements. This change to the NEC correlated with NFPA 72, National Fire Alarm Code, requirements for a circuit integrity cable. Note: Cables with a "-CI" suffix did not have an application, until changes were made to the 2005 NEC.
4. A change to the 2005 NEC permitted Types CM, CMR and CMP to have a "-CI" suffix. As of today, no company has a listed circuit integrity using the permitted markings. Note: Types CM-CI, CMR-CI, and CMP-CI do not have an application, just a listing and marking.

Panel Meeting Action: Reject
Panel Statement: The submitter did not provide adequate technical substantiation to support a need for a cable listed for concealed spaces.

Concealed spaces should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-224 Log #3243 NEC-P16 **Final Action: Reject**
(800.179(K) (New))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Add new 800.179(K), as follows:
(K) Type CMD. Type CMD air duct cable shall be listed as being suitable for use in ducts, plenums, and other space used for environmental air and shall also be listed as having adequate fire-resistant, very low smoke-producing characteristics, and very low potential heat release.
FPN No: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1:a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements of Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

The following is an example of air duct cable information from the UL Web Site:

OWKZ.GuideInfoLimited Combustible Cable

Guide Information for Electrical Equipment for Use in Ordinary Locations

GENERAL

This category covers electrical and optical fiber cable that meets the limited combustible and smoke developed requirements for cable in ceiling cavity and raised floor plenums in accordance with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems." This cable also meets the requirements for cable used in ducts, plenums and other spaces used for environmental air in accordance with Articles 725, 760, 770, 800, 820 and 830 of ANSI/NFPA 70, "National Electrical Code".

This cable has a maximum Potential Heat value of 3500 Btu/lb when tested in accordance with NFPA 259, "Standard Test Method for Potential Heat of Building Materials." This cable has a maximum smoke developed index of 50 and a maximum flame spread index of 25 when tested in accordance with UL 723 (NFPA 255), "Test for Surface Burning Characteristics of Building Materials" before and after exposure to elevated temperature and humidity. The cable also meets the requirements for plenum cable in one or more of the following product categories:

· Power-limited Circuit Cable (**QPTZ**) - Types CL2P or CL3P
· Communications Cable (**DUZX**) - Type CMP
· Power-limited Fire Alarm Cable (**HNIR**) - Type FPLP
· Nonpower-limited Fire Alarm Cable (**HNHT**) - Type NPLFP
· Optical Fiber Cable (**QAYK**) - Types OFNP or OFCP
· Community Antenna Television Cable (**DVCS**) - Type CATVP
· Network-powered Broadband Communications Cable (**PWIP**) - Type BLP

PRODUCT MARKINGS

This cable is identified by the marking "Limited Combustible FHC 25/50" on the surface of the jacket or on a marker tape under the jacket. This marking is immediately followed by one of the Type designations shown above. The cable also has the required markings including optional markings as indicated in the product categories referenced above. This cable may also be Verified for transmission performance if authorized in the product categories referenced above, and will bear the appropriate performance verification marking.

ADDITIONAL INFORMATION

For additional information, see Electrical Equipment for Use in Ordinary Locations (**AALZ**).

REQUIREMENTS

The basic requirements used to investigate products in this category are contained in Subject 2424, "Outline of Investigation for Cable Marked 'Limited Combustible.'"

UL MARK

The UL symbol on the product and the Listing Mark of Underwriters Laboratories Inc. on the attached tag, the reel, or the smallest unit container in which the product is packaged is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and the product name "Limited Combustible Cable."

Cable which is also Verified to the UL Data Transmission Performance Category Marking Program has the marking "Verified to UL Performance Category Program," or the UL Verification Mark along with the words "Performance Category Program" together with the Listing Mark information on the tag, the reel, or the smallest unit container. Cable which is also Verified to another transmission performance specification has the marking "Verified in Accordance with [Specification name and/or number]" or the UL Verification Mark along with the applicable Specification name and/or number together with the Listing Mark information on the tag, the reel, or the smallest unit container.

Last Updated on 2004-03-24

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-225 Log #3634 NEC-P16 **Final Action: Reject**
(800.179(K) (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Add new text as follows:

<u>**(K) Concealed Space Cables.** Cables that meet the requirements for Type CM that are also listed as having a low potential heat value, low flame spread characteristics, and low smoke producing characteristics shall be permitted to be listed and marked as concealed space cables Type CM-CS.</u>

<u>FPN: One method of defining a low flame spread and low smoke-producing cable is that the cable exhibits a maximum flame spread distance of 1.52 m (5 ft), a maximum peak optical density of 0.5 and a maximum average optical density of 0.15 when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*</u>

Substantiation: The purpose of this proposal is to provide listing and marking for a cable that will be suitable for use in concealed spaces where there are large quantities of cables. Users would have the option of using these cables to avoid establishing a fuel load above the threshold where the quantity of cables would be considered a combustible loading. Also, these cables provide a flame spread index and a smoke developed index that correlate with the requirements for exposed materials within concealed spaces in buildings.

Cables tested using NFPA 255 and 259 establish parameters commonly used in NFPA standards and building codes: smoke developed index, smoke developed index, and heat of combustion. This proposal uses the NFPA 262 test in place of NFPA 255. The Fire Protection Research Foundation's *International Limited Combustible Plenum Cable Fire Test Project* (copy attached) has shown that both of these tests are suitable and provided data (page 18 of the report) for setting equivalent criteria in the two tests. A maximum average optical density of 0.17 in NFPA 262 is equivalent to a smoke developed index of 450 in NFPA 255. This proposal sets the maximum optical density requirement at 0.15 to allow for a margin of error and to correlate with the existing requirements for plenum cable.

NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading. Combustible loading is a function of the density (number) of cables and their potential heat release determined by NFPA 259.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics*** . I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer

wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of this article need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or preferably avoid the buildup of combustible cables that would result in a combustible loading. Use of concealed space cables would be an option in a strategy to avoid establishing a combustible loading.

A flame spread index of 25 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

A smoke developed index of 450 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

The following requirements are from NFPA 5000-2003 identify heat of combustion, flame spread, and smoke as major concerns:

Chapter 4 General

4.4.7 Limiting Fire Spread.

4.4.7.1 Interior Finishes. The interior surfaces of the building shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.4.7.2 Concealed Spaces. The construction of concealed spaces shall not contribute to an unacceptable rate of the spread of fire, hot gases, and smoke to areas of the building remote from the fire source and shall limit their spread beyond the immediate area of the origin of the fire.

4.4.7.3 Compartmentation. The building shall be compartmented, as appropriate, by walls and floors, including their associated openings with proper closures, to limit the spread of fire, hot gases, and smoke to an acceptable area beyond the immediate area of fire origin.

Chapter 8 Fire-Resistive Materials and Construction

8.1 General.

8.1.1 The chapter addresses fire protection features intended to restrict or resist the spread of fire and smoke beyond the compartment of fire origin.

8.1.2 Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict or resist the movement of smoke.

8.1.2.1* Fire compartments shall be formed with fire barrier walls that comply with Section 8.4 or horizontal assemblies that comply with Section 8.6, or a combination of both.

8.1.2.2 Smoke compartments shall be formed with smoke barriers that comply with Section 8.11.

8.16 Insulating Materials.

8.16.7 Insulation and Covering on Pipe and Tubing. Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke developed index of not more than 450.

Chapter 10 Interior Finishes

10.3.2* Products required to be tested in accordance with NFPA 255 or ASTM E 84 shall be grouped in the classes described in 10.3.2(A) through 10.3.2(C) in accordance with their flame spread and smoke development, except as indicated in 10.3.3.

(A) Class A Interior Wall and Ceiling Finish. Class A interior wall and ceiling finishes shall be those finishes with a flame spread of 0–25 and smoke development of 0–450 and shall include any material classified at 25 or less on the flame spread test scale and 450 or less on the smoke test scale. Any element thereof, when so tested, shall not continue to propagate fire.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide adequate technical substantiation to support a need for a concealed space listed cable.

Concealed spaces should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-226 Log #751 NEC-P16 **Final Action: Reject**
(800.182(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the phrase as shown:

(A) Plenum Communications Raceways. Plenum communications raceways <u>shall be listed for use in other spaces used for environmental air</u> ~~listed as plenum optical fiber raceways shall be permitted for use in ducts, plenums, and other spaces used for environmental air~~ and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining that an optical fiber raceway is a low smoke producing raceway and a fire-resistant raceway is that the raceway exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with the plenum test in UL 2024, *Standard for Optical Fiber Cable Raceway* .

Substantiation: This proposal is a technical change. (Task Group No. 800-31)

It arose because the task group noticed that the listing requirements for plenum raceway were not consistent across the CMP-16 Articles.

It makes the listing requirements for plenum communications raceways the same as those for CATV raceways. Initially the listing requirements for plenum communications raceways referenced optical fiber raceways because the issue of NFPA 90A current at the time only had requirements for optical fiber raceways and NFPA 90A had primary responsibility for combustible in plenums. NFPA 90A has been revised and now permits plenum communications raceways; hence this requirement can be revised also. Furthermore listing these raceways for use in "other space used for environmental air" and not for use in ducts or other plenums is consistent with the requirements of NFPA 90A. The term "other space used for environmental air" is equivalent to the spaces in NFPA 90A as ceiling cavity plenums plus raised floor plenums.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

ARTICLE 810 — RADIO AND TELEVISION EQUIPMENT

16-227 Log #1551 NEC-P16 **Final Action: Accept**
(810)

TCC Action: The Technical Correlating Committee understands that the revisions in 810.54, Exception were to be made to the existing Exception text.

The Technical Correlating Committee directs the panel to correct the Exceptions to 810.57 to make them into complete sentences. This action will be considered by the panel as a public comment.

Submitter: Technical Correlating Committee on National Electrical Code®,
Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 810 and revise text as shown for the affected NEC sections.

810.20(A) Exception:

Exception: Where the lead-in conductors are enclosed in a continuous metallic shield that either is ~~permanently and effectively~~ grounded with a conductor in accordance with 810.21 or is protected by an antenna discharge unit.

810.21(F)(3):

(3) If the building or structure served has no grounding means, as described in 810.21(F)(1) or (F)(2), ~~to an effectively grounded metal structure or~~ to any of the individual electrodes described in 250.52

810.54 Exception:

Exception No. 1: Where protected by a continuous metallic shield that is ~~permanently and effectively~~ grounded with a conductor in accordance with 810.58 .

810.55 Except where protected with a continuous metallic shield that is ~~permanently and effectively~~ grounded with a conductor in accordance with 810.58 , lead-in conductors for transmitting stations shall enter buildings by one of the following methods: …

810.57 Exception No. 1:

Exception No. 1: Where protected by a continuous metallic shield that is ~~permanently and effectively~~ grounded with a conductor in accordance with 810.58 .

810.57 Exception No. 2:

Exception No. 2: Where the antenna is ~~permanently and effectively~~ grounded with a conductor in accordance with 810.58 .

810.71(B):

(B) Grounding of Controls. All external metal handles and controls accessible to the operating personnel shall be ~~effectively~~ connected to an equipment grounding conductor if the transmitter is powered by the premises wiring system or grounded with a conductor in accordance with 810.21 .

Substantiation: 810.20(A) Exception: The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective." Revise to be more specific and prescriptive for the users.

810.21(F)(3): The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

Here the reference to "effectively grounded metal structure" seems superfluous.

810.54 Exception: The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

Reference to 810.58 is proposed to replace appropriate here.

810.55: The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

Revise to be more specific and prescriptive for the users. Reference to 810.58 is proposed to replace appropriate here.

810.57 Exception No. 1: The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

Reference to 810.58 is proposed to replace appropriate here.

810.57 Exception No. 2: The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

Revise to be more specific and prescriptive for the users. Reference to 810.58 is proposed to replace appropriate here.

810.71(B): The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

Revise to be more specific and prescriptive for the users by requiring the connection to an equipment grounding conductor.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-228 Log #373 NEC-P16 **Final Action: Reject**
(810(5))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:

"...They shall not be exposed to ~~physical~~ damage...".

Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")

Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: The grounding conductor is potentially subject to multiple sources of damage: electrical, physical, and environmental. The word "physical" is necessary to specifically identify the type of damage that the section is addressing.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-229 Log #2830 NEC-P16 **Final Action: Reject**
(810.3)

Submitter: John Kacpenski, Western Telecommunications Consulting (WTC)
Recommendation: Add new text as follows:

810.3 Other Articles.

Penetrations of the fire-resistant room boundary shall be in accordance with 300.21. The accessible portion of abandoned network-powered communications cables shall not be permitted to remain.

Substantiation: This addition will harmonize this Article's text with the following: 725.3(B), 760.3(A), 770.3(A), 800.3(C), 820.3(A), and 830.3(A) - Also, being proposed for Article 645.7.
Panel Meeting Action: Reject
Panel Statement: "Network-powered communications cables" don't exist. However, see Article 830 for network-powered broadband communications cables.

The submitter's intent was not clear. The submitter is encouraged to review the proposal and resubmit for the ROC.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-230 Log #2315 NEC-P16 **Final Action: Reject**
(810.15 Exception)

Submitter: Robert Dudley, Amerisat Inc.
Recommendation: Revise text to read:
Exception: Masts and metal structures supporting antennas, not electrically connected to lead-in conductors and mounted to nonconductive material, do not require grounding.
Substantiation: In those instances where the lead-in conductors are not electrically connected to the mast or metal supporting structures and the mast is mounted to a nonconductive surface such as brick, wood, or block, the mast and supports should be exempt from this section's grounding requirement. This isolation inhibits surges from entering the location. This includes all accessible mounting locations, including those locations which are not the highest point on the structure.
Note: Supporting Material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The submitter apparently proposes to add an exception to 810.15. A metallic structure such as an antenna support assembly or mast, when mounted to non-conductive surfaces such as masonry, roofing, wood, or vinyl, should be grounded to reduce the possibility of flash-over and risk of fire in the event of a lightning strike.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-231 Log #852 NEC-P16 **Final Action: Accept**
(810.18(A))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(A) Outside of Buildings Lead-in conductors attached to buildings shall be installed so that they cannot swing closer than 600 mm (2 ft) to the conductors of circuits of 250 volts or less between conductors, or 3.0 m (10 ft) to the conductors of circuits of over 250 volts between conductors, except that in the case of circuits not over 150 volts between conductors, where all conductors involved are supported so as to ensure permanent separation, the clearance shall be permitted to be reduced but shall not be less than 100 mm (4 in.). The clearance between lead-in conductors and any conductor forming a part of a lightning protection ~~rod~~ system shall not be less than 1.8 m (6 ft) ~~unless the bonding referred to in 250.60 is accomplished~~ . Underground conductors shall be separated at least 300 mm (12 in.) from conductors of any light or power circuits or Class 1 circuits.
Exception: Where the electric light or power conductors, Class 1 conductors, or lead-in conductors are installed in raceways or metal cable armor.
FPN No.1: See 250.60 for use of air terminals. For further information, see NFPA 780-2004, Standard for the Installation of Lightning Protection Systems, which contains detailed information on grounding, bonding, and spacing from lightning protection systems.
FPN No. 2: Metal raceways, enclosures, frames, and other non-current-carrying metal parts of electric equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780-2004, Standard for the Installation of Lightning Protection Systems. Separation from lightning protection conductors is typically 1.8 m (6 ft) through air or 900 mm (3 ft) through dense materials such as concrete, brick, or wood.
Substantiation: The term "lightning protection system" is more accurate than "lighting rod system". 250.60 and 250.106 were revised in recent cycles to remove specific separation distances required between down leads of lighting protection systems and other systems or metal parts which has more to do with installations of those systems. This information should be covered by the requirements in NFPA 780. It appears that this same separation requirement is still left in this section and is no longer needed. The FPNs are identical to those following 250.106 and provide the information and references users need relative to what is required for separation and what Standard applies. Ground terminals of lightning protection systems are required to be bonded to the power system grounding electrodes as specified in 250.106.
810.21(J) requires the electrode for the radio and antenna equipment to be bonded to the power system electrode with bonding jumper not smaller than 6 AWG copper or equivalent.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-232 Log #3354 NEC-P16 **Final Action: Reject**
(810.21(A))

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Revise text to read:
810.21 Grounding Conductors — Receiving Stations. Grounding conductors shall comply with 810.21(A) through 810.21(K).
(A) Material. The grounding conductor shall be of copper, aluminum, copper-clad steel, bronze, or similar corrosion-resistant material. Bare aluminum ~~Aluminum~~ or copper-clad aluminum grounding conductors shall not be used where in direct contact with masonry or the earth or where subject to corrosive conditions. Where used outside, aluminum or copper-clad aluminum grounding conductors shall not be ~~installed~~ terminated within 450 mm (18 in.) of the earth.
Substantiation: The language should be changed to be consistent with that of 260.66(A). Aluminum conductors are commonly used outside such as for service drops, service laterals. The issue is with bare conductors and the termination of aluminum conductors.
Panel Meeting Action: Reject
Panel Statement: The proximity of the grounding conductor to the earth is the requirmment of the section. Further, no additional technical justification was provided.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-233 Log #1254 NEC-P16 **Final Action: Reject**
(810.21(A) and (D))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Revise last sentence of (A): Where used outside, aluminum or copper-clad aluminum not in a rigid type raceway, and connections to a grounding electrode, shall not be installed within 450 mm (18 in.) of the earth.
(D) Insert as second sentence: The grounding conductor shall be permitted to be protected by a rigid type conduit, electrical metallic tubing, or cable armor. Revise last sentence: Where the grounding conductor is run in a metal ~~raceway~~ conduit, electrical metallic tubing, or cable armor , both ends of the raceway or cable armor shall be bonded...(remainder unchanged)
Substantiation: It is unclear whether the intent of this requirement was to apply to open conductors or conductors in a rigid raceway such as conduit or tubing. Metal "raceway" includes flexible metal conduits, which may provide choke effects to high frequency lightning induced currents.
Panel Meeting Action: Reject
Panel Statement: The submitter does not provide adequate technical substantiation.
It is not necessary to provide an all-inclusive list of the types of metal raceways that may be encountered.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-234 Log #374 NEC-P16 **Final Action: Reject**
(810.21(D))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
"...The grounding conductor shall be protected where exposed to ~~physical~~ damage...".
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The grounding conductor is potentially subject to multiple sources of damage: electrical, physical, and environmental. The word "physical" is necessary to specifically identify the type of damage that the section is addressing.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-235 Log #857 NEC-P16 **Final Action: Accept**
(810.21(D))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(D) Mechanical Protection. The grounding conductor shall be protected where exposed to physical damage, ~~or the size of the grounding conductors shall be increased proportionately to compensate for the lack of protection~~ .

Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or to the same terminal or electrode to which the grounding conductor is connected.

Substantiation: This requirement in its current form is vague and unenforceable. There are no specific parameters to establish a starting point for making a proportional adjustment in size from the minimum sizes provided in 810.21(H) to compensate for the lack of protection. In its current form, this text is subjective and leads to inconsistencies in enforcement due to the lack of specific parameters. How much of a proportional increase is enough? This section should provide enforcement only with language that can be used to require physical protection where it is judged that the grounding conductor would be subjected to.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-236 Log #1891 NEC-P16 **Final Action: Accept**

(810.21(F))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-20. This action will be considered by the Panel as a Public Comment.

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: Revise 810.21(F) **Grounding Conductors — Receiving Stations. (Electrode)** as follows:

(F) Electrode. The grounding conductor shall be connected as follows:

(1) In Buildings or Structures with an Intersystem Grounding Termination. If the building or structure served has an intersystem grounding termination the grounding conductor shall be connected to the intersystem grounding termination.

(~~1~~) (2) In Buildings or Structures with Grounding Means. If the building or structure served has no intersystem grounding termination, the grounding conductor shall be connected to the nearest accessible location on the following:

....

..................Retain existing list and text.

....

~~(2)~~ **(3) In Buildings or Structures Without Intersystem Grounding Termination or Grounding Means.** If the building or structure served has no intersystem grounding termination or grounding means, as described in 810.21(F)(1),

a) to any one of the individual electrodes described in 250.52; or

b) ~~(3)~~ If the building or structure served has no grounding means, as described in 810.21(F)(1) or (F)(2), to an effectively grounded metal structure ~~or to any of the individual electrodes described in 250.52.~~

Substantiation: This is one of several correlated proposals (100 Definitions, 250.95, Chapter 8 Articles) to improve the requirements related to intersystem bonding and grounding of communication systems. The intent is to create a dedicated and well-defined location for terminating the grounding conductors required in Chapter 8 Articles and accomplishing the intersystem bonding between communication and power systems. The proposed termination would have sufficient capacity to handle multiple communication systems (telecom, satellite, cable) on premises. The proposed revision makes the intersystem bonding terminal the preferred destination for grounding conductor in Article 810. See the figures I have provided.

Intersystem bonding accomplished by connection of a communication grounding conductor to the power system is an important safety measure to prevent occurrences of voltages between communication system and power system. However, the existing requirements are not adequate. Bonding is becoming difficult to implement due to changes in building construction practices such as increased prevalence of flush construction and use of PVC conduits. Frequently, in new construction, the grounding electrode, the raceway and the grounding electrode conductor are hidden behind walls and not accessible for bonding connection.

Even in older construction with accessible equipment, the requirement for installation of intersystem bonding connection is subject to varying interpretation because there is not a clearly defined dedicated bonding location. The connection to the power system is sometimes haphazard. Installers are sometimes confused over where the connection should be made especially if multiple Communication Systems are present on premises.

In addition this proposal modifies the arrangement of the text in 810.21 to look similar to other Article in Chapter 8.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-237 Log #1992 NEC-P16 **Final Action: Accept in Principle**

(810.21(F))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-236. This action will be considered by the Panel as a Public Comment.

It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group

Recommendation: Add these two sentences after the last sentence of 810.21(F):

A device intended to provide a termination point for the grounding conductor (inter-system bonding) shall be prohibited from use when the installation of such device interferes with opening a service or metering equipment enclosure. An inter-system bonding device shall not be installed on an enclosure cover.

Substantiation: Poor grounding practices by installers of CATV, telephone, satellite and other communication systems using termination devices that clamp to enclosure covers have resulted in interruption of grounding continuity. This is a companion proposal to proposals to add this requirement to 800.100(B), 820.100(B), and 830.100(B).

Panel Meeting Action: Accept in Principle

Add the following after the last sentence of 810.21(F):

A device intended to provide a termination point for the grounding conductor shall not interfere with the opening of an equipment enclosure. A bonding device shall be mounted on non-removable parts. A bonding device shall not be mounted on a door or cover even if the door or cover is non-removable.

Panel Statement: The panel accepts the intent of the submitter and has reworded the text for clarity. It is requested that the TCC forward to Panel 5 for take similar action as applicable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRUNSSEN, J.: The submitter's text, as modified by the Panel, should be placed following the existing text of 810.21(F)(e.) rather than at the end of 810.21(F). Section 810.21(F)(e.) specifically addresses connection to the service equipment enclosure and that is the issue that the submitter intended to address.

ARTICLE 820 — COMMUNITY ANTENNA TELEVISON AND RADIO DISTRIBUTION SYSTEMS

16-238 Log #755 NEC-P16 **Final Action: Accept**

(820 V. (title))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Change title:

From V. Cables Within Buildings

To V. Installation Methods Within Buildings

Substantiation: This proposal is editorial. (Task Group No. 820-01)

The sections included under V. include more than cables and the recommended change is more descriptive. This title is consistent with similar recommendations for Articles 770, 800 and 830.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-239 Log #2695 NEC-P16 **Final Action: Reject**

(820.2)

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Delete the following:

~~820.2 Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum. [NFPA 97:1.2.6]~~

Substantiation: This is an editorial proposal to remove the term "air duct" as this term is not used in Article 800. The term "air duct" should not be defined in the article, as per the National Electrical Code Style Manual.

Panel Meeting Action: Reject

Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

We agree with deleting the term "air duct" as it was evidently an oversight that it was not removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 800. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

OHDE, H.: We do not believe that the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) would prohibit this definition of Air Duct from being deleted. We do believe that expansion of or new definition of Air Duct would be in violation of NFPA Standards Council Long Decision 05-24 (SC #05-7-4). This proposal should have been accepted.

This proposal was to remove the definition of "Air Duct" from 820.2 as this term is not used in Article 820.

16-240 Log #2364 NEC-P16 **Final Action: Reject**
(820.2.Abandoned Coaxial Cable)

Submitter: John H. Schmidt, ABC Television Network

Recommendation: In the definition for Abandoned Coaxial Cable, after the words "and not identified for future use with a tag" add the new text "or in a database."

Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.

Panel Meeting Action: Reject

Panel Statement: The AHJ is unlikely to have access to the database for every building under his/her jurisdiction. The majority of communications technicians (installation/repair) work at a multiplicity of locations. Database administrative responsibility is not identified in the proposal. Maintaining and referencing a database for every location is cumbersome, unwieldy, and impractical.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-241 Log #2684 NEC-P16 **Final Action: Reject**
(820.2. Abandoned Coaxial Cable)

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Recommendation: Revise 820.2 Abandoned Coaxial Cable to read:

Installed coaxial cable that is not terminated at equipment other than a coaxial connector and not identified for future use with a tag which is of a material impervious to the deleterious effects of temperature and dampness. The tag shall be resistant to the effects of gnawing by rodents. The tag shall contain the following information:

(1) Date tag was installed.

(2) Date of intended use of disconnected cable.

(3) Drawing or file number containing information relating to intended future use of disconnected cable.

The date of intended use of disconnected cable shall not exceed 90 days date of disconnection.

Substantiation: Abandoned cables are a growing problem in the industry. These cables are left for others to deal with when present users discontinue their operation. Understanding this problem, the removal of abandoned cables, is required by articles 640, 645, 725, 760, 770, 800, 820, and 830. Section 820.3(A) requires the removal of abandoned communications cables. Tagging of cables intended for future use without a method of ensuring the intention of future use invites tagging of cables to avoid the responsibility of their proper removal.

Panel Meeting Action: Reject

Panel Statement: While the submitter makes the point that the "tagging" requirements may be used to circumvent abandoned cable removal, the proposed additional requirements are impractical, burdensome, and preclude the pre-wiring of buildings. For example, buildings are often "pre-wired" for CATV. While the current tenant may not require all the coaxial cable pre-wiring, future tenants may have additional needs and require the additional wiring. Allowing only "90 days" is insufficient to support pre-wiring. A tag that is immune to temperature, dampness, and rodents needs to be of special material and would likely require special means to mark the tag. Adding a file number implies the existence of a database. No suggestion is provided as to who would be responsible for populating and maintaining the database.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-242 Log #3013 NEC-P16 **Final Action: Reject**
(820.2. Abandoned Coaxial Cable)

Submitter: Marcelo M. Hirschler, GBH International

Recommendation: Revise text to read as follows:

820.2 Definitions.

Abandoned Coaxial Cable. Installed coaxial cable that is not terminated at equipment ~~other than a coaxial connector~~ and not identified for future use with a tag.

Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:

640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.

725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.

The additional wording in this definition causes confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100.

Panel Meeting Action: Reject

Panel Statement: See panel action on Proposal 16-1.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be accepted as submitted. The submitter substantiates that the definitions of abandoned cables in Articles 640, 645, 725, 760, 770, 800, 820, and 830 should be identical. This proposal deletes unnecessary language in the present definitions and provides consistent language throughout the above articles mentioned. The panel statement does not explain the reason for rejecting this proposal other than to see panel action on Proposal 16-1.

16-243 Log #2664 NEC-P16 **Final Action: Reject**
(820.2. Air Duct)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association

Recommendation: Delete the following text:

~~**820.2 Air Duct.** A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum. [NFPA 97:1.2.6]~~

Substantiation: Air duct is not a term used in Article 800. This was an apparent miss in the 2005 editorial review under the Standards Council mandate to remove content related to "air duct cable".

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

We agree with deleting the term "air duct" as it was evidently an oversight that it was not removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 800. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

OHDE, H.: See my Explanation of Negative on Proposal 16-239.

16-244 Log #781 NEC-P16 **Final Action: Accept**
(820.2.Cable, coaxial (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add a definition as follows:

Cable, coaxial. A cylindrical assembly composed of a conductor centered inside a metallic tube or shield, separated by a dielectric material, and usually covered by an insulating jacket.

Substantiation: This proposal is editorial and technical. (Task Group No. 820-27)

The term "cable" is used throughout the Article without being defined. This Proposal corrects this omission and provides a definition parallel with 800.2.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-245 Log #41 NEC-P16 **Final Action: Accept in Principle**
(820.2. CATV Raceway)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:

<u>**CATV Raceway.** A raceway designed for enclosing and routing listed CATV cables.</u>

<u>FPN: See Article 100 for a definition of raceway.</u>

Substantiation: Optical Fiber Raceway is defined in Article 770. CATV raceway should be defined too.

Panel Meeting Action: Accept in Principle

Add new definition to 820.2 as follows:

<u>CATV Raceway. A raceway for enclosing and routing CATV cables.</u>

<u>FPN: See Article 100 for a definition of raceway.</u>

Panel Statement: Added new definition.

Removed "design", as specification does not belong in a definition.

Removed "listed", as specification does not belong in a definition per NEC Manual of Style.

The change meets the submitter's intent.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 12 Negative: 3
Explanation of Negative:

HUGHES, R.: The Panel action should have been to "reject". The definition for "Optical Fibers Raceway" was created specifically to define Innerduct. Innerduct is used only for Optical Fibers and nothing else. The definition of "raceway" in Article 100 is adequate and there is nt reason to create a specific definition "Communication Raceway".

JENSEN, R.: Propose to remove the FPN from the definition, thereby extending the committee action of "Accept in Principle".

CMP 16 accepted proposal 16-5 to harmonize 770.2, 800.2, 820.2, and 830.2 by including a normative reference to "See Article 100". Adding a FPN to again "See Article 100" is redundant, especially since this FPN will be a few lines down from the identical wording in normative text. Additionally, the 2003NEC Style Manual specifically states to avoid redundant use of references.

OHDE, H.: This definition would require that any raceway that is used for enclosing and routing CATV cables be listed to the requirements shown 820.182. This section states "CATV raceways shall be listed in accordance with 820.182(A) through 820.182(C)." There are metal raceways, for example, that are allowed to enclose communications cables but are not required to be listed plenum raceways or riser raceways. These listings are typically for nonmetallic raceways.

In addition, Section 90.1(C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." The addition of the FPN referencing Article 100 for the definition of raceway is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-246 Log #757 NEC-P16 **Final Action: Accept in Principle**
(820.2.CATV Raceway (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the following definition:

<u>**CATV Raceway.** A raceway designed for enclosing and routing listed CATV coaxial cables.</u>

Substantiation: This proposal is technical. (Task Group No. 820-03)

Optical fiber raceway is defined in article 770. This proposal will add a parallel definition in article 820. A similar definition is needed here.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-245.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

HUGHES, R.: The Panel action should have been to "reject". The definition for "Optical Fibers Raceway" was created specifically to define Innerduct. Innerduct is used only for Optical Fibers and nothing else. The definition of "raceway" in Article 100 is adequate and there is no reason to create a specific definition "Communication Raceway".

OHDE, H.: See my Explanation of Negative on Proposal 16-245.

16-247 Log #24 NEC-P16 **Final Action: Reject**
(820.2. Concealed Space)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:

Concealed Space. That portion(s) of a building behind walls, over suspended ceilings, in pipe chases, attics, and in whose size might normally range from 44.45 mm (1 3/4 in.) stud spaces to 2.44 m (8 ft) interstitial truss spaces and that might contain combustible materials such as building structural members, thermal and/or electrical insulation, and ducting. <u>[NFPA 96:3.3.42.1]</u>

Substantiation: The term concealed space is used in 820.154(A). This definition is an extract from NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. It is the only definition of concealed space in the NFPA Glossary.

Panel Meeting Action: Reject
Panel Statement: The definition may involve combustible material in environmental air spaces and, therefore, may fall under the Standards Council Decision 05-24 (SC #05-7-4).

The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions since the submitter is trying to define the term "concealed spaces". We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed* *spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-248 Log #1858 NEC-P16 **Final Action: Accept in Principle**
(820.2.Exposed (to Accidental Contact))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise the definition of "Exposed" as follows:
" **Exposed** **(to Accidental Contact)** . ~~An exposed cable is one that is~~ A circuit in such a position that, in case of failure of supports ~~and~~ or insulation, contact with another circuit may result."
Substantiation: The proposed revision clarifies the term "Exposed" as used in Article 820 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. Replacing of the phrase "An exposed cable is one that is" with the phrase "A circuit" provides a consistent definition throughout Articles 770, 800, 820 and 830. This is a companion proposal to 770.2, 800.2 and 830.2.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-249.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-249 Log #1938 NEC-P16 **Final Action: Accept**
(820.2.Exposed (to Accidental Contact))

Submitter: Stanley D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise the definition of "Exposed" as follows:
"Exposed (to Accidental Contact). ~~An exposed cable is one that is~~ A circuit in such a position that, in case of failure of supports ~~and~~ or insulation, contact with another circuit may result."
FPN: See Article 100 for two other definitions of Exposed.
Substantiation: This proposal is a clarification. (Task Group No. 820-03A)
It clarifies the term "Exposed" as used in Article 820 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The text was also changed to clarify that it is the circuit that is exposed rather than just the cable. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. This is a companion proposal to those submitted for 770.2; 800.2; and 830.2 and provides consistency and correlation in the definition of "exposed" across 770; 800; 820 and 830.
This is one of a group of proposals prepared by the CMP 16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related articles such that similar requirements are stated the same way in each article;
3) make the articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-250 Log #39 NEC-P16 **Final Action: Accept in Principle**
(820.2. Point of Entrance)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
Point of Entrance. The point within a building at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) grounded to an electrode in accordance with 820.100(B).
FPN: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).
FPN: See 344.2 for a definition of Rigid Metal Conduit (Type RMC).
Substantiation: The addition of a fine print notes pointing installers to the definitions of intermediate metal conduit and rigid metal conduit will help installers who are not Code experts. Use of the type designations will promote consistency throughout the code.
Panel Meeting Action: Accept in Principle
The panel accepts the submitter's proposal with the following revisions:
Number FPNs as follows:
FPN No. 1: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).
FPN No. 2: See 344.4 for a definition of Rigid Metal Conduit (Type RMC).
Panel Statement: Multiple FPNs are required to be numbered.
See panel action on Proposal 16-251.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." The addition of the two FPN's referencing the definitions of IMC raceway in 342.2 and RMC raceway in 344.4 is not needed nor warranted. In the submitter's substantiation he states these Fine Print Notes will help installers who are not Code experts. A trained installer will know the Code content and how the Code book is to be used.
Comment on Affirmative:
JENSEN, R.: The panel action regarding FPN No. 2 for Rigid Metal Conduit should refer to 344.2, not 344.4.

16-251 Log #756 NEC-P16 **Final Action: Accept in Principle**
(820.2. Point of Entrance)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the term "coaxial" to the definition as shown:
Point of Entrance. The point within a building at which the coaxial cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode in accordance with 820.100(B).
Substantiation: This proposal is a clarification, (Task Group No. 820-02)
It is one of a series of proposals to clarify that Article 820 deals with "coaxial" cable. Adding the word "coaxial" adds clarity to the section for the code user.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Principle
Change 820.2 Point of Entrance to read as follows:
Point of Entrance. The point within a building at which the coaxial cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) ~~grounded~~ connected by a grounding conductor to an electrode in accordance with 820.100(B).
FPN No 1: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).
FPN No.2: See 344.4 for a definition of Rigid Metal Conduit (Type RMC).
Panel Statement: The text inserted by the panel, "connected by a grounding conductor," provides for editorial consistency across Articles 770, 800, 820, and 830.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: See my Explanation of Negative on Proposal 16-250.

16-252 Log #3662 NEC-P16 **Final Action: Reject**
(820.2 Air Duct)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Delete the following text:
~~**820.2 Air Duct.** A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum.~~
Substantiation: The term "air duct" is not used in article 820 and should not be defined in the article, as per the manual of style of the National Electrical Code.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

We agree with deleting the term "air duct" as it was evidently an oversight that it was not removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 800. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

OHDE, H.: See my Explanation of Negative on Proposal 16-239.

16-253 Log #42 NEC-P16 **Final Action: Accept**
(820.2.Abandoned Coaxial Cable, FPN (New))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Add a fine print note to the definition of Abandoned Coaxial Cable

Abandoned Coaxial Cable. Installed coaxial cable that is not terminated at equipment other than a coaxial connector and not identified for future use with a tag.

<u>FPN: See Article 100 for a definition of equipment.</u>

Substantiation: The addition of a fine print note alerting installers that equipment is defined in Article 100 will help installers who are not Code experts.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: Propose to "Reject".

CMP 16 accepted proposal 16-5 to harmonize 700.2, 800.2, 820.2, and 830.2 by including a normative reference to "See Article 100". Adding a FPN to again "See Article 100" is redundant, especially since this FPN will be a few lines down from the identical wording in normative text. Additionally, the 2003 NEC Style Manual specifically states to avoid redundant use of references.

OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing Article 100 for the definition of equipment is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-254 Log #758 NEC-P16 **Final Action: Accept in Part**
(820.3)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Revise 820.3 Other Articles as follows:

820.3 Other Articles. Circuits and equipment shall comply with 820.3(A) through 820.3(G).

~~**(A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned coaxial cables shall be removed.~~

~~**(B) Ducts, Plenums, and Other Air-Handling Spaces.** Section~~ <u>300.22</u> ~~, where installed in ducts, plenums, or other spaces used for environmental air, shall apply.~~

~~*Exception: As permitted in 820.154(A).*~~

<u>**(A) Hazardous (Classified) Locations.** CATV equipment installed in a location that is classified in accordance with 500.5 shall comply with the applicable requirements of Chapter 5.</u>

<u>**(B) Equipment in Other Space Used for Environmental Air** . Section 300.22(C)(2) shall apply.</u>

(C) Installation and Use . Section 110.3 shall apply.

(D) Installations of Conductive and Nonconductive Optical Fiber Cables . Article 770 shall apply.

(E) Communications Circuits. Article 800 shall apply.

(F) Network-Powered Broadband Communications Systems. Article 830 shall apply.

(G) Alternate Wiring Methods. The wiring methods of Article 830 shall be permitted to substitute for the wiring methods of Article 820.

FPN: Use of Article 830 wiring methods will facilitate the upgrading of Article 820 installations to network-powered broadband applications

Substantiation: This proposal is editorial and technical. (Task Group No. 820-04)

To correlate with other proposals from the Task Group, this proposal deletes 820.3(A) and (B).

The substantiation for deletion of (A) is that the requirements are being moved to other, more appropriate sections. The substantiation for deletion of (B) is to remove a conflict.

This proposal creates a Section on hazardous locations for Article 820 and a Section on Equipment used in other spaces for environmental air. These sections are required in Article 820. In addition, this proposal makes 820 text comparable to parallel articles in 800 and 830.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Part

Revise 820.3 to read as follows:

820.3 Other Articles. Circuits and equipment shall comply with 820.3(A) through 820.3(G).

(A) Hazardous (Classified) Locations. CATV equipment installed in a location that is classified in accordance with 500.5 shall comply with the applicable requirements of Chapter 5.

(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts, plenums, or other spaces used for environmental air, shall apply.

Exception: As permitted in 820.154(A).

(C) Installation and Use. Section 110.3 shall apply.

(D) Installations of Conductive and Nonconductive Optical Fiber Cables. Article 770 shall apply.

(E) Communications Circuits. Article 800 shall apply.

(F) Network-Powered Broadband Communications Systems. Article 830 shall apply.

(G) Alternate Wiring Methods. The wiring methods of Article 830 shall be permitted to substitute for the wiring methods of Article 820. FPN: Use of Article 830 wiring methods will facilitate the upgrading of Article 820 installations to network-powered broadband applications

Panel Statement: The panel accepts the submitter's deletion of subsection (A).

The panel rejects the submitter's revision of subsection (B).

The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-255 Log #3103 NEC-P16 **Final Action: Reject**
(820.3)

Submitter: Donald Hall, Corning Cable Systems

Recommendation: Revise text to read as follows:

820.3 Other Articles.

Circuits and equipment shall comply with 820.3(A) through 820.3(G).

(A) Spread of Fire or Products of Combustion. 300.21 shall apply. ~~The accessible portion of a~~ Abandoned network-powered broadband coxial cables shall be removed.

Also, add the following FPN to 820.3(A):

<u>FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.</u>

Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.

The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.

Panel Meeting Action: Reject
Panel Statement: The proposal would require all abandoned cable to be removed, irrespective of accessibility, presenting a compliance conundrum to installers. Without access, it is impossible to remove cables that are securely fastened without damaging the building or adjacent cables. The submitter's substantiation states: "It is not reasonable or necessary to install cables in a manner that prevents their eventual removal." However, the panel previously imposed additional securing and supporting requirements by referencing 300.11 in 820.24. Gaining access may sometimes require disassembly of part of the building. This is not the intent of the panel. The current requirement to remove only the accessible portion is reasonable. The submitter further proposes to add an FPN following 820.3(A) that is already contained in 820.24. Note that the submitter has referenced "network-powered broadband coaxial cables," which are not covered by 820.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article. The FPN that the submitter submitted is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.

16-256 Log #1386 NEC-P16 **Final Action: Reject**
(820.3(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-257. This action will be considered by the Panel as a Public Comment.
Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete text concerning abandoned cables
820.3 Other Articles.
Circuits and equipment shall comply with 820.3(A) through 820.3(G).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. ~~The accessible portion of abandoned coaxial cables shall be removed.~~
Substantiation: The NEC is an installation standard, not a maintenance standard. Because of this, this rule should not be a part of the NEC. Furthermore, this provision does not accomplish its intent, as the code is not a retroactive document. To require abandoned cables to be removed is similar to requiring facilities to update their receptacles to the new GFCI provision every three years. With that said, the only time this rule applies is when an installer creates an abandoned cable. Also, this provision does not fall within the purpose of the NEC 90.1(A). The NEC is concerned with the hazards created from the use of electricity…this rule seems to imply that a cable with a voltage applied to it is safe, but a cable with no voltage applied to it is dangerous.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-26.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-257 Log #2809 NEC-P16 **Final Action: Accept in Part**
(820.3(A))

Submitter: Harold C. Ohde, IBEW #134
Recommendation: Revise text to read as follows:
820.3 Other Articles. No change.
(A) Spread of Fire or Products of Combustion. ~~Section~~ 300.21 <u>shall apply</u> . ~~The accessible portion of abandoned coaxial cables shall be removed.~~
Substantiation: The requirements for removal of abandoned coaxial cables would be better suited in appropriate code section within Article 820. I have submitted another proposal that would move the abandoned coaxial cables requirements to 820.24 - Mechanical Execution of Work. The abandoned coaxial cables requirements are out of place in 820.3 - Other Articles. The requirements are not part of another Article as they are part of Article 820 and are lcoated within Article 820.
The deletion of the word "Section" is an editorial change to comply the National Electrical Code Style Manual.
Similar proposals have been submitted for 640.3, 725.3, 760.3, 770.3, 800.3, and 830.3 to revise these sections as well.
Panel Meeting Action: Accept in Part
Panel Statement: The Panel accepts the part that deletes the second sentence of 820.3(A) concerning abandoned cables. The Panel rejects the proposed revisions to the first sentence.
The panel agrees that the requirement to remove abandoned cable does not belong in 820.3 and should be relocated. A direct reference to 300.21 is inappropriate, as it applies to electrical installations and not CATV (coaxial cable) installations. See panel action on Proposal 16-259 that relocates the requirement to remove abandoned cable to 820.25 (new) and restates the spread of fire requirements in CATV (coaxial cable) terms in 820.26 (new).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should have been accepted as originally submitted. The panel statement seems to be in conflict as it states the provisions of 300.21 will work well in the new proposed section 820.26 but not in 820.3(A) where it has always been properly located. The panel accepted the same 300.21 requirements whose concern is the spread of fire and products of combustion in hollow spaces, vertical shafts and ventilation and air- handling ducts caused by electrical installations and located them in 820.26.

16-258 Log #3010 NEC-P16 **Final Action: Reject**
(820.3(A))

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
820.2 Definitions.
Abandoned Coaxial Cable. Installed coaxial cable that is not terminated at equipment other than a coaxial connector and not identified for future use with a tag.
820.3 Other Articles.
Circuits and equipment shall comply with 820.3(A) through 820.3(G).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. ~~The accessible portion of abandoned~~ <u>Abandoned</u> coaxial cables shall be removed. <u>Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components.</u>
Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in "inaccessible spaces". This is not conducive to safe electrical practice; this the key change is the elimination of the words "the accessible portion of".
If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.
Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.
For information, see the relevant definitions in the NEC.
Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.
Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.
Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.
Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.
Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-28.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article.

16-259 Log #759 NEC-P16 **Final Action: Accept in Principle**
(820.3(A), 820.25 (new) & 820.26 (new))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding what is meant by "reorder subsections of 820.3." This action will be considered by the Panel as a Public Comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:
~~**820.3 (A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned coaxial cables shall be removed.~~
<u>**820.25. Abandoned Cables.** The accessible portion of abandoned coaxial cables shall be removed.</u>

820.26 Spread of Fire or Products of Combustion. Installations of coaxial cables and CATV raceways in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of coaxial cables and CATV raceways through fire-resistantÐrated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistanceÐrated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 820.26 can be found in building codes, fire resistance directories, and product listings.

Substantiation: This proposal is editorial. (Task Group No. 820-05)

The title of Section 820.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 820. It is out of place in section 820.3. This proposal will move it to a new section of Article 820. Rather than refer section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 820 which should be familiar to CATV installers. The text of proposed section 820.26 is based on section 300.21 but modified to apply to CATV cables and raceways.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

The panel accepts the submitter's proposal.

Reorder subsections of 820.3.

Panel Statement: The panel accepts the submitter's proposal.

Editorial changes are made to reorder subsections of 820.3.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 820.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.

The substantiation provided to delete 820.3(A) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 820.26 is based on the requirements of 300.21. There was no substantiation submitted for this change. In addition there is no need for the FPN to be mentioned as the language in 820.3(A) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.

16-260 Log #2776 NEC-P16 **Final Action: Accept in Principle in Part (820.3(A), 820.25 (new) & 820.26 (new))**

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Make the following changes:

~~**820.3 (A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned coaxial cables shall be removed.~~

820.25. Abandoned Cables. The accessible portion of abandoned coaxial cables shall be removed.

820.26 Spread of Fire or Products of Combustion. Installations of coaxial cables and CATV raceways in hollow spaces, concealed spaces, vertical shafts and air ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of coaxial cables and CATV raceways through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 820.26 can be found in building codes, fire resistance directories, and product listings.

FPN No. 2: FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The title of Section 820.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 820. It is out of place in section 820.3. This proposal will move it to a new section of Article 820. Rather than refer section to 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 820 which should be familiar to CATV installers. The text of proposed section 820.26 is based on section 300.21 but modified to apply to CATV cables and raceways. For clarity, "ventilation or air-handling ducts" has been simplified by replacing it with "air ducts". Also, "concealed spaces" have been added to the list of areas requiring fire protection vigilance (hollow spaces, vertical shafts, and air ducts) to correlate with NFPA 13, *Installation of Sprinkler Systems*, which has requirements for protecting concealed spaces. A FPN is included to refer users to the NFPA 13 requirements.

Panel Meeting Action: Accept in Principle in Part

Panel Statement: The Panel accepts the submitter's deletion of 820.3(C), the addition of 820.25 (new), and the addition of 820.26 (new), but revises "air ducts" to "ventilation or air handling duct" in keeping with the existing NEC text.

See panel action on Proposal 16-259.

The panel rejects the addition of FPN No. 2 because it introduces undefined terminology. "Concealed spaces" should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 820.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.

The substantiation provided to delete 820.3(A) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 820.26 is based on the requirements of 300.21 but modified to apply to CATV cables and raceways. There was no substantiation submitted for this change. In addition there is no need for the FPN No.1 to be mentioned as the language in 820.3(A) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.

We believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

Comment on Affirmative:

BRUNSSEN, J.: The Panel Statements refers to "deletion of 820.3(C)"; it should state "deletion of 820.3(A)".

16-261 Log #3314 NEC-P16 **Final Action: Accept in Principle in Part (820.3(A), 820.25 (new) & 820.26 (new))**

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

Submitter: William E. Koffel, Koffel Assoc., Inc. / Rep. Society of the Plastics Industry

Recommendation: Make the following changes:

~~**820.3 (A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned coaxial cables shall be removed.~~

820.25. Abandoned Cables. The accessible portion of abandoned coaxial cables shall be removed.

820.26 Spread of Fire or Products of Combustion. Installations of coaxial cables and CATV raceways in hollow spaces, concealed spaces, vertical shafts and air ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of coaxial cables and CATV raceways through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 820.26 can be found in building codes, fire resistance directories, and product listings.

FPN No. 2: FPN: See 8.14.1 of NFPA 13, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The title of Section 820.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 820. It is out of place in Section 820.3. This proposal will move it to a new section of Article 820. Rather than refer section to 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 820 which should be familiar to CATV installers. The text of proposed Section 820.26 is based on Section 300.21 but modified to apply to CATV cables and raceways. For clarity, "ventilation or air-handling ducts" has been simplified by replacing it with "air ducts". Also, "concealed spaces" have been added to the list of areas requiring fire protection vigilance (hollow spaces, vertical shafts, and air ducts) to correlate with NFPA 13, *Installation of Sprinkler Systems,* which has requirements for protecting concealed spaces. A FPN is included to refer users to the NFPA 13 requirements. It should be noted that the section number may need to be revised once the 2006 Edition of NFPA 13 is published.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the submitter's deletion of 820.3(C), the addition of 820.25 (new) and the addition of 820.26 (new), but revises "air ducts" to "ventilation or air handling duct" in keeping with the existing NEC text. The panel accepts FPN No. 1 but rejects the addition of FPN No 2.

Panel Statement: See panel action on Proposal 16-259.

The panel rejects the addition of FPN No. 2 because it introduces undefined terminology. "Concealed spaces" should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: See my Explanation of Negative on Proposal 16-260.

Comment on Affirmative:

BRUNSSEN, J.: The Panel Statements refers to "deletion of 820.3(C)"; it should state "deletion of 820.3(A)".

16-262 Log #30 NEC-P16 **Final Action: Reject**

(820.3(B))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Delete as follows:

~~**(B) Ducts, Plenums, and Other Air-Handling Spaces.** Section~~ 300.22 ~~, where installed in ducts, plenums, or other spaces used for environmental air, shall apply.~~

~~*Exception: As permitted in 820.154(A).*~~

Substantiation: Section 820.3(B) provides no additional guidance or requirements that are not already in 820.154(A). It's redundant and perhaps confusing to send a CATV installer to section 300.22 to look for requirements that are already in Article 820. Section 800.3 does not have a similar requirement. Elimination of 820.3(B) will improve the parallelism between the articles.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

(Note: The sequence nos. 16-263 and 16-264 were not used)

16-265 Log #760 NEC-P16 **Final Action: Reject**

(820.3(B))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the following changes:

~~**(B) Ducts, Plenums, and Other Air-Handling Spaces.** Section~~ 300.22 ~~, where installed in ducts, plenums, or other spaces used for environmental air, shall apply.~~

~~*Exception: As permitted in 820.154(A).*~~

Substantiation: This is an editorial and clarification proposal. (Task Group No. 820-06)

Section 820.3(B) provides no additional guidance or requirements that are not already in 820.154(A). It conflicts with Article 820 because Article 820 requires listed coaxial cables whereas 300.22 permits various electrical power and control cables that are not permitted to be used for CATV circuits in Article 820. Section 800.3 does not have a similar requirement.

Acceptance of this proposal will make Articles 770, 800, 820 and 830 consistent and in compliance with section 3.3.5 of the NEC Style Manual, shown below:

3.3.5 Parallel Construction. Parallel construction means stating similar requirements in similar ways for greater consistency. This helps makes the *NEC* clear for users. Lack of consistency often creates confusion, causing users to ask: *Does this difference in wording represent a different requirement? Or is it simply two different ways of trying to say the same thing?* There are several kinds of parallel construction:

Organization and Numbering . If practicable, the subsections of similar articles should be numbered in the same order (see 2.4.1).

Sections. Different sections, within the same article, that reflect similar or closely related subjects, should have similar structures.

Lists. All items in a list should be parallel (that is, singular or plural, written in the same verb tense, using phrases or sentences but not a mix).

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The Panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-266 Log #74 NEC-P16 **Final Action: Reject**

(820.15)

Submitter: John Chamberlain, Broadband Telecommunications. LLC

Recommendation: Revise as follows:

820.15 Energy Limitations. ~~Coaxial cable shall be permitted to deliver low-energy power to equipment that is directly associated with the radio frequency distribution system if the voltage is not over 60 volts and if the current supply si from a transformer or other device that has energy limiting characteristics.~~ Coaxial drop cable under Article 820 shall not be permitted to deliver energy for the purpose of powering devices. Refer to Article 830 Network-Powered Communications Systems.

Substantiation: Ambiguity appears to exist in the 2005 NEC between Sections 820.15 and Article 830. Section 820.15 states that coaxial cable under Section 820 shall be permitted to deliver low energy power that is directly associated with the radio frequency distribution system. The voltage allowed in 820.15 is up to and including 60 volts if other conditions are met.

Section 830.1 Scope, defines a network-powered broadband communications system as communications systems that provide any combination of voice, audio, video, data, and interactive services through a network interface device. Section 830.15 Power Limitations, for Article 830, defines low powered network powered systems as 0-100 volts.

Ambiguity exists for network-powered communications systems with delivery voltages less than 60 volts. There would be no ambiguity if:

1) Section 820.15 was stricken or,

2) Section 820.15 was reworded to allow up to 60 volts except in the case supply power is delivered to an NIU per Network-Powered Communications Systems Article 830 definition or,

3) Replace 820.15 with a statement allowing no supply voltages under Article 820 and to refer to Article 830 for coaxial drop systems when supply voltages are required.

Panel Meeting Action: Reject

Panel Statement: Article 820 allows the delivery of low-energy power in order to operate amplifiers and other devices necessary to distribute "radio signals typically employed in community antenna television (CATV) systems" (quote from Article 820 scope). These applications are not Article 830 applications and should remain allowable under Article 820.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

(Note: The sequence 16-267 was not used)

16-268 Log #761 NEC-P16 **Final Action: Accept in Principle**
(820.15)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the following changes:

820.15 ~~Energy~~ Power Limitations.

Coaxial cable shall be permitted to deliver ~~low~~ - ~~energy~~ power to equipment that is directly associated with the radio frequency distribution system if the voltage is not over 60 volts and if the current ~~supply~~ is supplied by ~~from~~ a transformer or other device that has ~~energy~~ power- limiting characteristics.

Substantiation: This proposal is a clarification. (Task Group No. 820-07)

The proposed wording is more descriptive and is consistent and is parallel to 830.15.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Make the following changes to 820.15:

820.15 ~~Energy~~ Power Limitations.

Coaxial cable shall be permitted to deliver power to equipment that is directly associated with the radio frequency distribution system if the voltage is not over 60 volts and if the current ~~supply~~ is supplied by ~~from~~ a transformer or other device that has ~~energy~~ power- limiting characteristics.

Power shall be blocked from premises devices on the network that are not intended to be powered via the coaxial cable.

Panel Statement: The changes meet the submitter's intent. The panel added additional requirements to complete the submitter's intent.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-269 Log #783 NEC-P16 **Final Action: Accept**
(820.21)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the changes as shown:

820.21 Access to Electrical Equipment Behind Panels Designed to Allow Access.

Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ coaxial cables that prevents removal of panels, including suspended ceiling panels.

Substantiation: This proposal is editorial. (Task Group No. 820-290

It creates consistency among parallel articles and references the specific medium used in this article. Article 820 does not use "wires" so that term was removed.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-270 Log #763 NEC-P16 **Final Action: Accept**
(820.24)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Add the word "coaxial" where shown:

820.24 Mechanical Execution of Work.

Community antenna television and radio distribution systems shall be installed in a neat and workmanlike manner. Coaxial cables installed exposed on the surface of ceiling and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.

Substantiation: This proposal is a clarification, (Task Group No. 820-08)

It is part of a series of proposals to clarify that Article 820 deals with "coaxial" cable. Adding the word "coaxial" adds clarity to the section for the code user.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-271 Log #1387 NEC-P16 **Final Action: Reject**
(820.24)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete requirement to comply with 300.4(D)

800.24 Mechanical Execution of Work.

Communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with ~~300.4(D) and~~ 300.11.

Substantiation: There is no reason to protect limited energy circuits from accidental contact with nails or screws. Limited energy circuits are considered to be inherently safe from a fire and electric shock perspective, hence the allowances of lesser wiring methods and allowances for open splicing with out boxes. The protection of these circuits is a design and/or performance issue, not a safety issue. The requirement found in the existing *Code* text does not fit into the purpose of the NEC, as addressed in 90.1(A).

Panel Meeting Action: Reject

Panel Statement: Compliance with 300.4(D) has been a Code requirement for many years, resulting in an exemplary safety record. While the submitter points out that communications circuits are energy-limited circuits and "… considered to be inherently safe from a fire and electric shock perspective", it is inappropriate and poor workmanship to permit the potential energization of nails, screws, or other construction/decorative attachment devices at any level.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-272 Log #1388 NEC-P16 **Final Action: Accept in Principle in Part**
(820.24)

Submitter: Mike Holt, Mike Holt Enterprises

Recommendation: Delete requirement to comply with 300.4(D)

820.24 Mechanical Execution of Work.

Community antenna television and radio distribution systems shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceiling and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, cable ties , hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568–2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved installation standards.

Substantiation: This is being proposed in an effort to create uniform language with the chapter three cable wiring method support sections, specifically, 230.30(A), 330.30(A) and 334.30. Similar proposals are also being made to 725.8, 640.6, 760.8, 770.24, 800.24 and 830.24

Panel Meeting Action: Accept in Principle in Part

Change 820.24 to read as follows:

820.24 Mechanical Execution of Work. Community antenna television and radio dist ribution systems shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceiling and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by listed hardware including straps, staples, cable ties , hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568–2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved installation standards.

Panel Statement: The panel does not accept deletion of 300.4(D). Compliance with 300.4(D) has been a Code requirement for many years resulting in an exemplary safety record. While the submitter points out that communications circuits are energy-limited circuits and "… considered to be inherently safe from a fire and electric shock perspective", it is inappropriate and poor workmanship to permit the potential energization of nails, screws, or other construction/decorative attachment devices at any level.

The panel basically accepts the submitter's revision to 820.24 but modified for coordination.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 11 Negative: 3 Abstain: 1

Explanation of Negative:

BOYER, J.: NEMA does not believe that all such product used for the securement of communications circuits need be listed. Code Panel 8 has steadily rejected similar proposals relating to the support of conduit and cables. UL 1565 provides requirements for listed cable ties intended for primary support of flexible conduits and cables in accordance with the NEC. Such cable ties must have a minimum loop tensile strength rating of 23 kg (50 lbs) or greater. NEMA proposes that the panel reconsider its action and ACCEPT the proposal in principle and in part with the following action. Accept the proposed addition of "cable ties" in the third sentence, reject the requirement that all such hardware be "listed", and add the following new fourth sentence. " Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.)"

BRUNSSEN, J.: See my explanation of negative vote on Proposal 16-43.

DORNA, G.: See my explanation of negative vote on Proposal 16-45.

Explanation of Abstention:

KAHN, S.: Though I agree with the proposal and the submitter's intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

Comment on Affirmative:

OHDE, H.: The panel statement does not reflect the recommendation submitted by the submitter.

16-273 Log #1763 NEC-P16 **Final Action: Reject**
(820.24)

TCC Action: The Technical Correlating Committee notes that neither the panel statement nor the revised statement shown in the affirmative vote are responsive to the submitter's substantiation for the recommendation. The Technical Correlating Committee directs the panel to act on the merits of the recommendation. This action will be considered by the Panel as a Public Comment.

Submitter: Percy E. Pool, Verizon NS

Recommendation: Add the following exception to 820.24:

"Exception: 300.11(C) shall not apply."

Substantiation: 300.11(C) is clearly not applicable to CATV cabling. CATV cables are typically lashed together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. CATV cables are physically smaller, lighter and carry less voltage and current than power cables. It is overly restrictive to prohibit lashing of CATV cables together to form a cable assembly. CATV cables secured in this manner have adequate support (see 300.11(A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.

Panel Meeting Action: Reject

Panel Statement: The requirements of 300.11(C) are applicable to optical fiber cables.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. If the Panel continues to support the addition of the requirements of 300.11 to 820.24, then at the very least, the requirements of 300.11(C) should be waived. Section 300.11(C) is clearly not applicable to CATV cables. Installation practice is to lash CATV cables together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. CATV cables are physically smaller and lighter than power cables and typically contain no electrical power. Application of 300.11(C) is overly restrictive and will preclude lashing of CATV cables together to form a cable assembly. CATV cables secured in this manner have adequate support (see 300.11 (A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.

JOHNSON, S.: I agree with the submitter's points in his proposal. There is no safety issue that should preclude the long-standing practice of lashing an additional CATV drop cable to an existing bundle that is already installed and supported properly where it is owned by the same entity. These cables are lightweight, and carry much less voltage and current than power cables. No evidence has been shown that this practice has not been used safely and successfully in the past and should not continue to be allowed. I vote against the Panel's action to reject.

Comment on Affirmative:

JENSEN, R.: The panel statement should read:

The requirements of 300.11 are applicable to coaxial cables.

This appears as though it was copied from another panel statement regarding optical fiber.

STENE, S.: The panel statement should be revised to state "The requirements of 300.11(C) are applicable to ~~optical fiber cables~~ community antenna television cables ."

16-274 Log #1881 NEC-P16 **Final Action: Reject**
(820.24)

TCC Action: The Technical Correlating Committee notes that neither the panel statement nor the revised statement shown in the affirmative vote are responsive to the submitter's substantiation for the recommendation. The Technical Correlating Committee directs the panel to act on the merits of the recommendation. This action will be considered by the Panel as a Public Comment.

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: In the final sentence, delete the reference to 300.11 as follows:

"The installation shall also conform with 300.4(D) ~~and 300.11~~ ."

Substantiation: The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for CATV and radio distribution systems. The Fine Print Note associated with 820.24 presently directs the reader to the appropriate installation practices for CATV and radio distribution systems cabling. Section 300.11 is directed toward power cable assemblies that are heavier, larger and operate at greater voltage and current levels than CATV cables. A CATV cable used for premises wiring is typically one-quarter inch in diameter contains no electrical power. Deletion of the reference to 300.11 will yield consistency throughout the NEC as Panel 3 did not see fit to adopt this reference in Articles 760 and 725.

Panel Meeting Action: Reject

Panel Statement: The requirements of 300.11 are applicable to optical fiber cables.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for CATV cables. The Fine Print Note associated with 820.24 directs the reader to the appropriate installation standards. The Panel has enhanced the Fine Print Note during this cycle by the addition of three new references covering the installation of CATV cables (see Proposal 16-277). These references are all that is necessary and sufficient for such cables without imposing the burdensome requirements of 300.11. Section 300.11 is directed toward power cable assemblies that are heavier and larger than communications cables, operate at much greater power levels (CATV cables often contain no power), and present a greater risk of injury if not properly installed.

JOHNSON, S.: I agree with the submitter's points in his proposal. 300.11 deals with cables that are larger and heavier than CATV drop cables. Referencing 300.11 also creates an inconsistency with Sections 760 and 725, which deal with similar sized cables and do not make this reference. I vote against the Panel's action to reject.

Comment on Affirmative:

JENSEN, R.: The panel statement should read:

The requirements of 300.11 are applicable to coaxial cables.

This appears as though it was copied from another panel statement regarding optical fiber.

STENE, S.: The panel statement should be revised to state "The requirements of 300.11 are applicable to ~~optical fiber cables~~ community antenna television cables ."

16-275 Log #3055 NEC-P16 **Final Action: Accept in Principle in Part (820.24)**

Submitter: Harold C. Ohde, IBEW #134
Recommendation: Revise 820.24 as follows:
820.24 Mechanical Execution of Work
(A) **Neat and Workmanlike Manner.** Community television and radio distribution systems, equipment, cables and circuits shall be installed in a neat and workmanlike manner.
(B) **Installation of Coaxial Cables.** Coaxial cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the coaxial cables will not be damaged by normal building use. Such cables shall be secured by listed straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D) and 300.11.
FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling*, and other ANSI- approved installation standards.
(C) **Abandoned Coaxial Cables.** Abandoned coaxial cables shall be removed.
FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for installing Commercial Building Telecommunications Cabling, and other ANSI-approved standards which provide cable installation that facilitates the removal of abandoned cables.
Substantiation: This proposal revises this section into a practical working tool which will assist in making 820.24 a clear, usable and enforceable code. Each first level subdivision contains a code rule that requires action and the required action has been presented in clear, usable and enforceable manner.
In the electrical industry, the electrician, contractor and AJH have been taught the importance and significance of the concept of mechanical execution of work. I am an electrical instructor who teaches this important concept to the people involved. This is one of the basis for 90.1(A) which serves as the purpose of this Code. The Code's purpose is to provide a safe installation from the hazards arising from the use of electricity.
The revised text in 820.24(A) will require all community antenna television and radio distribution systems, equipment, cables and circuits to be installed in a neat and workmanlike manner.
820.24(B) is an editorial change with additional language to require the means of securing and supporting to be listed for the purpose.
The addition of 820.24(C) would replace the requirements that were located in 820.3(A), 820.154(A), 820.154(B), and 820.154(D). It makes sense to have the requirements of both the installation of cable and the removal of cable in the same Code section. This would provide the proper guidance to everyone involved. The installer, contractor and the AHJ would gain from this revised section as the rules are centrally located in one Code section. If coaxial cables are installed properly then the removal of coaxial cables should be no problem if it is not needed anymore or abandoned. The proposed FPN will provide useful guidance and information to everyone involved regarding correct installation practices which would facilitate the removal of the cable as well.
Similar proposals have been submitted for 640.6, 725.8, 760.8, 770.24, 800.24, and 830.24.
Panel Meeting Action: Accept in Principle in Part
The panel accepts the incorporation of the term "listed".
The panel accepts in principle the part of the proposal that recommends relocating requirements for abandoned cable.
The panel does not accept the breaking up of 820.24 and the changes to the FPN.
Panel Statement: See panel action on Proposal 16-272, and 16-259.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 10 Negative: 4 Abstain: 1
Explanation of Negative:
BRUNSSEN, J.: See my explanation of negative vote on Proposal 16-43.
DORNA, G.: See my explanation of negative vote on Proposal 16-45.
OHDE, H.: This proposal should have been accepted in part. The FPN located after 820.24(C) is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.
PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.
Explanation of Abstention:
KAHN, S.: Though I agree with the proposal and the submitter's intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

16-276 Log #2276 NEC-P16 **Final Action: Reject (820.24, FPN)**

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Update the publication date of the referenced standard as follows:
FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved installation standards.
Substantiation: ANSI/NECA/BISCI 568-2001 is currently being revised, and the 2008 NEC should reference the latest edition.
ANSI/NECA/BICSI 568-2006 will be completed prior to the Public Comment deadline.
Panel Meeting Action: Reject
Panel Statement: The panel cannot act on ANSI/NECA/BICSI 568-2006 as it has not yet been issued.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BOYER, J.: See NEMA's negative comment on Proposal 16-136.

16-277 Log #2337 NEC-P16 **Final Action: Accept in Principle (820.24, FPN)**

Submitter: James W. Romlein, MV Labs LLC / Rep. TIA
Recommendation: Add an FPN to read:
FPN: Accepted industry practices are described in:
ANSI/TIA/EIA-568-B.1 2004 - Part 1 General Requirements Commercial Building Telecommunications Cabling Standard, ANSI/TIA-569-B 2004 - Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA-570-B - Residential Telecommunications Infrastructure.
(List Other Documents Here) and other ANSI-approved installation standards.
Substantiation: TIA standards contain the source specifications that drive the performance-related industry practices. These TIA documents have a long history of demonstrated successful guidance to the installation, inspection, and network ownership communities. TIA wiring standards have been recognized by the Federal Communications Commission since before 2000 as the appropriate industry standards to be used for new and revised wiring, and are encouraged to be called out in building codes. (See, "Third Report and Order" in CC Docket No. 88-57 (FCC 99-405) (2000), released January 10, 2000, and 47 CFR section 68.213(c) of the FCC Rules.)
Panel Meeting Action: Accept in Principle
Change FPN to read as follows:
FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568–2001, Standard for Installing Commercial Building Telecommunications Cabling; ANSI/TIA/EIA-568-B.1 2004 - Part 1, General Requirements Commercial Building Telecommunications Cabling Standard; ANSI/TIA-569-B 2004, Commercial Building Standard for Telecommunications Pathways and Spaces; ANSI/TIA-570-B, Residential Telecommunications Infrastructure, and other ANSI-approved installation standards.
Panel Statement: The panel combined the submitter's FPN with the existing text.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
BOYER, J.: See NEMA's negative comment on Proposal 16-136.
PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

16-278 Log #3064 NEC-P16 **Final Action: Reject**
(820.24, FPN)

Submitter: Ron Alley, ELECTRICO
Recommendation: Delete the following text:
~~FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI approved installation standards.~~
Substantiation: Numerous consensus standards from organizations such as Electronics Industry Association (EIA), Telecommunication Industry Association (TIA), Underwriters Laboratories Inc. (UL), NEMA, IEEE and IEC/ISO could be added as a Fine Print Note throughout the Code to assist the reader of the NEC as the existing FPN note does. There are just as many publications such as Telecommunications Cabling Installation, Network Cabling, Telecommunications Cable Splicing, Communications Cabling, Telecommunications Internetworking and too many others to mention, that could be listed in a FPN that would benefit the reader. Also, there are safety regulations, pertaining to telecommunication systems such as OSHA 1910 and OSHA 1926 that could be added as a Fine Print Note to assist readers to make their companies and workers safer. Adding a Fine Print Note for the purpose of informing the reader of all related standard and publications would be cumbersome. The NEC should list all prominent standards and publications in a FPN or it should list none.

The particular standard mentioned in the FPN, (ANSI/NECA/BICSI 568-2001 (Installing Commercial Building Telecommunications Cabling) contains only 46 pages. The Standard mentioned in the FPN is very basic. It lists only a small percentage of the terminations used in the industry. Also, only a limited number of communications cables are shown and their limitations are not discussed. The standard does not contain enough information to be used as stand alone document without the use of other standards and text books that are not mentioned in the FPN. In my opinion, the ANSI standard listed in the FPN should never be used instead of manufacturer’s instructions.

Manufacturer’s instructions are sometimes required to be included as a condition of listing or labeling of telecommunications equipment and are sent with the listed or labeled products or can be requested from the manufacturer prior to installation. Manufacturer’s instructions are updated as needed to keep up with product improvements. The FPN in the 2005 Code most likely will not be as up-to-date as the manufacturer’s instructions.

If the committee decides to keep the FPN, please consider modifying the FPN as follows:

“ANSI/NECA/BICSI 568-2001 Standard for Installing Commercial Building Telecommunications Cabling is one source of many that can be used with manufacturer instructions.”

Panel Meeting Action: Reject
Panel Statement: The references provided in the FPN provide guidance for installation in a neat and workmanship like manner.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
OHDE, H.: This proposal should have been accepted. The submitter substantiates that there are numerous consensus standards from reputable organization that also could be added to assist the reader of the NEC as existing FPN do. The ANSI/NECA/BICSI 568-2001 Standard is also a very basic and non-informative document that does not provide much guidance to the installer.

PREZIOSO, L.: The proposal removes a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly the proposal should be accepted and the FPN should be removed.

16-279 Log #56 NEC-P16 **Final Action: Accept in Principle**
(820.25 (New), 820.26 (New) & 820.3(A))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
<u>820.25 Abandoned Cables. The accessible portion of abandoned coaxial cables shall be removed.</u>
<u>FPN: See Article 100 for a definition of “accessible.”</u>
<u>820.26 Spread of Fire or Products of Combustion. Installations of coaxial cables and CATV raceways in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of coaxial cables and CATV raceways through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.</u>
<u>FPN: See Article 100 for the definition of “approved”.</u>
~~820.3(A) Spread of Fire or Productions of Combustion. Section 300.21 shall apply. the accessible portion of abandoned coaxial cables shall be removed.~~
Substantiation: The title of 820.3 is “Other Articles”. The requirement for the removal of abandoned cables is not in another article; it is in Article 820. It is out of place in 820.3. This proposal will move it to a new section of Article 820. Rather than refer to 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 820 which should be familiar to CATV installers. The text of proposed 820.26 is based on 300.21, but modified to apply to coaxial cables and CATV raceways. The fine print notes pointing to definitions are intended to assist installers who are not code experts and may not be aware of Article 100. The fine print note in 300.21 was not copied because it does not provide sufficient guidance for a CATV cable installer.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-259.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 820.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.

The substantiation provided to delete 820.3(A) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 820.26 is based on the requirements of 300.21 but modified to apply to coaxial cables and CATV raceways. There was no substantiation submitted for this change.

In addition, Section 90.1 (C) of the NEC states “ *This Code is not intended as a design specification or an instruction manual for the untrained persons* .” In the submitter’s substantiation he states these FPN’s will help installers who are not Code experts. The addition of the FPN following 820.25 referencing Article 100 for the definition of accessible the FPN following 820.26 referencing Article 100 for the definition of approved is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-280 Log #2665 NEC-P16 **Final Action: Accept in Principle in Part**
(820.30)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Consolidated from various areas to a new section:
<u>**800.30 Abandoned Cables.** The accessible portion of abandoned coaxial cables shall be removed.</u>
Remove wording in 820.3(A) “The accessible portion of abandoned coaxial cables shall be removed.”
Remove wording in 820.154(A), “Abandoned cables shall not be permitted to remain.”
Remove wording in 820.154(B)(1), “Abandoned cables shall not be permitted to remain.”
Substantiation: The title of Section 820.3 is “Other Articles”. The requirement for the removal of abandoned cables is not in another article; it is in Article 820. It is out of place in section 820.3. This proposal will move it to a new section of Article 820. The deletion of the requirements to remove abandoned cable in 820.154(A) and (B) corrects an error.
Panel Meeting Action: Accept in Principle in Part
The panel accepts the change pertaining to 820.3(A).
The panel accepts in principle the recommendation to move the abandoned cable requirements. See panel action on Proposal 16-259.
The panel rejects the submitter’s action on 820.154(A) and accepts the change to 820.154(B)(1). See panel action on Proposal 16-333.
Panel Statement: See Proposals 16-259 and 16-333.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: We agree with the submitter’s intent to locate all abandoned cable requirements to a new section in Part 1- General within the Article. Part 1- General applies to the entire article and therefore would reduce the confusion. We believe that not just the accessible portion of abandoned cables but all abandoned cables be removed to reduce the fuel load.

16-281 Log #764 NEC-P16 **Final Action: Accept**
(820.44)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the term “coaxial” as shown:
II. <u>Coaxial</u> Cables Outside and Entering Buildings
820.44 Overhead <u>Coaxial</u> Cables.
(B) Lead-in Clearance. Lead-in or aerial-drop <u>coaxial</u> cables from a pole or other support, including the point of initial attachment to a building or structure, shall be kept away from electric light, power, Class 1, or nonÐpower-limited fire alarm circuit conductors so as to avoid the possibility of accidental contact.

(C) On Masts. Aerial coaxial cables shall be permitted to be attached to an above-the-roof raceway mast that does not enclose or support conductors of electric light or power circuits.

(D) Above Roofs. C oaxial c ables shall have a vertical clearance of not less than 2.5 m (8 ft) from all points of roofs above which they pass.

(E) Between Buildings. C oaxial c ables extending between buildings and also the supports or attachment fixtures shall be acceptable for the purpose and shall have sufficient strength to withstand the loads to which they may be subjected.

Exception: Where a coaxial cable does not have sufficient strength to be self-supporting, it shall be attached to a supporting messenger cable that, together with the attachment fixtures or supports, shall be acceptable for the purpose and shall have sufficient strength to withstand the loads to which they may be subjected.

(F) On Buildings. Where attached to buildings, coaxial cables shall be securely fastened in such a manner that they will be separated from other conductors in accordance with 820.44(F)(1), (F)(2), and (F)(3).

Substantiation: This proposal is a clarification. (Task Group No. 820-09)

It is part of a series of proposals to clarify that Article 820 deals with "coaxial" cable. Adding the word "coaxial" adds clarity to the section for the code user.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-282 Log #765 NEC-P16 **Final Action: Accept in Principle**
(820.47)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Add the sentence as shown:

820.47. Underground Circuits Entering Building. Underground coaxial cables entering buildings shall comply with 820.47(A) and 820.47(B).

Change the title of (A) as follows:

(A) ~~Underground Systems.~~ With Electric Light and Power Conductors.

Substantiation: This proposal is editorial. (Task Group No. 820-10)

It proposes wording parallel to that in Article 800 and properly describes the requirements of the Section and the title change also parallels that of Article 800 and is more descriptive of the paragraph.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Principle

Accept the submitter's proposal with the following revisions:

In the title of 820.47, make "Building" plural as in 2005 NEC text.

In proposed new title of 820.47(A), delete the period following "Systems".

Panel Statement: These changes reflect the 2005 NEC existing text and provide a correction to punctuation.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-283 Log #766 NEC-P16 **Final Action: Accept in Principle**
(820.48 (New) & 800.113 Exception No. 2)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the following changes:

820.48. Unlisted Cables Entering Buildings. ÊUnlisted outside plant coaxial cables shall be permitted in building spaces other than risers, air ducts, plenums and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated at a grounding block.

FPN No. 1: This section limits the length of unlisted outside plant cable to 15 m (50 ft), while 820.93 requires that the outer conductive shield of the coaxial cable be grounded at the building premises as close to the point of cable entrance or attachment as practicable. Therefore the outside plant coaxial cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to ground the outer conductive shield closer than 15 m (50 ft) to the entrance point.

FPN No, 2: See 820.2 for the definition of point of entrance.

FPN No. 3: See 820.2 for the definition of air duct.

FPN No. 4: See Article 100 for the definition of plenum.

FPN No. 5: See 300.22(C) for information on other space used for environmental air.

820.113, *Exception No. 2: As permitted in 820.48.* ~~*Listing and marking shall not be required where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated at a grounding block.*~~

Substantiation: This is an editorial and technical proposal. (Task Group No.820-11)

It is a companion proposal to similar proposals made for articles 770 and 800. Part II of Article 820 covers "Cables Outside and Entering Buildings". Part VI covers "Cables Within Buildings". Exception No. 2 to 820.113 deals with cables entering buildings and logically belongs in Part II.

The proposed new fine print notes 2, 3, 4 & 5 are provided to help the reader by pointing to the definitions of "point of entrance", "air duct" and "plenum" and a description of "other space used for environmental air". New fine print note 1 is provides useful information for simultaneously complying with the 50 foot rule and the requirement for grounding. It is similar to the fine print note No. 2 to Exception No.2 in 800.113.

The technical portion is a requirement prohibiting outside plant cables from running in risers or in the air distribution system; thereby correcting an omission in the current code.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-284.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-284 Log #27 NEC-P16 **Final Action: Accept in Principle**
(820.48 (New) & 800.113, Exception No. 2)

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

820.48. Unlisted Cables Entering Buildings. Unlisted outside plant coaxial cables shall be permitted in building spaces other than risers, air ducts, concealed spaces, plenums and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated at a grounding block.

FPN No. 1: This section limits the length of unlisted outside plant cable to 15 m (50 ft), while 820.93 requires that the outer conductive shield of the coaxial cable be grounded at the building premises as close to the point of cable entrance or attachment as practicable. Therefore the outside plant coaxial cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to ground the outer conductive shield closer than 15 m (50 ft) to the entrance point.

FPN No, 2: See 820.2 for the definition of point of entrance.

FPN No. 3: See 820.2 for the definition of air duct.

FPN No. 4: See Article 100 for the definition of plenum.

FPN No. 5: See 300.22(C) for information on other space used for environmental air.

820.113, *Exception No. 2: As permitted in 820.48.* ~~*Listing and marking shall not be required where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated at a grounding block.*~~

Substantiation: Part II of Article 820 covers "Cables Outside and Entering Buildings". Part VI covers "Cables Within Buildings". Exception No. 2 to 820.113 deals with cables entering buildings and logically belongs in Part II.

In addition to editorially changing the exception to positive language and moving it to Part II, this proposal deals with the issue of the fire hazard of unlisted outside plant cables in buildings. Unlisted outside plant entrance cables are sometimes run in risers, air ducts, concealed spaces and plenums. When the 50-foot exemption for outside plant cable was adopted, it was assumed that the entrance cable would go into an equipment room. It was not envisioned that the unlisted cable, which is not fire resistant, would run up a riser, in an air duct, in concealed spaces, or a plenum. The proposed new fine print notes 2, 3, 4 & 5 are provided to help the reader by pointing to the definitions of "point of entrance", "air duct" and "plenum" and a description of "other space used for environmental air". New fine print note 1 is provides useful information for simultaneously complying with the 50 foot rule and the requirement for grounding. It is similar to the fine print note No. 2 to Exception No.2 in 800.113.

Panel Meeting Action: Accept in Principle

The panel accepts the submitter's proposal with the following revisions:

820.48 to read as follows:

820.48. Unlisted Cables Entering Buildings. Unlisted outside plant coaxial cables shall be permitted to be installed in locations as described in 820.154(D), where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated at a grounding block.

Delete FPNs 3, 4, and 5.

Change 820.113 Exception No. 2 to be Exception.

Panel Statement: The panel made changes to the submitter's text to correlate with the language in the remainder of the article.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-285 Log #600 NEC-P16 **Final Action: Reject**
(820.93)

Submitter: John Chamberlain, Broadband Telecommunications. LLC
Recommendation: Revise text to read as follows:
820.93 Grounding of Outer Conductive Shield of a Coaxial Cable.
The outer conductive shield of the coaxial cable shall be grounded at the building premises as close to the point of cable entrance or attachment as practicable. Interruption of the shield with a listed device shall be allowed prior to the cable entrance as an additional measure to protect against surges entering buildings.
Substantiation: The majority of premises in the US have delivered to them multiple "utility" services. Typically these services include Power, Telephone, and Cable TV. Power is delivered with three conductors; 1) Hot-power delivered from a generator, 2) Return-a low resistance return to the generator to complete the electrical circuit in an economic fashion, and 3) Ground-for safety in the case that the return path is compromised and for providing a "common ground" in the premises for safety.
Although the NEC provides for safe distribution of power in the home, when there is an accidental code violation dangerous conditions can develop on the outer conductor of the coaxial cable that supplies typical broadband services such as Cable Television, data services, and FoIP telephony.
In the case of a "neutral crossing" or a "compromised ground" in a premises, the power delivered by the power company attempts to complete the circuit to the power generators by the lowest resistance path. In some cases, this path can be the outer conductor of a coaxial cable that is bonded to ground at both ends of the coaxial cable (bonded at the premises and the pedestal or strand). In this case, the outer conductor of the coaxial cable acts as a bonding conductor to ground at the pedestal. Currents as high as 20 amps have been measured and cable has been know to melt and drop onto homes.
I propose a change to NEC 820 to resolve this potential safety issue. I propose that an automatic resettable fuse be required in the outer conductor electrical path of the supply cable (drop cable) between the. The proposed solution would maintain a bond between the network ground and the premises ground at all times except in the case that more than an allowable current is detected on the outer conductor of the coaxial cable. At that point, the "fuse" would trip and the high current would not be on the cable of concern. An indicator of the condition should be required as part of the proposed solution, thereby alerting personnel to the safety issue present. In addition, when the fuse trips the outer conductor of the supply, or network, side would still be grounded to the network ground, and the outer conductor of the premises cable would still be grounded to the premises ground, the two would just not be bonded together for the duration of the existence of the problem. The resettable fuse would reconnect the two outer conductors automatically in the case that the issue resolved itself.
Panel Meeting Action: Reject
Panel Statement: Any device will introduce an undesirable impedance in the ground path.
Shock issues are not addressed. When in a high impedance state, there could be a dangerous voltage differential between the premises shield and equipment "grounds" and the earth ground resulting in a significant risk of electric shock. Even in the low impedance state, it is possible to have enough of a differential with current flow high enough to pose a risk of shock yet not high enough to trip the device.
Without equipotential bonding, ground potential rise issues can result in circuit damage.
Articles 770 and 800 permit installation of an interruption device; this does not seem to be a suitable insulation device.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-286 Log #767 NEC-P16 **Final Action: Accept in Part**
(820.93)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise 820.93 as follows:
820.93 Grounding of the Outer Conductive Shield of ~~a~~ Coaxial ~~Cable~~ Cables Entering Buildings. The outer conductive shield of ~~the~~ coaxial ~~cable~~ cables entering buildings shall be grounded ~~at the building premises~~ as close to the point of ~~cable~~ entrance or attachment as practicable. For purposes of this section, grounding located at mobile home ……..
Substantiation: This proposal is editorial. (Task Group No. 820-12)
It provides for consistency between 770.93, 800.93, 820.93 and 830.93. This is a companion proposal to 770.93, 800.93 and 830.93.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Part
Revise 820.93 as follows:
820.93 Grounding of the Outer Conductive Shield of ~~a~~ Coaxial ~~Cable~~ Cables . The outer conductive shield of ~~the~~ coaxial ~~cable~~ cables shall be grounded ~~at the building premises~~ as close to the point of ~~cable~~ entrance or attachment as practicable. For purposes of this section, grounding located at mobile home ……..
Panel Statement: "Entering Buildings" is inappropriate as the cable may not actually enter the building. This is removed in two places.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-287 Log #1308 NEC-P16 **Final Action: Accept**
(820.93)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-286. This action will be considered by the Panel as a Public Comment.
Submitter: Steven C. Johnson, Time Warner Cable / Rep. National Cable Telecommunications Association
Recommendation: Revise as follows:
820.93 Grounding of Outer Conductive Shield of a Coaxial Cable. The outer conductive shield of the coaxial cable shall be grounded at the building premises as close to the point of cable entrance or attachment as practicable.
For purposes of this section, grounding located at mobile home service equipment located ~~in sight from, and not more~~ within 9.0 (30 ft) of the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with 250.32 and located ~~in sight from, and not more~~ within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.
Substantiation: Improves clarity. The existing, double-negative wording is difficult to interpret. This editorial change makes the text easier to interpret and clarifies the requirements.
For purposes of grounding or bonding CATV equipment, being able to see the power disconnection point is immaterial. Where as "in sight from" may be critical for disconnecting power in an emergency, maintaining a reasonable length grounding conductor is the key in a CATV application. This proposal does not affect service equipment placement requirements. It only clarifies where the CATV grounding will be done based on where the service equipment is already placed.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-288 Log #768 NEC-P16 **Final Action: Accept**
(820.93, FPN (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add a Fine Print Note Number 1 (FPN No 1) to 820.93 as follows:
FPN No. 1: See 820.2 for the definition of *point of entrance* .

Renumber the existing FPN as "FPN No. 2.

Substantiation: This is an editorial proposal. (Task Group No.)
The editorial addition of FPN No. 1 will provide consistency with 770.93, 800.93 and 830.93. This is a companion proposal to 770.93 and 830.93.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing 820.2 for the definition of point of entrance is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-289 Log #73 NEC-P16 **Final Action: Accept in Principle in Part**
(820.94 (New))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. The first sentence in new (C) references compliance with (B)(1) and there is not a (B)(1). This action will be considered by the Panel as a Public Comment.
Submitter: John Chamberlain, Broadband Telecommunications. LLC
Recommendation: New Article 820 Section for Primary Protection.
820.XX Primary Electrical Protection.
(A) Application. Primary electrical protection shall be provided on all community antenna television and radio distribution systems that are neither grounded nor interrupted and are run partly or entirely in aerial cable not confined within a block. Also, primary protection shall be provided on all aerial or underground community antenna television and radio distribution systems that are neither grounded nor interrupted and are located within the block containing the building served so as to be exposed to lightning or accidental contact with electric light or power conductors operating at over 300 volts to ground.
(1) Fuseless Primary Protectors. Fuseless type primary protectors shall be permitted where power fault currents on all protected conductors in the cable are safely limited to a value no greater than the current-carrying capacity of the primary protector and of the primary protector grounding conductor.
(2) Fused Primary Protectors. Where the requirements listed in 820.XX(A)(1) are not met, fused type primary protectors shall be used. Fused-type primary protectors shall consist of an arrestor connected between each conductor to be protected and ground, a fuse in series with each conductor to be protected, and an appropriate mounting arrangement. Fused primary protector terminals shall be marked to indicate line, instrument, and ground, as applicable.
(B) Location. The location of the primary protector, where required, shall comply with (B)(1)
(1) A listed primary protector shall be applied on each community antenna and radio distribution cable external to the premises. The listed primary protector should be located as close as practicable to the entrance point of the cable on either side or integral to the ground block.
(C) Hazardous (Classified) Locations. The primary protector or the equipment providing the primary protection function shall not be located in any hazardous (classified) location as defined in Article 500 or in the vicinity of easily ignitable material.
Substantiation: A change in technology requires that Article 820 include a provision for "Primary Protection". Due to the advent of VoIP (Voice over Internet Protocol) delivered by Community Antenna Television and Radio Distribution Systems as per Article 820, primary protection should be required in this article. Both Article 800 Communications Circuits, and Article 830 Network-Powered Communications Circuits have requirements for "Primary Protection". Currently, Article 820 does not have this requirement.
The wiring methods for all three articles (800, 820, and 830) are similar, the only differentiation that Article 820 currently seems to have is that voice or telephone services are not delivered. Given, this current differentiation, it is understandable that primary protection only be required for telephone delivery systems because the end user equipment (a telephone headset) places personnel in very close proximity to the equipment and a potential safety hazard exists for high voltage surges such as lightning strikes.
Now that VoIP is being delivered by systems that fall under Article 820, Primary Protection should also be required in this Article. In addition, it is possible for third parties to deliver VoIP over Article 820 systems without the knowledge or approval of the carrier. Therefore, primary protection should be required on Article 820 systems whether the carrier is providing VoIP services or not.
Panel Meeting Action: Accept in Principle in Part
Add the following text to 820.93 as follows:
(C) Location. The location of the primary protector, where required, shall comply with (B)(1).
(1) A listed primary protector shall be applied on each community antenna and radio distribution cable external to the premises. The listed primary protector should be located as close as practicable to the entrance point of the cable on either side or integral to the ground block.
(D) Hazardous (Classified) Locations. Where a primary protector or equipment providing the primary protection function is used, it shall not be located in any hazardous (classified) location as defined in 500.5 or in the vicinity of easily ignitible material.
Exception: As permitted in 501.150, 502.150, and 503.150.
Panel Statement: The panel did not accept the submitter's subsection (A) because 820.93 requires grounding on all Article 820 installations. As this proposal is worded, a primary protector would never be required.
Section 820.93(B) already allows the use of such a device.
Adding the new text addresses the submitter's concern of locating protectors.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-290 Log #159 NEC-P16 **Final Action: Reject**
(820.94 (New))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. The first sentence in new (C) references compliance with (B)(1) and there is not a (B)(1). This action will be considered by the Panel as a Public Comment.
Submitter: Jon Spencer, J-Tech
Recommendation: Add the primary protection requirement (NEC 830.9) into Article 820.
Substantiation: Additions to the 1999 NEC publication include Article 830, to govern MSOs (Multiple Service Operators) who provided multiple services using a Network-Powered Broadband Communications Systems. NEC 830 provided guidelines for many aspects of delivering bundled services.
830.90 Primary Electrical Protection required primary protection for all network powered drop cables to protect against lightning, power crossing and other high voltage situations. Section 830.90 is significant because of the increased risk of electrical shock to the end-user due to physical contact between the telephone headset and personal body. (Reference pages 3 & 4 of article from the Maine Today newspaper which I have provided). Clearly, 830.90 is a vital safety aspect when telephone services are provided, however, the article is limited to Network-Powered Broadband Communications Systems: NEC Article 830.
Advances in VoIP technology allow MSOs and 3rd party vendors to offer residential and business telephone service that relies on home power and/or battery backup. By using home power and/or battery backup, the system falls under Article 820 and leaves the individual at an increased risk of electrical shock hazard due to the lack of primary protection requirement.
As the cable industry and 3rd party vendors continue to launch new products, like VoIP, it becomes harder to determine which customers subscribe to telephone service over cable and those who do not. Based on the uncertainty and severity of lightning and factor in the future penetration rates of VoIP technology, it is critical primary protection is added to the 2008 version Article 820. (Radio Distribution Systems)
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The submitter did not provide text for the new section.
The submitter indicated a possible problem but did not provide proposed text to solve said problem.
Supporting material relayed accounts of lightning strike damage but did not identify the path taken by the lightning.
The substantiation does not show that present grounding requirements are insufficient or that adding a protector would add safety over present requirements.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

(Note: The sequence 16-291 was not used)

16-292 Log #1311 NEC-P16 **Final Action: Accept**
(820.100)

Submitter: Steven C. Johnson, Time Warner Cable / Rep. National Cable Telecommunications Association
Recommendation: Revise as follows:
820.100 Cable Grounding. ~~Where required by 820.93, t~~ T he shield of the coaxial cable shall be grounded as specified in 820.100(A) through 820.100(D).
Substantiation: Prior to 2002, the NEC listed criteria where grounding was required, such as exposure to lightning, exposure to accidental contact with power conductors, etc. The 2002 code removed these qualifications and just specified that the shield be grounded. Since 820.93 requires grounding without exception, the phrase "Where required by 820.93" is redundant.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-293 Log #3510 NEC-P16 **Final Action: Reject**
(820.100)

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Revise as Follows:
820.100 Cable Grounding. Where required by 820.93, the shield of the coaxial cable shall be grounded as specified in 820.100(A) through 820.100(D).
(A) Grounding Electrode Conductor.
(1) Insulation. The grounding electrode conductor shall be insulated and shall be listed as suitable for wet locations ~~the purpose~~ .
(2) Material. The grounding electrode conductor shall be copper or other corrosion-resistant conductive material, stranded or solid.
(3) Size. The grounding electrode conductor shall not be smaller than 14 AWG. It shall have a current-carrying capacity approximately equal to that of the outer conductor of the coaxial cable. The grounding electrode conductor shall not be required to exceed 6 AWG.

(4) Length. The grounding electrode conductor shall be as short as practicable. In one- and two-family dwellings, the grounding electrode conductor shall be as short as practicable, not to exceed 6.0 m (20 ft) in length.

FPN: Similar grounding electrode conductor length limitations applied at apartment buildings and commercial buildings will help to reduce voltages that may be developed between the building's power and communications systems during lightning events.

Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum grounding electrode conductor length of 6.0 m (20 ft), a separate ~~ground~~ grounding connection as specified in 250.52(A)(5), (A)(6), or (A)(7) shall be used, the grounding electrode conductor shall be grounded ~~to the separate ground~~ in accordance with 250.70, and ~~the separate ground~~ bonded to the power grounding electrode system in accordance with 820.100(D).

(5) Run in Straight Line. The grounding electrode conductor shall be run to the grounding electrode in as straight a line as practicable.

(6) Physical Protection. Where subject to physical damage, the grounding electrode conductor shall be adequately protected. Where the grounding e lectrode conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding electrode conductor or the same terminal or electrode to which the grounding electrode conductor is connected.

(B) Electrode. The grounding electrode conductor shall be connected in accordance with 820.100(B)(1) and (B)(2).

(1) In Buildings or Structures with Grounding Means. To the nearest accessible location on the following:

(1) The building or structure grounding electrode system as covered in 250.50

(2) The grounded interior metal water piping system, within 1.52 m (5 ft) from its point of entrance to the building, as covered in 250.52

(3) The power service accessible means external to enclosures as covered in 250.94

(4) The metallic power service raceway

(5) The service equipment enclosure

(6) The service, system, building or structure grounding electrode conductor or the grounding electrode conductor metal enclosure, or

(7) The grounding electrode conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in 250.32

(2) In Buildings or Structures Without Grounding Means. If the building or structure served has no grounding means, as described in 820.100(B)(1):

(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), (A)(4); or,

(2) If the building or structure served has no grounding means, as described in 820.100(B)(1) or (B)(2)(1), to an effectively grounded metal structure or to any one of the individual electrodes described in 250.52(A)(5), (A)(6), and (A)(7).

(C) Electrode Connection. Connections to grounding electrodes shall comply with 250.70.

(D) Bonding of Electrodes. A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the community antenna television system's grounding electrode and the power grounding electrode system at the building or structure served where separate electrodes are used.

Exception: At mobile homes as covered in 820.106.

FPN No. 1: See 250.60 for use of air terminals (lightning rods).

FPN No. 2: Bonding together of all separate electrodes limits potential differences between them and between their associated wiring systems.

Substantiation: The concept of listed for the purpose needs to be explained. If being suitable for a wet location is not the intent, then please describe what is.

The term grounding conductor should be replaced with grounding electrode conductor. A proposal was submitted to Article 100 to modify the existing definition of grounding electrode and to delete the term grounding conductor. to clarify this issue. The Term Grounding conductor is sometimes used to describe a connection to the earth and other times to describe any of the different types of conductors that use the term "grounding". Separate grounding electrodes are already required to be bonded together by 250.50.

Describing what listed for the purpose will improve usablity.

Panel Meeting Action: Reject

Panel Statement: The term "grounding electrode conductor" specifically applies to the conductor that connects the grounding electrode(s) to the equipment grounding conductor or to the grounded conductor, or both at the electric service to the building. The conductor connecting the metallic members of the cable sheath and the primary protector grounding terminal to the building grounding means is not a "grounding electrode conductor", but a "grounding conductor" as determined by the TCC Grounding & Bonding Task Group.

The listing of a grounding electrode conductor does not include a special investigation for a wet location.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-294 Log #847 NEC-P16 **Final Action: Reject**
(820.100(A)(1))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

820.100 Cable Grounding.

Where required by 820.93, the shield of the coaxial cable shall be grounded as specified in 820.100(A) through 820.100(D).

(A) Grounding Conductor

(1) Insulation. The grounding conductor shall be insulated and shall be listed and marked as a grounding protector wire. ~~as suitable for the purpose.~~

Substantiation: Under the category KDER and the UL White Book, Protector Grounding wires are addressed. The guide card information indicates that this wire is required to be marked with the manufacturer's name, size, and the words "protector grounding wire". In step with the directives to address the term listed or listed as suitable for the purpose, this proposal is an effort to be more specific in the rule to require a conductor specifically listed and marked for this purpose.

Panel Meeting Action: Reject

Panel Statement: There is nothing special about the conductor used to ground the protector. The communications industry has used listed wire to ground the protector universally and safely for many years. There is no need to specifically mark this conductor "as a grounding protector wire". Such marking may lead to confusion and misinterpretation. The submitter has demonstrated no safety issue with the present practice.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-295 Log #851 NEC-P16 **Final Action: Accept**
(820.100(A)(1))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

820.100 Cable Grounding.

Where required by 820.93, the shield of the coaxial cable shall be grounded as specified in 820.100(A) through 820.100(D).

(A) Grounding Conductor

(1) Insulation. The grounding conductor shall be insulated and shall be listed. ~~as suitable for the purpose.~~

Substantiation: Listed insulated conductors are currently being used for this purpose and there doesn't appear to be insulated conductors listed specifically for the purpose of accomplishing the grounding required by this section.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-296 Log #905 NEC-P16 **Final Action: Reject**
(820.100(A)(3))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: (A)(3) revise second sentence:

It shall have a current-carrying capacity ~~approximately equal to~~ not less than that of the outer conductor of the coaxial cable

(D) A copper bonding jumper not smaller than 6 AWG ~~copper~~ or equivalent... (remainder unchanged).

Substantiation: Edit. Present wording indicates the grounding conductor is not permitted to have a current-carrying capacity greater than the outer conductor. In (D) copper appears intended, however, literal wording only requires a jumper that is not smaller than 6 AWG copper, for which 6 AWG aluminum suffices.

Panel Meeting Action: Reject

Panel Statement: The present text is clear. The bonding jumper can be "… not smaller than 6 AWG copper or equivalent …". An equivalent conductor is one with at least the same ampacity and corrosion-resistance capability and could be of different material and/or larger in size (AWG). The panel notes that the submitter did not see the necessity to revise "equivalent" in his proposals on similar requirements in 820.100(A)(3) and 830.100(D).

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-297 Log #376 NEC-P16 **Final Action: Reject**
(820.100(A)(6))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Recommendation: Revise text as follows:

" ~~Physical~~ Protection. Where subject to ~~physical~~ damage, the grounding conductor shall be adequately protected...".

Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion." I also leave it to you whether to update "adequately" to something like "by a means acceptable to the AHJ.")

Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject

Panel Statement: The grounding conductor is potentially subject to multiple sources of damage: electrical, physical, and environmental. The word "physical" is necessary to specifically identify the type of damage that the section is addressing.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-298 Log #850 NEC-P16 **Final Action: Accept**

(820.100(A)(6))

Submitter: Michael J. Johnston, Plano, TX

Recommendation: Revise text to read as follows:

(6) Physical Protection. <u>The grounding conductor shall be protected where exposed to physical damage.</u> ~~Where subject to physical damage, the grounding conductor shall be adequately protected.~~ Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or the same terminal or electrode to which the grounding conductor is connected.

Substantiation: Adequately is subjective in this requirement and can lead to inconsistencies. The word "adequate" is a word that is identified by the Style Manual as one to avoid in Code rules for that reason.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-299 Log #1888 NEC-P16 **Final Action: Accept**

(820.100(B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the use of the word "and" in the sentence "The grounding conductor shall be connected in accordance with 820.100(B)(1), (B)(2), and (B)(3)." This action will be considered by the Panel as a Public Comment.

It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-20.

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: Revise 820.100(B) **Cable and Primary Protector Grounding (Electrode)** as follows:

(B) Electrode. The grounding conductor shall be connected in accordance with 820.100(B)(1), ~~and~~ (B)(2) <u>and (B)(3).</u>

<u>**(1) In Buildings or Structures with an Intersystem Grounding Termination.** If the building or structure served has an intersystem grounding termination the grounding conductor shall be connected to the intersystem grounding termination.</u>

~~**(1)**~~ <u>**(2)**</u> **In Buildings or Structures with Grounding Means.** <u>If the building or structure served has no intersystem grounding termination, the grounding conductor shall be connected</u> to the nearest accessible location on the following:

....

.................Retain existing list and text.

....

~~**(2)**~~ **(3) In Buildings or Structures Without** <u>**Intersystem Grounding Termination or**</u> **Grounding Means.** If the building or structure served has no <u>intersystem grounding termination or</u> grounding means, as described in 820.100(B)(~~1~~ <u>2</u>), the grounding conductor shall be connected to either of the following:.

(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), (A)(4); or,

(2) If the building or structure served has no <u>intersystem grounding termination or</u> grounding means, as described in 820.100(B)(~~1~~ <u>2</u>) or (B)(~~2~~ <u>3</u>)(1), to an effectively grounded metal structure or to any one of the individual electrodes described in 250.52(A)(5), (A)(6), and (A)(7).

Substantiation: This is one of several correlated proposals (100 Definitions, 250.95, Chapter 8 Articles) to improve the requirements related to intersystem bonding and grounding of communication systems. The intent is to create a dedicated and well-defined location for terminating the grounding conductors required in Chapter 8 Articles and 770.93. These grounding conductors also provide between communication and power systems (intersystem bonding). The proposed termination would have sufficient capacity to handle multiple communication systems (telecom, satellite, CATV) on premises. The proposed revision makes the intersystem bonding terminal the preferred destination for grounding conductor in Article 820. See the figures I have provided.

Intersystem bonding accomplished by connection of a communication grounding conductor to the power system is an important safety measure to prevent occurrences of voltages between communication system and power system. However, the existing requirements are not adequate. Bonding is becoming difficult to implement due to changes in building construction practices such as increased prevalence of flush construction and use of PVC conduits. Frequently, in new construction, the grounding electrode, the raceway and the grounding electrode conductor are hidden behind walls and not accessible for bonding connection.

Even in older construction with accessible equipment, the requirement for installation of intersystem bonding connection is subject to varying interpretation because there is not a clearly defined dedicated bonding location. The connection to the power system is sometimes haphazard. Installers are sometimes confused over where the connection should be made especially if multiple Communication Systems are present on premises.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-300 Log #1993 NEC-P16 **Final Action: Accept in Principle**

(820.100(B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal based on the placement of the recommended text as indicated in the affirmative comment. This action will be considered by the Panel as a Public Comment.

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group

Recommendation: Add these two sentences after the last sentence of 820.100(B):

<u>A device intended to provide a termination point for the grounding conductor (inter-system bonding) shall be prohibited from use when the installation of such device interferes with opening a service or metering equipment enclosure. An inter-system bonding device shall not be installed on an enclosure cover.</u>

Substantiation: Poor grounding practices by installers of CATV, telephone, satellite and other communication systems using termination devices that clamp to enclosure covers have resulted in interruption of grounding continuity. This is a companion proposal to proposals to add this requirement to 800.100(B), 810.21(F), and 830.100(B).

Panel Meeting Action: Accept in Principle

Add the following after the last sentence of 820.100(B):

A device intended to provide a termination point for the grounding conductor shall not interfere with the opening of an equipment enclosure. A bonding device shall be mounted on non-removable parts. A bonding device shall not be mounted on a door or cover even if the door or cover is non-removable.

Panel Statement: The panel accepts the intent of the submitter and has reworded the text for clarity. It is requested that the Technical Correlating Committee forward to Code-Making Panel 5 for similar action as applicable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRUNSSEN, J.: The submitter's text, as modified by the Panel, should be placed following the existing text of 820.100(B)(5) rather than at the end of 820.100(B). Section 820.100(B)(5) specifically addresses connection to the service equipment enclosure and that is the issue that the submitter intended to address.

16-301 Log #1552 NEC-P16 **Final Action: Accept**

(820.100(B)(2)(2))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 820 and revise text as shown for the affected NEC sections.

820.100(B)(2)(2):

(2) If the building or structure served has no grounding means, as described in 820.100(B)(1) or (B)(2)(1), ~~to an effectively grounded metal structure or~~ to any one of the individual electrodes described in 250.52(A)(5), (A)(6), and (A)(7).

Substantiation: 820.100(B)(2)(2): Here the reference to "effectively grounded metal structure" seems superfluous.

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-302 Log #2316 NEC-P16 **Final Action: Reject**
(820.100(B)(1) Exception)

Submitter: Robert Dudley, Amerisat Inc.
Recommendation: Add an Exception to read:

Exception: In dwellings where it is not practicable to ground as specified in 820.100(B)(1) or (B)(2), such as in multiple story buildings and in buildings with exterior ownership restrictions, grounding may be accomplished by connection to grounded equipment as specified in 250.138(A).

Substantiation: When the cable shield is connected to equipment which is grounded in accordance with 250.138(A), it is acceptable as a ground for the cable in those areas where other grounding is not readily available. Grounding conductors should always be as straight and short as possible, and this exception, in many installations, would allow shorter grounding conductor paths. Unplugging the device or disconnecting power to the outlet cuts power to the cable as well as to the equipment it is connected to.

Panel Meeting Action: Reject
Panel Statement: The intent of the grounding requirements of 820.100(B) is to obtain the best ground connection possible at a specific location. The grounding connection options are therefore presented in a descending order of acceptability. One should always strive to achieve the best ground connection possible when installing the cable ground. Electrical safety is of paramount importance and "practicability" is never a consideration.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-303 Log #769 NEC-P16 **Final Action: Accept**
(820.100(B)(1)7.)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the following:

<u>For purposes of this section, the mobile home service equipment or the mobile home disconnecting means, as described in 820.93, shall be considered accessible.</u>

Substantiation: This proposal is technical and editorial. (Task Group No. 820-14)

It provides parallel consistency with 830.100(B) and 800.100(B).

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-304 Log #770 NEC-P16 **Final Action: Accept**
(820.106)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:

820.106 ~~Bonding and~~ Grounding <u>and Bonding</u> at Mobile Homes

Substantiation: This is an editorial proposal. (Task Group No. 820-15)

It provides consistency in the title with Section 800.106

Note: A similar change is proposed to Section 830.106.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-305 Log #1313 NEC-P16 **Final Action: Accept in Principle**
(820.106(A))

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-4 based on text in the affirmative comments. This action will be considered by the Panel as a Public Comment.

Submitter: Steven C. Johnson, Time Warner Cable / Rep. National Cable Telecommunications Association
Recommendation: Revise as follows:

820.106 Bonding and Grounding at Mobile Homes.

(A) Grounding. <u>Grounding shall comply with (1) and (2).</u>

<u>(1)</u> Where there is no mobile home service equipment located ~~in sight from, and not more~~ <u>within</u> 9.0 m (30 ft) <u>of</u> the exterior wall of the mobile home it serves, <u>the coaxial cable shield ground, or surge arrester ground, shall be in accordance with 820.100(B)(2).</u>

<u>(2) Where</u> ~~or~~ there is no mobile home disconnecting means grounded in accordance with 250.32 and located ~~within sight from, and not more~~ <u>within</u> 9.0 m (30 ft) <u>of</u> the exterior wall of the mobile home it serves, the coaxial cable shield ground, or surge arrester ground, shall be in accordance with 820.100(B)(2).

Substantiation: Improves clarity. The existing, double-negative wording is difficult to interpret. This editorial change makes the text easier to interpret and clarifies the requirements.

For purposes of grounding or bonding CATV equipment, being able to see the power disconnection point is immaterial. Whereas "in sight from" may be critical for disconnecting power in an emergency, maintaining a reasonable length grounding conductor is the key in a CATV application. This proposal does not affect service equipment placement requirements. It only clarifies where the CATV grounding will be done based on where the service equipment is already placed.

Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-4.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

BRUNSSEN, J.: The Panel Action is "Accept in Principle" and the reader is referred to the Panel Action on Proposal 16-4. However, the Panel Meeting Action on Proposal 16-4 with regard to 820.106(A) is incorrect. See my affirmative comment on Proposal 16-4, 820.106(A).

16-306 Log #63 NEC-P16 **Final Action: Accept**
(820.110)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:

820.110 Raceways for Coaxial Cables.

Where coaxial cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or <u>listed plenum CATV raceway, listed riser CATV raceway, or listed general-purpose CATV raceway installed in accordance with 820.154, and</u> ~~a listed nonmetallic raceway complying with 820.182(A), (B), or (C), as~~

~~applicable, and installed in accordance~~ with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.
Exception: Conduit fill restrictions shall not apply.
Substantiation: This is a corollary proposal to one being submitted for Article770. Specifically mentioning each plenum, riser and general-purpose raceway, rather that using the term "nonmetallic raceway" is more user-friendly. The installation requirements are in 820.154 so the reference to 820.182(A) (which is listing requirements) was changed to 820.154 since this section deals with installation.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be modified. Change the last part of the first sentence of the new 820.110 as follows: "and installed in accordance with 362.10, 362.12 and 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply".
The Chapter 3 raceways must be installed in accordance with all of the requirements of Chapter 3. These raceways (general-purpose, riser) should also have to be installed in accordance with 362.10 and 362.12 since they have the same or similar characteristics to ENT.

16-307 Log #771 NEC-P16 **Final Action: Accept**
(Table 820.113)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change the title as shown:
Table 820.113 Coaxial Cable Markings
Substantiation: This is an editorial proposal. (Task Group No. 820-16)
It is part of a series of proposals to clarify that Article 820 deals with "coaxial" cable. Adding the word "coaxial" adds clarity to the section for the code user. Note that another proposal from the editorial task group moves this table to section 820.179 (Task Group No.).
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-308 Log #2385 NEC-P16 **Final Action: Reject**
(820.113)

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.
Recommendation: Add a sentence at the end of 820.113.
The temperature rating shall be marked on the cable .
Substantiation: It is important for the system designer, installer, local authority, and building owners to know the temperature rating of cables for proper application.
Panel Meeting Action: Reject
Panel Statement: The Code presently permits the temperature rating to be marked on the cable. See UL 444.
The AHJ does not have the authority to require the manufacturer to mark the temperature rating on the cable.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-309 Log #776 NEC-P16 **Final Action: Accept**
(820.113 and 820.179)

TCC Action: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-284. This action will be considered by the Panel as a Public Comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise 820.179 and 820.113 as shown and transfer Table 820.113 and Table FPN's to 820.179.
820.179 Coaxial Cables.
Cables shall be listed in accordance with 820.179(A) through 820.179(D) and marked in accordance with Table 820.179. The cable voltage rating shall not be marked on the cable.
FPN: Voltage markings on cables could be misinterpreted to suggest that the cables may be suitable for Class 1, electric light, and power applications.
Exception: Voltage markings shall be permitted where the cable has multiple listings and voltage marking is required for one or more of the listings.
820.113 Installation and Marking of Coaxial Cables.
Listed coaxial cables shall be installed as wiring within buildings. ~~Coaxial cables shall be marked in accordance with Table 820.113. The cable voltage rating shall not be marked on the cable.~~
~~FPN: Voltage markings on cables could be misinterpreted to suggest that the cables may be suitable for Class 1, electric light, and power applications.~~
~~*Exception No. 1: Voltage markings shall be permitted where the cable has multiple listings and voltage marking is required for one or more of the listings.*~~
Exception No. 2: Listing and marking shall not be required where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated at a grounding block.
Substantiation: The change is editorial. (Task Group No. 820-22)
It moves the cable marking requirements from 820.113 to 820.179. Marking requirements belong with listing requirements.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 16-284.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-310 Log #1882 NEC-P16 **Final Action: Accept in Principle**
(820.113 Exception No. 2)

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 820.113, Exception No. 2 as follows:
Exception No. 2: Unlisted coaxial cables shall be permitted within buildings in spaces other than risers, air ducts, plenums, and other spaces used for environmental air. ~~Listing and marking shall not be required where the~~ The length of the unlisted cable permitted within the building, measured from its point of entrance, ~~does~~ shall not exceed 15 m (50 ft) . ~~and the~~ The unlisted cable ~~enters~~ shall enter the building from the outside and ~~is~~ shall be terminated at a grounding block.
Substantiation: The NEC presently permits up to 50 ft of unlisted coaxial cable to be run into a building, but places no restriction on installing the unlisted cables in air handling spaces where they could contribute to fire and smoke hazard. This proposal adds that restriction, further contributing to fire and smoke safety. This is a companion proposal and is intended to correlate with similar proposals for 770.113 Ex. No. 1 and 800.113 Ex. No. 2.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-284.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-311 Log #772 NEC-P16 **Final Action: Accept**
(820.133)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make changes as shown:
820.133 Installation of Coaxial Cables and Equipment.
Beyond the point of grounding, as defined in 820.93, the coaxial cable installation shall comply with 820.133(A) through 820.133(C).
Substantiation: This is an editorial proposal. (Task Group No. 820-17)
It is one of a series of proposals to clarify that Article 820 deals with "coaxial" cable. Adding the word "coaxial" adds clarity to the section for the code user.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-312 Log #773 NEC-P16 **Final Action: Accept**
(820.133(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Renumber this section as shown:
820.133 Installation of Cables and Equipment.
Beyond the point of grounding, as defined in 820.93, the cable installation shall comply with 820.133(A) through 820.133(C).
(A) Separation from Other Conductors.
(1) In Raceways and Boxes.
(a ~~1~~) Other Circuits. Coaxial cables shall be permitted in the same raceway or enclosure with jacketed cables of any of the following:
(1) ~~a~~ . Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
(2) ~~b~~ . Power-limited fire alarm systems in compliance with Article 760
(3) ~~c~~ . Nonconductive and conductive optical fiber cables in compliance with Article 770
(4) ~~d~~ . Communications circuits in compliance with Article 800
(5) ~~e~~ . Low-power network-powered broadband communications circuits in compliance with Article 830
(b ~~2~~) Electric Light, Power, Class 1, NonÐPower-Limited Fire Alarm, and Medium Power Network-Powered Broadband Communications Circuits. Coaxial cable shall not be placed in any raceway, compartment, outlet box, junction box, or other enclosures with conductors of electric light, power, Class 1, nonÐpower-limited fire alarm, or medium power network-powered broadband communications circuits.
Exception No. 1: Where all of the conductors of electric light, power, Class 1, nonÐpower-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the coaxial cables by a permanent barrier or listed divider.
Exception No. 2: Power circuit conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to the coaxial cable system distribution equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum 6-mm (0.25-in.) separation from coaxial cables.
Substantiation: This proposal is editorial. (Task Group No. 820-18)
The change in numbering will bring this section into conformance with the numbering guideline of the NEC Style Manual and make the numbering the same as articles 800 and 830.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-313 Log #2630 NEC-P16 **Final Action: Reject**
(820.133(A) Exception (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add a new exception to 820.133(A) to read as follows:
Exception: Where all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the coaxial cables by a permanent barrier or listed divider.
Substantiation: This is a new exception for 820.133(A) that would allow a coaxial cable to share the same raceway, outlet box or enclosure as long as a barrier was in place. This language is similar to the language found in 800.133(A)(1)(c) Exception No. 1. Coaxial cable can become energized if it comes in contact with electrical conductors. This proposal defines the barrier as a permanent function of the enclosure or that it may be a removal or field installed listed divider. These barriers are used to divide the coaxial cable from the power circuits.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: Exception No.1 presently meets the submitter's intent.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-314 Log #1287 NEC-P16 **Final Action: Accept**
(820.133(A)(1))

Submitter: Gerald Lee Dorna, Belden CDT. Inc.
Recommendation: Revise text to read:
800.133 (A) (1) (1) In Raceways , Cable Trays and Boxes.
(1) Other Circuits. Coaxial cables shall be permitted in the same raceway , cable tray or enclosure with jacketed cables of any of the following:
a. Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
b. Power-limited fire alarm systems in compliance with Article 760
c. Nonconductive and conductive optical fiber cables in compliance with Article 770
d. Communications circuits in compliance with Article 800
e. Low-power network-powered broadband communications circuits in compliance with Article 830
Substantiation: Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray. Stating that these cables are allowed "in the same cable tray" will avoid having the user assume that they are not permitted to be installed together in the same cable tray. It clarifies the use in the Code. Article 770, in section 770.133(B), has text similar to that proposed here. This is one of five similar proposals that are being submitted for Articles 725, 760, 800, 820 and 830.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
JONES, R.: The submitter is obviously in error with the assertion "Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray." O NLY cABLES LISTED FOR INSTALLATION IN CABLE TRAYS CAN BE INSTALLED IN CABLE TRAYS.

16-315 Log #3432 NEC-P16 **Final Action: Reject**
(820.133(A)(1)2. Exception No. 1)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the phrase "listed divider" at the end; substitute the words "a securely installed barrier identified for the use."
Substantiation: This wording correlates with the changes made by CMP 9 to an equivalent rule in 404.8(B) in response to an equivalent proposal from the same submitter. The problem is that Article 314 does not require conventional steel outlet boxes to be listed, and therefore not all steel box dividers manufactured for this purpose are listed. In addition, none of these barriers (for outlet boxes) are permanently installed; but they certainly can be securely installed, and they certainly meet the provisions of the Article 100 definition of identified, in that they are recognizable as suitable for this purpose. This wording refers to the identical products and should therefore correlate with Article 314 requirements.
Panel Meeting Action: Reject
Panel Statement: This situation is not the same as 404.8(B). Section 404.8(B) deals with the grouping of snap switches with other snap switches and similar devices such as receptacles. The barriers described in 404.8(B) are used to separate these similar devices containing similar circuits.
Section 800. 133(A)(1)c; Exception No. 1; 820.133(A)(1)2, Exception No. 1; and 830.133(A)(1)d, Exception No. 1 deal with the separation of communications, CATV and broadband circuits from electric light, power and Class 1 circuits.
A permanent barrier as currently permitted is okay as it is a physical part of the metal box or listed plastic box and its suitability can be determined by the AHJ or is covered by the listing. There are concerns associated with a non-permanent barrier or divider that cannot be easily dealt with at the point of installation. For example compatibility with the box (fit and secureness), compatibility with the installed hardware such as power receptacles materials, ease of installation, clarity of proper installation procedures, affect on wiring space inside the box, and the like, need to be investigated and listed.
These articles do not only cover metal boxes. The proposal would allow non-listed barriers in metal and listed non-metallic boxes, voiding the listing of a non-metallic box.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-316 Log #2631 NEC-P16 **Final Action: Reject**
(820.135 (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add a new section to read as follows:
820.135 Communication Device and Equipment Mounting. Communication devices or equipment shall be mounted in listed boxes, brackets or assemblies designed for the purpose, and such boxes or assemblies shall be securely fastened in place. Boxes or brackets can be completely enclosed or backless.
(A) Communication Devices and Equipment Mounted to Boxes or Brackets. Communication devices or equipment shall be mounted to a listed boxes or bracket and installed per 314.20.
(B) Communication Devices and Equipment Mounted on Covers. Communication device and equipment mounted to and supported by a cover shall be held rigidly against the cover which is mounted to the box or bracket.
Substantiation: This proposal adds a new section to Article 820 addressing the mounting of devices or equipment to listed boxes and brackets. Currently, depending on the quality of workmanship, coaxial devices or equipment have not been mounted to boxes or brackets that can support them. After several years device and/or covers that are mounted directly to the dry wall will become a hazard because they have become loose and exposed. Coaxial cable can become energized by coming in incidental contact with electrical conductors.
820.135 was only a suggestion for the location of this new section. (A) addresses devices mounted directly to boxes or devices where as (B) address devices mounted to covers.
Panel Meeting Action: Reject
Panel Statement: The submitter has provided no data supporting an existing hazard. The submitter offers only an individual opinion that, depending on the quality of workmanship, equipment or devices mounted directly to drywall may, over time, loosen and become a hazard. The addition of listed boxes or assemblies will not, in itself, guarantee a hazard-free installation. The same quality of workmanship is necessary to help ensure a hazard-free equipment installation whether or not listed boxes are used.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: I concur with submitter's recommendation which addresses the mounting of equipment or devices to listed boxes and brackets. However the submitter has not provided CMP 16 member any technical substantiation or data supporting the existing hazard. The submitter should resubmit the proposal in the 2008 ROC and provide CMP 16 members with such data.

16-317 Log #774 NEC-P16 **Final Action: Accept**
(820.154)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
820.154 Applications of Listed CATV Cables and CATV Raceways.
CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154.
(A) Plenums. C oaxial c ables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.
FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
(B) Riser. C oaxial c ables installed in risers shall comply with any of the requirements of 820.154(B)(1) through (B)(3).
(1) C oaxial c ables in Vertical Runs. C oaxial c ables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CATVR. Floor penetrations requiring Type CATVR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.
Substantiation: This is an editorial proposal. (Task Group No. 820-19)
It is part of a series of proposals to clarify that Article 820 deals with "coaxial" cable. Adding the word "coaxial" adds clarity to the section for the code user.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-318 Log #782 NEC-P16 **Final Action: Accept**
(820.154)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
820.154 Applications of Listed CATV Cables and CATV Raceways.
CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154.
(A) Plenums. C oaxial c ables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.
FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.
(B) Riser. C oaxial c ables installed in risers shall comply with any of the requirements of 820.154(B)(1) through (B)(3).
(1) C oaxial c ables in Vertical Runs. C oaxial c ables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CATVR. Floor penetrations requiring Type CATVR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.
Substantiation: This is an editorial proposal. (Task Group No.820-28)
It is part of a series of proposals to clarify that Article 820 deals with "coaxial" cable. Adding the word "coaxial" adds clarity to the section for the code user.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-319 Log #1440 NEC-P16 **Final Action: Accept**
(820.154)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes and addition as shown:
820.154 Applications of Listed CATV Cables and CATV Raceways.
CATV cables shall comply with the requirements of 820.154(A) through 820.154(~~D~~ E) or where cable substitutions are made as shown in Table 820.154.
(~~C~~ , D) Cable Trays.
(~~D~~ , C) Other Wiring.
(E) Cable Substitutions. The uses and permitted substitutions for CATV coaxial cables listed in Table 820.154 shall be considered suitable for the purpose and shall be permitted.
Substantiation: This proposal is editorial. (Task Group No. 820-19(A))
The text being proposed adds clarity and creates parallelism between 800, 820, and 830.
This is one of a group of proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonalby possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Panel Statement: See panel action on CP-1602.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-320 Log #2533 NEC-P16 **Final Action: Reject**
(820.154)

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Revise 820.154, as shown.

CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154. CATV very-low-smoke cable shall be permitted to be installed meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.

Substantiation: NFPA 13-2002 has requirements for installation of sprinklers where a concealed space has combustible loading. Type CATV50 cable has a heat release that is significantly lower than combustible plenum cable listed using NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces* .

The 2003 International Mechanical Code (IMC), 602.2.1 requires a smoke developed index less than 25 and a smoke developed index less than 50 for materials in plenums.

The Fine Print Note provides guidance to system designers, installers, and code officials. Over the past few decades, there has been a significant increase in the quantity of combustible cables installed in concealed spaces (hollow spaces and HVAC system spaces).

NFPA 13-2002, Installation of Sprinkler Systems, requires installation of a sprinkler system in concealed spaces where combustible loading is present. Because other NFPA documents reference NFPA 13, it is important for correlation for the NEC to include a pointer to NFPA 13. The following requirements are from NFPA 13-2002:

"8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:

(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.

(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (1.8 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction."

"8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum."

The definition of combustible, from NFPA 5000 is:

"3.3.340.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible."

During the 2005 NEC code cycle, the proposed Fine Print Note was added to 800.154(A). Because communications cables are permitted to substitute for Class 2 and Class 3 circuit cables, it is important to have parallel requirements in both NEC Sections. Additionally, the Fine Print Note applies to all concealed spaces.

In July of 2004, an appeal to the NFPA Standards Council requested deletion of the Fine Print Note to 800.154(A), prior to publication of the 2005 NEC. The appeal was denied.

There is a companion proposal for the listing and marking of Type CATV50.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide adequate technical substantiation to support a need for a cable listed for concealed spaces.

Concealed spaces should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-321 Log #2662 NEC-P16 **Final Action: Reject**
(820.154)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Delete the following text:

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: This FPN is being misinterpret and used in aggressive marketing attempts to require the installation of "limited combustible cable" (one such example is found at http://www.dupont.com/cablingsolutions/products/codes.html). The FPN has had a profound effect in which it is used in misleading the AHJ to require limited combustible cable, conduit, or a sprinkler system to be installed within the concealed space.

As an example, an AHJ Massachusetts would not provide a certificate of occupancy until the communications cabling was either replaced with limited combustible cable, the CMP cable was placed in conduit, or a sprinkler system installed above the suspended ceiling.. Although the installer had met the requirements of the NEC, the FPN misled the AHJ causing project delays and the potential of inordinate cost to the project. A plea to the NFPA aided the communications installer in which clarification was given that the CMP cabling was indeed sufficient to meet code and that NFPA 13 allowed some quantities (which is not defined) of communications cabling within concealed spaces. The installation of the CMP cable was allowed.

To further the removal of this FPN, the Report on Proposals A2006 from NFPA 13 (see attached), the NFPA committee specifically added an annex A.8.14.1.2.1 in 13-284 log #551 stating that, "Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection."

In addition to the above, Panel 3 rejected the last minute introduction of this proposal that was made in the ROC stage. BICSI, which represents 24,000 installers, designers and manufacturers, feels that this last minute interjection of a FPN was not sufficiently vetted to industry and that the TCC should review this matter.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: We do not believe that the NFPA Standards Council Long Decision 05-24 (SC #05-7-4) would prohibit this Fine Print Note from being deleted. We do believe that expansion of or new Fine Print Notes referencing NFPA 13 would be in violation of NFPA Standards Council Long Decision 05-24 (SC #05-7-4). This proposal should have been accepted. This Fine Print Note referencing NFPA 13 offers no value to the user of NFPA 70 and in fact misleads the user and AHJ.

16-322 Log #2813 NEC-P16 **Final Action: Accept in Part**
(820.154)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Harold C. Ohde, IBEW #134
Recommendation: Delete the wording "Abandoned cables shall not be permitted to remain." in the following areas:

820.154 Applications of Listed CATV Cables and CATV Raceways. No change.

Revise text to read as follows:

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. ~~Abandoned cables shall not be permitted to remain.~~ Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in raceways.

(B) Riser. Cables installed in risers shall comply with any of the requirements of 820.154(B)(1) through (B)(3).

(1) Cables in Vertical Runs. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CATVR. Floor penetrations requiring Type CATVR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain.~~ Listed riser CATV raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CATVR and CATVP cables shall be permitted to be installed in these raceways.

(2) Metal Raceways or Fireproofed Shafts. No change.

(3) One- and Two- Family Dwellings. No change.

(C) Cable Trays. No change.

(D) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 820.154(A) and 820.154(B) shall be with any of the requirements in 820.154(D)(1) through (D)(5). ~~Abandoned cables in hollow spaces shall not be permitted to remain.~~

Substantiation: I have submitted a proposal that would move the abandoned coaxial cables requirements to a more appropriate and central section within Article 800. The abandoned coaxial cables requirements belong in 820.24 - Mechanical Execution of Work. 820.24 is located within Part I, General which would apply to the entire Article 820.

Panel Meeting Action: Accept in Part

The panel accepts the submitter's deletion of subsections (B) and (D).

The panel rejects the submitter's revision of subsection (A).

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

See panel action on Proposals 16-333 and 16-336.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

BRUNSSEN, J.: Under "Panel Meeting Action:", revise the first sentence as follows: "The panel accepts the submitter's deletion of the sentence 'Abandoned cables shall not be permitted to remain.' in subsection (B), and the deletion of the sentence 'Abandoned cables in hollow spaces shall not be permitted to remain.' in subsection (D). It was the two sentences that were deleted, not entire subsections (B) and (D).

DORNA, G.: The panel statement contains an error. The panel accepted the deletion in subsections (B) and (D), not of subsections (B) and (D).

KAHN, S.: The panel statement requires correction as the panel accepted the submitter's deletion "in" subsections (B) and (D), not the deletion "of" subsections (B) and (D).

16-323 Log #3009 NEC-P16 **Final Action: Reject**
(820.154)

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:

820.2 Definitions.

Abandoned Coaxial Cable. Installed coaxial cable that is not terminated at equipment other than a coaxial connector and not identified for future use with a tag.

820.154 Applications of Listed CATV Cables and CATV Raceways.

CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154.

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. ~~The accessible portion of abandoned~~ Abandoned coaxial cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.

FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.

(B) Riser. Cables installed in risers shall comply with any of the requirements of 820.154(B)(1) through (B)(3).

(1) Cables in Vertical Runs. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CATVR. Floor penetrations requiring Type CATVR shall contain only cables suitable for riser or plenum use. ~~The accessible portion of abandoned~~ Abandoned coaxial cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components. Listed riser CATV raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CATVR and CATVP cables shall be permitted to be installed in these raceways.

(D) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 820.154(A) and 820.154(B) shall be with any of the requirements in 820.154(D)(1) through (D)(5). ~~The accessible portion of abandoned~~ Abandoned coaxial cables shall be removed from hollow spaces . Removal of abandoned cables shall not damage the building structure or finish.

Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in "inaccessible spaces". This is not conducive to safe electrical practice; this the key change is the elimination of the words "the accessible portion of".

If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.

Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.

For information, see the relevant definitions in the NEC.

Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.

Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.

Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.

Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-28.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:

OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article.

16-324 Log #2201 NEC-P16 **Final Action: Reject**
(820.154, 820.179)

Submitter: Frank Peri, Communications Design Corporation
Recommendation: In 820.154 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Also establish a new cable substitution section (E) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Air Ducts. Coaxial cables installed in air ducts shall be Type CATVD and shall be associated with the air distribution system and shall be as short as practicable. Types CATVD, CATVP, CATVR, CATV, and CATVX cables installed in raceway that is installed in compliance with 300.22(B) shall also be permitted.

(B~~A~~) Plenum. Cables installed in ~~ducts,~~ plenums~~,~~ and other space~~s~~ used for environmental air shall be Type CATVD or CATVP. Abandoned cables shall not be permitted to remain. Types CATVD, CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ~~ducts and~~ plenums as described in 300.22(B) and in other space~~s~~ used for environmental air as described in 300.22(C). Only Types CATVD and CATVP cables shall be permitted to be installed in ~~these~~ listed plenum CATV raceways.

_FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems*, for requirements for sprinklers in concealed spaces containing exposed combustibles.

(E) Cable Substitutions. The uses and permitted substitutions for CATV coaxial cables listed in Table 820.154 shall be considered suitable for the purpose and shall be permitted.

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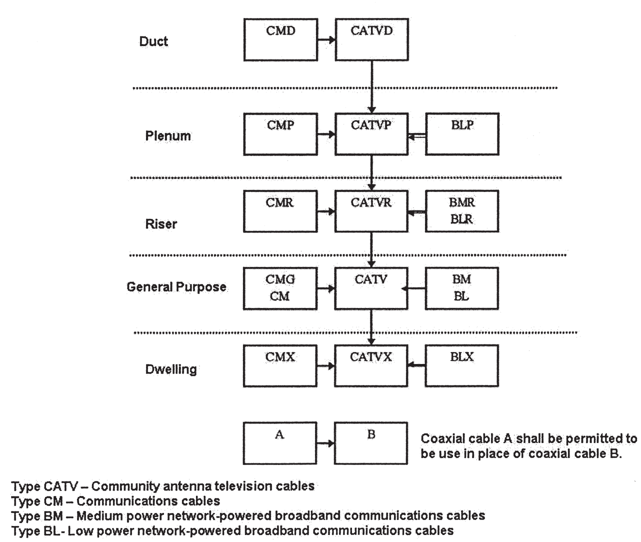
Table 820.154 Coaxial Cable Uses and Permitted Substitutions

Cable Type	Permitted Substitutions
CATVP	CATVD, CMD, CMP, BLP
CATVR	CATVD, CMD, CATVP, CMP, CMR, BMR, BLP, BLR
CATV	CATVD, CMD, CATVP, CMP, CATVR, CMR, CMG, CM, BMR, BM, BLP, BLR, BL
CATVX	CATVD, CMD, CATVP, CMP, CATVR, CMR, CATV, CMG, CM, BMR, BM, BLP, BLR, BL, BLX

FPN No. 1: See Figure 820.154, Cable Substitution Hierarchy.
FPN No. 2: The substitute cables in Table 820.154 are only coaxial-type cables.



In 820.179 revise and re-letter the existing section (A) to (B) and introduce a new (A) as shown below. Re-letter the remaining sections, (B) to (C), (C) to (D) etc.

(A)Type CATVD. Type CATVD CATV air duct cables shall be listed as suitable for use in air ducts and shall be rated for continuous use at 121°C. Type CATVD communications air duct cables shall also be listed as having a low potential heat value, low flame spread characteristics, and very low smoke-producing characteristics.

FPN: One method of defining a low potential heat cable is establishing an acceptable value of potential heat when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, to a maximum potential heat value not exceeding 8141 kJ/kg (3500 BTU/lb). One method of defining low flame spread cable is establishing an acceptable value of flame spread when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to a maximum flame spread index of 25, with the cable unslit (intact) and slit. Similarly, one method of defining very low smoke-producing cable is establishing an acceptable value when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, to maximum smoke developed index of 50, with the cable unslit (intact) and slit. These test methods and resultant values correlate with the requirements of NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems* for materials installed in ducts and plenums. *For additional testing information see Underwriters Laboratories Subject 2424, Outline of Investigation For Cable Marked Limited Combustible.*

(B~~A~~) Type CATVP. Type CATVP community antenna televison plenum cables shall be listed as being suitable for use in ~~ducts,~~ plenums~~,~~ and other space~~s~~ used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2002, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.*

Substantiation: **Summary**
This proposal is submitted to accomplish four things:
1.) Change the code to not allow the dangerous practice of using air ducts as a cable pathway.
2.)Code recognition that there may be instances where a small amount of in-duct cable is necessary for air handling equipment, dampers, security, temperature control, fire protection, etc.
3.)Establish minimum requirements for flame spread, smoke, and potential heat for in-duct (CL2D, CL3D, FPLP, OFND, OFCD, CMD and CATVD) cables used in this special hazard space.
4.)Include air duct "D" cables as permissible substitute for plenum "P" cables for installation in ceiling cavity and raised floor plenums (other space used for environmental air).

This proposal correlates with a TIA that I submitted for NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems.* Similar proposals have been submitted for Articles 725, 760, 770, 800 and 820.

The substantiation for the TIA is shown below:

"This TIA is being submitted in accordance with Section 5 of the *2005 NFPA REGULATIONS GOVERNING COMMITTEE PROJECTS.* In particular, it addresses a hazard meeting the criteria of section 5-2(d), which states:

(d) The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

The purpose of this TIA is to address the dangerous practice of installing combustible communications/data cables in air ducts.

NFPA 90A-2002 does not have explicit requirements for electrical wiring in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cable into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This TIA would greatly reduce the amount of wiring in air ducts by only permitting wiring and raceways associated with the air distribution system and also requiring that they be as short as practicable. It would require that the wiring and nonmetallic raceway in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A permits the supplied air to be at 121° C (250° F). The permitted wiring and nonmetallic raceway would be required to have initial flame spread and smoke requirements identical to those for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). In addition to these initial requirements, there are slitting and ageing requirements to assure that the cables installed in air ducts meet the flame spread, smoke and potential heat requirements equivalent to those for limited combustible materials. Essentially they would be required to be listed to the UL 2424.

Combustible plenum cable is unsuitable and dangerous for this application. Typically, combustible plenum cable has a temperature rating of 60 ° C, which is significantly less that the 121 $^{\circ}$ C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests, these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

It is essential that these requirements be adopted now in NFPA 90A."

Section 820.154(A) in the 2005 NEC permits unlimited amounts of Type CATVP cable in air ducts. While there is a need for some limited amount of wiring in air ducts where the function of the wiring is associated with the function of the air handling system, use of an air duct instead of an electrical raceway for routing wiring unassociated with the air handling system is a dangerous practice. It introduces unlimited quantities of combustible cables into an air handling system and thus unacceptability increases the potential for the spread of fire and smoke through the air distribution system.

This proposal would greatly reduce the amount of wiring in air ducts by only permitting wiring associated with the air duct and as short as practicable. It would require that the wiring in the ducts have the appropriate temperature rating for hot air ducts; NFPA 90A-2002, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, permits the supplied air to be at 121° C (250° F). The permitted wiring would be required to have flame spread and smoke requirements identical to those in NFPA 90A-2002 section 4.3.3.1 for supplementary materials in an air duct (flame spread index =25, smoke developed index =50). Essentially they would be required to be listed to the UL 2424, *Outline of Investigation For Cable Marked Limited Combustible* (copy attached) .

"P" type plenum cables are unsuitable and dangerous for this application. Typically, they have a temperature rating of 60° C, which is significantly less that the 121° C air permitted in the air duct. Furthermore, according to Fire Protection Research Foundation tests (copy attached), these cables can have smoke developed index (SDI) of up to 850. This SDI is an order of magnitude greater than permitted for supplementary materials installed in an air duct.

"D" type air duct cables will meet the NFPA 90A listing requirements for use in ceiling cavity and raised floor plenums (other space used for environmental air) and therefore will be able to safely substitute for "P" type plenum cables. "D" type air duct cables have approximately 1/20 the smoke production of "P" type plenum cables.

In order to be consistent with the applications of plenum cable, this proposal will also prohibit the installation of plenum communications raceways in air ducts.

The cable substitution table and figure have been revised to permit air duct cables to substitute for plenum cables since air duct cables are superior cables. "D" type air duct cables also meet the requirements in NFPA 90A for use in ceiling cavity plenums and raised floor plenums (other space used for environmental air).

Some of the applications that require the installation of cables in air ducts are fire alarm (Article 760), temperature sensing and control (Article 725), security (Articles 725 and 820) and communications (Article 800). Optical fiber cables (Article 770) could be used in place of copper conductor cables. Communications cables are permitted to substitute for Class 2 & 3, fire alarm and CATV cables. I am submitting similar proposals for each of these articles.

Note: Supporting Material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

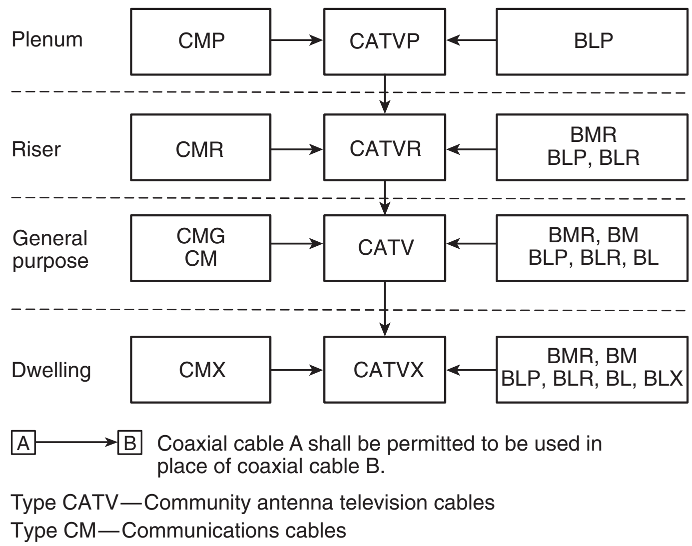
Ballot Results: Affirmative: 15

16-325 Log #50 NEC-P16 **Final Action: Accept**
(Figure 820.154)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the placement of the additional text added by the proposal as follows: "Type BM-Network-Powered Broadband Communications Medium Power cable" should be placed in the figure directly below the similar text for CATV and CM. This action will be considered by the Panel as a Public Comment.

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Change "dwellings" to "dwelling" and add broadband cables to the figure as shown.



Substantiation: Table 820.154 permits broadband cables are permitted to substitute for CATV cables so broadband cables should be in Figure 820.154 also. "Dwellings" was changed to "Dwelling" for editorial consistency with the other labels; they're all singular.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-326 Log #18 NEC-P16 **Final Action: Reject**
(820.154(A))

Submitter: Stanley Kaufman, Cable Safe Inc.

Recommendation: Revise as follows:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. ~~Abandoned cables shall not be permitted to remain~~ . Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.

Substantiation: Section 820.3(A) requires that "The accessible portion of abandoned coaxial cables shall be removed." The requirement in to remove all abandoned cables in 820.154(A) is an error from the 1999 NEC that the panel tried to correct in the last code cycle.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-327 Log #775 NEC-P16 **Final Action: Reject**
(820.154(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the sentence as shown:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. ~~Abandoned cables shall not be permitted to remain.~~ Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.

Substantiation: This is an editorial proposal. (Task Group No. 820-20)

Section 820.3(A) requires that "The accessible portion of abandoned coaxial cables shall be removed." The requirement to remove all abandoned cables in 820.154(A) is an error from the 1999 NEC that the panel tried to correct in the last code cycle.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-328 Log #819 NEC-P16 **Final Action: Reject**
(820.154(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Delete the phrase as shown:

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed ~~in ducts and plenums as described in 300.22(B) and~~ in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.

Substantiation: This is a technical proposal. (Task Group No. 820-30)

The applications of CATV plenum raceways should be consistent with the listing requirements (see below).

820.182 CATV Raceways.

CATV raceways shall be listed in accordance with 820.182(A) , through 820.182(C) .

(A) Plenum CATV Raceways. Plenum CATV raceways shall be listed for use in other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2)improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3)make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-329 Log #3095 NEC-P16 **Final Action: Reject**
(820.154(A))

Submitter: Donald Hall, Corning Cable Systems

Recommendation: This is a companion proposal to two similiar proposals addressing the same NFPA 13 reference in Articles 770 and 800.

Delete FPN text as follows:

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: The reference to 8.14.1 of NFPA 13 is misleading and should be removed for the following reasons:

(1) The reference is related to sprinkler protection of combustible concealed spaces and their stored content. The use of a concealed space as a pathway for cables and raceway in a manner permitted by the NEC does not constitute a storage condition.

(2) The Technical Committee for NFPA 13 has never provided any useful guidance to indicate what quantity of cable/raceway or other circumstance might trigger requirement for communications cables to be protected by sprinklers. The Technical Committee for NFPA 13 proposed a new annex for addition to the next revision of NFPA 13 (shown below). The proposed annex is non binding, contains vague terminology, and does not add any new clarifying information, because it is identical to the existing language of the NFPA 13 Handbook. For normal circumstances in which cables and raceway are installed in accordance with the NEC and are listed by a Nationally Recognized Test Laboratory "as suitable for use in ducts, plenums, and other spaces used for environmental air and as having adequate fire resistant and low smoke producing characteristics" it is understood that these cables and raceways are safe and do not require additional protection from sprinklers.

(3) The cited portion of NFPA 13 is broadly applicable to all concealed spaces, not just those which handle environmental air. The selective placement of this FPN within three sections of the NEC all pertaining to plenum spaces, creates a perceived encumbrance to the permitted use of plenum cables and plenum cables alone. This perceived encumbrance is being aggressively exploited through the marketing efforts of multiple commercial interests to create a new market for their products.

NFPA 13 ROP indicates the following proposed change:

A.8.14.1.2.1 Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: See my Explanation of Negative on Proposal 16-321.

16-330 Log #3244 NEC-P16 **Final Action: Reject**
(820.154(A))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Revise 820.154(A), as shown.

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be <u>Type CATVD or </u>Type CATVP. Abandoned cables shall not be permitted to remain. Types <u>CATVD, </u>CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type <u>s CATVD or</u> CATVP cable shall be permitted to be installed in these raceways.

FPN: See 8.14.1 of NFPA 13-2002, Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1: a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements in Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-331 Log #2819 NEC-P16 **Final Action: Reject**
(820.154(A), FPN)

Submitter: Ronald E. Hackett, Village of Buffalo Grove
Recommendation: Delete the FPN text that follows 800.154(A).

~~FPN: See 8.14.1 of NFPA 13 (2002). Installation of Sprinkler Systems for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: As chief electrical inspector of Buffalo Grove, I do not see any reason or any technical support as why this FPN referencing 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles was added to the 2005 NEC. This FPN is very misleading and inappropriate as well. My own personal experience as the AHJ has found that this FPN being a negative effect on the National Electrical Code which is used as an installation documentation to be in conflict with the NFPA 13.

NFPA 13 Technical Committee added new Annex A8.14.1.2.1 in the 2006 ROP #13-284, Log# 551 which should provide guidance to both the installer and AHJ for cabling in concealed spaces.

Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.

The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.

OHDE, H.: See my Explanation of Negative on Proposal 16-321.

16-332 Log #3000 NEC-P16 **Final Action: Reject**
(820.154(A), FPN)

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: 820.154 Applications of Listed CATV Cables and CATV Raceways.

CATV cables shall comply with the requirements of 820.154(A) through 820.154(D) or where cable substitutions are made as shown in Table 820.154.

(A) Plenums. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.

~~FPN: See 8.14.1 of NFPA 13 (2002), Installation of Sprinkler Systems, for requirements for sprinklers in concealed spaces containing exposed combustibles.~~

Substantiation: This is one of three references to NFPA 13 (it is repeated identically in articles 770, 800 and 820) included in the code that is a meaningless reference. Other references to NFPA 13, in Article 362, are properly included in mandatory sections of the code (section 362.10). Whenever a jurisdiction adopts NFPA 13 they need to adopt it for mandatory sections and not for an unenforceable FPN in one section, which is intended to mislead the user. In fact, there have been several documented examples already of misrepresentation in that authorities having jurisdiction have been told that this means that sprinklers are required in plenum areas unless "limited combustible cable" is installed. I have been personally involved in two cases to date, and have heard of many more cases where this is being stated.

Section 8.14.1 of NFPA 13 (2002) reads as follows:

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

8.14.1.2 Concealed Spaces Not Requiring Sprinkler Protection.*

8.14.1.2.1 Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

8.14.1.2.2 Noncombustible and limited combustible concealed spaces with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

8.14.1.2.3 Concealed spaces formed by studs or joists with less than 6 in. (152 mm) between the inside or near edges of the studs or joists shall not require sprinkler protection. (See Figure 8.6.4.1.5.1.)

8.14.1.2.4 Concealed spaces formed by bar joists with less than 6 in. (152 mm) between the roof or floor deck and ceiling shall not require sprinkler protection.

8.14.1.2.5 Concealed spaces formed by ceilings attached directly to or within 6 in. (152 mm) of wood joist construction shall not require sprinkler protection.

8.14.1.2.6 Concealed spaces formed by ceilings attached to composite wood joist construction either directly or onto metal channels not exceeding 1 in. in depth, provided the joist channels are firestopped into volumes each not exceeding 160 ft3 (4.53 m3) using materials equivalent to the web construction*

and at least 3½ in. of batt insulation is installed at the bottom of the joist channels when the ceiling is attached utilizing metal channels, shall not require sprinkler protection.
8.14.1.2.7 Concealed spaces entirely filled with noncombustible insulation shall not require sprinkler protection.
8.14.1.2.8 Concealed spaces within wood joist construction and composite wood joist construction having noncombustible insulation filling the space from the ceiling up to the bottom edge of the joist of the roof or floor deck, provided that in composite wood joist construction the joist channels are firestopped into volumes each not exceeding 160 ft3 (4.53 m3) to the full depth of the joist with material equivalent to the web construction, shall not require sprinkler protection.
8.14.1.2.9 Concealed spaces over isolated small rooms not exceeding 55 ft2 (4.6 m2) in area shall not require sprinkler protection.
8.14.1.2.10 Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread rating of 25 or less and the materials have been demonstrated not to propagate fire in the form in which they are installed shall not require sprinkler protection.
8.14.1.2.11 Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703, Standard for Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Materials, shall not require sprinkler protection.
8.14.1.2.12 Noncombustible concealed spaces having exposed combustible insulation where the heat content of the facing and substrate of the insulation material does not exceed 1000 Btu/ft2 (11,356 kJ/m2) shall not require sprinkler protection.
8.14.1.2.13 Concealed spaces below insulation that is laid directly on top of or within the ceiling joists in an otherwise sprinklered attic shall not require sprinkler protection.
8.14.1.2.14 Vertical pipe chases under 10 ft2 (0.93 m2), where provided that in multifloor buildings the chases are fire stopped at each floor using materials equivalent to the floor construction, and where such pipe chases shall contain no sources of ignition, piping shall be noncombustible, and pipe penetrations at each floor shall be properly sealed and shall not require sprinkler protection.
8.14.1.2.15 Exterior columns under 10 ft2 in area formed by studs or wood joist, supporting exterior canopies that are fully protected with a sprinkler system, shall not require sprinkler protection.
8.14.1.3 Concealed Space Design Requirements. Sprinklers in concealed spaces having no access for storage or other use shall be installed in accordance with the requirements for light hazard occupancy.
8.14.1.4 Heat Producing Devices with Composite Wood Joist Construction. Where heat-producing devices such as furnaces or process equipment are located in the joist channels above a ceiling attached directly to the underside of composite wood joist construction that would not otherwise require sprinkler protection of the spaces, the joist channel containing the heat-producing devices shall be sprinklered by installing sprinklers in each joist channel, on each side, adjacent to the heat-producing device.
8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles. In concealed spaces having exposed combustible construction, or containing exposed combustibles, in localized areas, the combustibles shall be protected as follows:
(1) If the exposed combustibles are in the vertical partitions or walls around all or a portion of the enclosure, a single row of sprinklers spaced not over 12 ft (3.7 m) apart nor more than 6 ft (1.8 m) from the inside of the partition shall be permitted to protect the surface. The first and last sprinklers in such a row shall not be over 5 ft (1.5 m) from the ends of the partitions.
(2) If the exposed combustibles are in the horizontal plane, the area of the combustibles shall be permitted to be protected with sprinklers on a light hazard spacing. Additional sprinklers shall be installed no more than 6 ft (1.8 m) outside the outline of the area and not more than 12 ft (3.7 m) on center along the outline. When the outline returns to a wall or other obstruction, the last sprinkler shall not be more than 6 ft (1.8 m) from the wall or obstruction.
8.14.1.6 Sprinklers used in horizontal combustible concealed spaces (with a slope not exceeding 2 in 12) having a combustible upper surface where the assembly or supporting members channel heat and where the depth of the space is less than 36 in. from deck to deck or with double wood joist construction with a maximum of 36 in. between the top of the bottom joist and the bottom of the upper joist shall be listed for such use.*
Moreover, the NFPA13 ROP indicates the following change:
8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15 and 8.14.6.
8.14.1.2.1 Concealed spaces of noncombustible and limited combustible construction with minimal combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum. (For additional information on combustible loading See 8.14.1.2.1)*
8.14.1.2.2 Conceal d spaces of noncombustible and limited combustible construction with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
A.8.14.1.2.1 Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection.
This FPN is being misinterpreted by authorities having jurisdiction to indicate that these concealed spaces require sprinkler protection. Moreover, I have come across at least two cases (one in Massachusetts and one in California), where the authority having jurisdiction was informed by a vendor that the only cabling alternative to using sprinklers was the installation of "limited combustible cable". In fact, in one case I have worked on, the concealed space was an 8 inch high underfloor space of totally non combustible construction, which had no ducts or other parts of an air distribution system, and yet the code official had been led to the belief that cables could only be used if the space was sprinklered or the cable was "limited combustible cable".
Examples of misinformation exist and some are attached for committee members' use.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.
The proposal to delete this FPN is not involved with NFPA 90A and should be deleted for the reasons given in the submitter's substantiation. To further acceptance of removing this FPN, refer to several comments within the 2006 NFPA 13 ROC and in particular to 13-389a.
OHDE, H.: See my Explanation of Negative on Proposal 16-321.

16-333 Log #19 NEC-P16 **Final Action: Accept**
(820.154(B)(1))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
(1) Cables in Vertical Runs. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CATVR. Floor penetrations requiring Type CATVR shall contain only cables suitable for riser or plenum use. ~~Abandoned cables shall not be permitted to remain~~ . Listed riser CATV raceways <u>and listed plenum CATV raceways</u> shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CATVR and CATVP cables shall be permitted to be installed in these raceways.
Substantiation: Plenum raceways should be permitted to substitute for riser and general purpose raceways just as plenum cable is permitted to substitute for riser and general purpose cables.
Section 820.3(A) requires that "The accessible portion of abandoned coaxial cables shall be removed." The requirement in to remove all abandoned cables in 820.154(B) is an error from the 1999 NEC that the panel tried to correct in the last code cycle.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-334 Log #20 NEC-P16 **Final Action: Accept**
(820.154(D))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
(D) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 820.154(A) and 820.154(B) shall be with any of the requirements in 820.154(D)(1) through (D)(5). ~~Abandoned cables in hollow spaces shall not be permitted to remain~~ .

Substantiation: Section 820.3(A) requires that "The accessible portion of abandoned coaxial cables shall be removed." The requirement in to remove all abandoned cables in 820.154(D) is an error from the 1999 NEC that the panel tried to correct in the last code cycle.
Panel Meeting Action: Accept
Panel Statement: See panel action on Proposal 16-336.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-335 Log #1875 NEC-P16 **Final Action: Accept**
(820.154(D))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Delete the last sentence of 820.154(D) as follows:
" ~~Abandoned cables in hollow spaces shall not be permitted to remain~~ ."
Substantiation: The proposed deletion provides consistency with 770.154(C), 800.154(E) and 830.154(D). Removal of abandoned cable is now covered in 820.3(A).
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-336 Log #21 NEC-P16 **Final Action: Accept in Principle**
(820.154(D)(1))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
(1) General. Type CATV shall be permitted. Listed CATV general-purpose raceways , listed riser CATV raceways and listed plenum CATV raceways shall be permitted. Only Types CATV, CATVX, CATVR, or CATVP cables shall be permitted to be installed in ~~general-purpose communications~~ these CATV raceways.
Substantiation: Plenum and riser raceways should be permitted to substitute for general purpose raceways just as plenum and riser cables are permitted to substitute for general purpose cables.
Panel Meeting Action: Accept in Principle
Revise as follows:
(1) General. Type CATV shall be permitted. Listed CATV general-purpose raceways , listed riser CATV raceways and listed plenum CATV raceways shall be permitted. Only Types CATV, CATVX, CATVR, or CATVP cables shall be permitted to be installed in ~~general-purpose communications~~ these CATV raceways.
Panel Statement: The change clarifies the submitter's intent.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected as this new code language could be confusing to code-users. The revised language allows all of the cables listed to be used in riser and plenum optical fiber raceways. As long as it is clear that these riser and plenum raceways are not being used in riser and plenum applications, the use of those cables in those raceways in not a problem. However, why would anyone want to use the more expensive raceways in "other wiring within buildings" locations? This language is also in conflict with 820.154(A) which states "Only Type CATVP cables shall be permitted to be installed in these raceways" and with 820.154 (B)(1) which requires either plenum or riser cables to be installed in riser communications raceways.

16-337 Log #2534 NEC-P16 **Final Action: Reject**
(820.154(E) (New))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Add new 820.154(E).
(E) CATV Cable Substitutions. The uses and permitted substitutions for CATV cables listed in Table 820.154 shall be considered suitable for the purpose and shall be permitted. CATV50 very-low-smoke cable shall be permitted to substitute for all CATV cables in Table 820.154 to meet requirements for very-low-smoke producing characteristics, low potential heat release, and low flame spread characteristics.
FPN: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation: This proposal correlates with the proposal to add Type CATV50 to 820.154.
There is a companion proposal for the listing and marking of Type CATV50.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.
This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."
In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-338 Log #3246 NEC-P16 **Final Action: Reject**
(820.154(E))

Submitter: Frank Peri, Communications Design Corporation
Recommendation: Add new 820.154(E), as shown.
(E) CATV Cable Substitutions. The uses and permitted substitutions for CATV cables listed in Table 820.154 shall be considered suitable for the purpose and shall be permitted. Type CATVD air duct cable shall be permitted to substitute for all CATV cables in Table 820.154 and Figure 820.154.
Substantiation: This proposal correlates the substitution table and figure with the listing and application requirements for air duct cable.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-339 Log #777 NEC-P16 **Final Action: Accept**
(820.179(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
(A) Type CATVP. Type CATVP community antenna television plenum coaxial cable s shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.
FPN: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air Handling Spaces* .
Substantiation: This is an editorial proposal. (Task Group No. 820-23)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular". Also the adjective "coaxial" was added for consistency and clarity.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-340 Log #778 NEC-P16 **Final Action: Accept**
(820.179(B))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
(B) Type CATVR. Type CATVR community antenna television riser coaxial cable s shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.
FPN: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-2002, *Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.*
Substantiation: This is an editorial proposal. (Task Group No. 820-24)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular". Also the adjective "coaxial" was added for consistency and clarity.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-341 Log #779 NEC-P16 **Final Action: Accept**
(820.179(C))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
(C) Type CATV. Type CATV community antenna television coaxial cable s shall be listed as being suitable for general-purpose CATV use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire.
FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* .
Another method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, *Test Methods for Electrical Wires and Cables.*
Substantiation: This is an editorial proposal. (Task Group No. 820-25)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular". Also the adjective "coaxial" was added for consistency and clarity.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-342 Log #1426 NEC-P16 **Final Action: Accept**
(820.179(C), FPN)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
FPN: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the " UL Flame Exposure , Vertical Tray Flame Test" in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords.~~ UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.
Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M- ~~1985~~ 2001 , Test Methods for Electrical Wires and Cables.
Substantiation: The revised wording is an update of the standard references and not a change in the test methods. UL 1581 now references UL 1685 for the text of the test method.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-343 Log #780 NEC-P16 **Final Action: Accept**
(820.179(D))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
(D) Type CATVX. Type CATVX limited-use community antenna television coaxial cable s shall be listed as being suitable for use in dwellings and for use in raceway and shall also be listed as being resistant to flame spread.
FPN: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* .
Substantiation: This is an editorial proposal. (Task Group No. 820-26)
Section 3.3.3 of the NEC Style Manual states "references to electrical components and parts shall be plural rather than singular". Also the adjective "coaxial" was added for consistency and clarity.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-344 Log #2535 NEC-P16 **Final Action: Reject**
(820.179(E))

Submitter: Sanford Egesdal, Egesdal Associates PLC
Recommendation: Insert new 820.179(E).
(E) Type CATV50. Type CATV50 cables shall be listed as suitable for installation in concealed spaces having restrictive requirements for smoke generation, combustible loading, and flame spread and shall be listed as having very-low-smoke producing characteristics, a low potential heat release value, and low flame spread characteristics.
FPN No. 1: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*
FPN No. 2: See 8.14.1 of NFPA 13-2002, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
FPN No. 3: Building codes adopted by code jurisdictions may contain restrictions on permissible flame spread index and smoke developed index.
Substantiation: This proposal establishes a listing and marking for cable permitted as an electrical wiring option in concealed spaces where a smoke developed index no greater than 50 is required or large quantities of cable may cause combustible loading. The proposed cable has very-low-smoke-producing characteristics, a low potential heat release value, and low flame spread characteristics. Presently, a number of manufacturers have cables listed to the proposed requirements.
The testing criteria are based on the requirements found in NFPA 13-2003 and the 2003 International Mechanical Code, as revised.
NFPA 13, Section 8.14.1.2.1 follows: "Noncombustible and limited combustible concealed spaces with no combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum." The proposed cable has a very low heat of combustion. While the term "combustible loading" is not defined, the fuel load can be calculated to determine the potential hazard from large quantities of cable.
The 2003 International Mechanical Code, 602.2.1, requires materials in plenums to be noncombustible or have a flame spread index no greater 25 and a smoke index no greater than 50. At the recent ICC meeting in Detroit,

exception #5 to 602.2.1 was revised to include "combustible material (electrical wiring) installed in noncombustible raceways or enclosures." The requirements in IMC 602.2.1.1 permits cables meeting NFPA 262 test requirements. Cables meeting NFPA 262 requirements, according to Fire Protection Research Foundation testing using NFPA 255, have a smoke developed index that varies between 450 and 850. The proposed cable meets the requirements of the base paragraph, 602.2.1.

The following (change is underlined) shows the result of action on IMC public comment on M 77 (floor actions in Detroit, September 2005).

602.2.1 Materials exposed within plenums. Except as required by Sections 602.2.1.1 through 602.2.1.5, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84.

Exceptions:

1. Rigid and flexible ducts and connectors shall conform to Section 603.
2. Duct coverings, linings, tape and connectors shall conform to Sections 603 and 604.
3. This section shall not apply to materials exposed within plenums in one- and two-family dwellings.
4. This section shall not apply to smoke detectors.
5. Combustible materials <u>enclosed in noncombustible raceways or enclosures,</u> approved gypsum board assemblies or enclosed in materials listed and labeled for such application.

602.2.1.1 Wiring. Combustible electrical or electronic wiring methods and materials, optical fiber cable, and optical fiber raceway exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread not greater than 5 feet (1524 mm) when tested in accordance with NFPA 262. Only type OFNP (plenum rated nonconductive optical fiber cable) shall be installed in plenum-rated optical fiber raceways. Wiring, cable, and raceways addressed in this section shall be listed and labeled as plenum rated and shall be installed in accordance with ICC *Electrical Code* .

The Fire Protection Research Foundation report demonstrated that NFPA 255, <u>*Standard Method of Test of Surface Burning Characteristics of Building Materials*</u> , provides a suitable test method for establishing the cable characteristics (flame spread index & smoke developed index) specified in the FPN.

Establishing a listing and marking for a Type FPL50 cable provides a wiring option for complying with requirements of other standards and building codes. The NEC has previously established listings and markings for cable to correlate with other codes and standards. Additionally, the listing and marking may or may not have a specific application. Specific examples follow:

1. Type CMG cable was included in the 1993 NEC to correlate with the Canadian Electrical Code. The change was proposed by the Chair of NEC TCC, Harold Ware and Roy Hicks from Canada. Type CMG has a listing and marking in the NEC. Article 800 permits "Type CM or Type CMG" to be installed as a general purpose cable. Note: Type CMG does not have a unique application, and neither cable is considered a minimum requirement.
2. Types MP, MPR, and MPP cable was included in the 1990 NEC. The cables had a listing and marking. The multiple-purpose cables were permitted to substitute for similar cables in Articles 725, 760, & 800. Note: Types MP, MPR, and MPP cables do not have a unique application, just a listing and marking.
3. A change to the 1999 NEC permitted Types NPLF, NPLFR, NPLFP, FPL, FPLR, and FPLP to have a "-CI" suffix. The change included only listing and marking requirements. This change to the NEC correlated with NFPA 72, National Fire Alarm Code, requirements for a circuit integrity cable. Note: Cables with a "-CI" suffix did not have an application, until changes were made to the 2005 NEC.
4. A change to the 2005 NEC permitted Types CM, CMR and CMP to have a "-CI" suffix. As of today, no company has a listed circuit integrity using the permitted markings. Note: Types CM-CI, CMR-CI, and CMP-CI do not have an application, just a listing and marking.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide adequate technical substantiation to support a need for a cable listed for concealed spaces.

Concealed spaces should be adequately defined. See Action on Proposals 16-13, 16-110 and 16-247 where the proposed definition was determined to be unacceptable.

The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"[S]o as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-345 Log #3230 NEC-P16 **Final Action: Reject**
(820.179(E))

Submitter: Frank Peri, Communications Design Corporation

Recommendation: Add new 820.179(E), as shown.

<u>(K) Type CATVD. Type CATVD air duct cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant, very low smoke-producing characteristics, and very low potential heat release.</u>

<u>FPN No: One method of defining a low flame spread and very low smoke-producing cable is that the cable exhibits a maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials* with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*</u>

Substantiation: The purpose of this proposal is to correlate with NFPA 5000-2006. NFPA 5000-2006, recently issued by the NFPA Standards Council, incorporates extracted plenum requirements from NFPA 90A-2002. Consequently, the plenum requirements in NFPA 5000-2006 are identical to the ceiling cavity plenum requirements in NFPA 90A-2002. This proposal provides listing requirements for a cable with characteristics that complies with the NFPA 90A-2002, 4.3.10.2.6: requirements for limited combustible materials exposed to the airflow. This proposal provides a listing and marking for a cable that complies with the NFPA 90A-2002, 4.3.10.2.6.1: a requirement for a listed limited combustible cable with a maximum smoke developed index of 50. The proposed cable meets the NFPA Standards Council's directive to not identify cable as "limited combustible," because it is not a building construction material. The cable name and listing requirements meets guidance from the NFPA Standards Council to identify cable characteristics in terms of flame spread index, smoke developed index, and potential heat release.

As compared to a combustible plenum cable that is listed using NFPA 262, air duct cable is a much "safer" cable. Air duct cable provides users with an opportunity to significantly reduce the potential hazard from smoke during a fire emergency. Additionally, the much lower potential heat release of air duct cable provides much lower combustible loading than found in combustible plenum cable listed using NFPA 262.

Air duct cables are available on the market today. Presently, there is air duct cable available to meet the plenum installation requirements of Articles 725, 760, 770, and 800. Unfortunately, the only marking available in the NEC is for a combustible plenum cable. The NEC decides what marking is permitted, and listing organizations correlate. That is, it would be inappropriate for a listing organization to mark cable with a "Type XXX" that is not published in the NEC.

The following is an example of air duct cable information from the UL Web Site:

OWKZ.GuideInfoLimited Combustible Cable

<u>Guide Information for Electrical Equipment for Use in Ordinary Locations</u>

GENERAL

This category covers electrical and optical fiber cable that meets the limited combustible and smoke developed requirements for cable in ceiling cavity and raised floor plenums in accordance with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems." This cable also meets the requirements for cable used in ducts, plenums and other spaces used for environmental air in accordance with Articles 725, 760, 770, 800, 820 and 830 of ANSI/NFPA 70, "National Electrical Code".

This cable has a maximum Potential Heat value of 3500 Btu/lb when tested in accordance with NFPA 259, "Standard Test Method for Potential Heat of Building Materials." This cable has a maximum smoke developed index of 50 and a maximum flame spread index of 25 when tested in accordance with UL 723 (NFPA 255), "Test for Surface Burning Characteristics of Building Materials" before and after exposure to elevated temperature and humidity. The cable also meets the requirements for plenum cable in one or more of the following product categories:

- Power-limited Circuit Cable (**QPTZ**) - Types CL2P or CL3P
- Communications Cable (**DUZX**) - Type CMP
- Power-limited Fire Alarm Cable (**HNIR**) - Type FPLP
- Nonpower-limited Fire Alarm Cable (**HNHT**) - Type NPLFP
- Optical Fiber Cable (**QAYK**) - Types OFNP or OFCP
- Community Antenna Television Cable (**DVCS**) - Type CATVP
- Network-powered Broadband Communications Cable (**PWIP**) - Type BLP

PRODUCT MARKINGS

This cable is identified by the marking "Limited Combustible FHC 25/50" on the surface of the jacket or on a marker tape under the jacket. This marking is immediately followed by one of the Type designations shown above. The cable also has the required markings including optional markings as indicated in the product categories referenced above. This cable may also be Verified for transmission performance if authorized in the product categories referenced above, and will bear the appropriate performance verification marking.

ADDITIONAL INFORMATION

For additional information, see Electrical Equipment for Use in Ordinary Locations (**AALZ**).

REQUIREMENTS

The basic requirements used to investigate products in this category are contained in Subject 2424, "Outline of Investigation for Cable Marked 'Limited Combustible.'"

UL MARK

The UL symbol on the product and the Listing Mark of Underwriters Laboratories Inc. on the attached tag, the reel, or the smallest unit container in which the product is packaged is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and the product name "Limited Combustible Cable."

Cable which is also Verified to the UL Data Transmission Performance Category Marking Program has the marking "Verified to UL Performance Category Program," or the UL Verification Mark along with the words "Performance Category Program" together with the Listing Mark information on the tag, the reel, or the smallest unit container. Cable which is also Verified to another transmission performance specification has the marking "Verified in Accordance with [Specification name and/or number]" or the UL Verification Mark along with the applicable Specification name and/or number together with the Listing Mark information on the tag, the reel, or the smallest unit container.

Last Updated on 2004-03-24

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-346 Log #3635 NEC-P16 **Final Action: Reject**
(820.179(E) (New))

Submitter: Allen C. Weidman, The Society of the Plastics Industry, Inc.

Recommendation: Add new text as follows:

(E) Concealed Space Cables. Coaxial cables that meet the requirements for Type CATV that are also listed as having a low potential heat value, low flame spread characteristics, and low smoke producing characteristics shall be permitted to be listed and marked as concealed space cables Type CATV-CS.

FPN: One method of defining a low flame spread and low smoke-producing cable is that the cable exhibits a maximum flame spread distance of 1.52 m (5 ft), a maximum peak optical density of 0.5 and a maximum average optical density of 0.15 when tested in accordance with NFPA 262-2002, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces with the cable unslit (intact) and cut through to expose the cable core. One method of defining a low potential heat cable is that the cable exhibits a maximum potential heat value of exceeding 8141 kJ/kg (3500 BTU/lb) when tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials.*

Substantiation: The purpose of this proposal is to provide listing and marking for a cable that will be suitable for use in concealed spaces where there are large quantities of cables. Users would have the option of using these cables to avoid establishing a fuel load above the threshold where the quantity of cables would be considered a combustible loading. Also, these cables provide a flame spread index and a smoke developed index that correlate with the requirements for exposed materials within concealed spaces in buildings.

Cables tested using NFPA 255 and 259 establish parameters commonly used in NFPA standards and building codes: smoke developed index, smoke developed index, and heat of combustion. This proposal uses the NFPA 262 test in place of NFPA 255. The Fire Protection Research Foundation's *International Limited Combustible Plenum Cable Fire Test Project* (copy attached) has shown that both of these tests are suitable and provided data (page 18 of the report) for setting equivalent criteria in the two tests. A maximum average optical density of 0.17 in NFPA 262 is equivalent to a smoke developed index of 450 in NFPA 255. This proposal sets the maximum optical density requirement at 0.15 to allow for a margin of error and to correlate with the existing requirements for plenum cable.

NFPA 13 has requirements for sprinklers in a concealed space that contains a combustible loading. Combustible loading is a function of the density (number) of cables and their potential heat release determined by NFPA 259.

The following is excerpted from the Automatic Systems Sprinkler Handbook 2002 edition: In the handbook the commentary is printed in blue. Since the proposals are printed in black and white I have changed the handbook commentary to ***bold italics***. I also underlined the text that refers to computer room raised floors.

As indicated in 8.1.1(1), sprinklers are required throughout the premises. Under certain conditions, however, the omission of sprinklers in certain areas and spaces within a building is permitted. Section 8.14 identifies these spaces and conditions.

8.14.1 Concealed Spaces.

8.14.1.1 Concealed Spaces Requiring Sprinkler Protection. All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by 8.14.1.2.1 through 8.14.1.2.15.

Concealed spaces requiring sprinkler protection are covered in 8.14.1.1. Concealed spaces, unless protected, can provide an unabated passage for firespread throughout a building. Paragraph 8.14.1 applies to those portions of a building that have construction or finish materials of a combustible nature, are used for the storage of combustible materials, and can contain combustibles associated with building system features such as computer wiring or large quantities of nonmetallic piping.

Any of these scenarios could be found in a concealed space. It is important to recognize that concealed spaces are not exclusively limited to areas above ceilings but can also be found in walls and in spaces beneath the floor. For example, a raised floor in a computer room is a . concealed space. If none of the three prescribed conditions exists, the space is defined as a concealed, noncombustible space with respect to combustible objects and requires no additional sprinkler protection.

Some minor quantities of combustible materials, such as communication wiring, can be present in some concealed spaces but should not typically be viewed as requiring sprinklers (see 8.14.1.1). The threshold value at which sprinklers become necessary in the concealed space is not defined. For example, the usual amounts of data or telephone wiring found above a ceiling would not typically constitute a threat. If bundles of unsheathed computer wiring are installed above the ceiling or beneath the floor in a manner where fire propagation in all directions is likely, then the concealed space should be treated the same as a combustible space, thereby requiring appropriate sprinkler protection. If some other protection measure is provided, such as a CO, system, then the concealed space is considered to be protected, and sprinklers are not required.

Users of this article need to be aware of the requirements of NFPA 13 so they can provide the appropriate fire protection where these is a build-up of combustible cables that constitute a combustible loading, or preferably avoid the buildup of combustible cables that would result in a combustible loading. Use of concealed space cables would be an option in a strategy to avoid establishing a combustible loading.

A flame spread index of 25 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

A smoke developed index of 450 is a typical requirement for materials permitted in concealed spaces or exposed in buildings.

The following requirements are from NFPA 5000-2003 identify heat of combustion, flame spread, and smoke as major concerns:

Chapter 4 General

4.4.7 Limiting Fire Spread.

4.4.7.1 Interior Finishes. The interior surfaces of the building shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.4.7.2 Concealed Spaces. The construction of concealed spaces shall not contribute to an unacceptable rate of the spread of fire, hot gases, and smoke to areas of the building remote from the fire source and shall limit their spread beyond the immediate area of the origin of the fire.

4.4.7.3 Compartmentation. The building shall be compartmented, as appropriate, by walls and floors, including their associated openings with proper closures, to limit the spread of fire, hot gases, and smoke to an acceptable area beyond the immediate area of fire origin.

Chapter 8 Fire-Resistive Materials and Construction

8.1 General.

8.1.1 The chapter addresses fire protection features intended to restrict or resist the spread of fire and smoke beyond the compartment of fire origin.

8.1.2 Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict or resist the movement of smoke.

8.1.2.1* Fire compartments shall be formed with fire barrier walls that comply with Section 8.4 or horizontal assemblies that comply with Section 8.6, or a combination of both.

8.1.2.2 Smoke compartments shall be formed with smoke barriers that comply with Section 8.11.

8.16 Insulating Materials.

8.16.7 Insulation and Covering on Pipe and Tubing. Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke developed index of not more than 450.

Chapter 10 Interior Finishes

10.3.2* Products required to be tested in accordance with NFPA 255 or ASTM E 84 shall be grouped in the classes described in 10.3.2(A) through 10.3.2(C) in accordance with their flame spread and smoke development, except as indicated in 10.3.3.

(A) Class A Interior Wall and Ceiling Finish. Class A interior wall and ceiling finishes shall be those finishes with a flame spread of 0–25 and smoke development of 0–450 and shall include any material classified at 25 or less on the flame spread test scale and 450 or less on the smoke test scale. Any element thereof, when so tested, shall not continue to propagate fire.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide adequate technical substantiation to support a need for a concealed space listed cable.

Concealed spaces should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

OHDE, H.: We agree with panel action and believe that the panel statement should reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.

This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."

In the committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

ARTICLE 830 — NETWORK-POWERED BROADBAND COMMUNICATIONS SYSTEMS

16-347 Log #2365 NEC-P16 **Final Action: Reject**
(830.2.Abandoned Network Powered Broadband Communications Cable)

Submitter: John H. Schmidt, ABC Television Network

Recommendation: In the definition for Abandoned Network Powered Broadband Communications Cable, after the words "and not identified for future use with a tag" add the new text "or in a database."

Substantiation: In modern large systems, cables are often identified with a number at each end, and the function of the cable is listed in a database referencing that number. This database should be adequate to identify cables for future use.

Panel Meeting Action: Reject

Panel Statement: The AHJ is unlikely to have access to the database for every building under his/her jurisdiction. The majority of communications technicians (installation/repair) work at a multiplicity of locations. Database administrative responsibility is not identified in the proposal. Maintaining and referencing a database for every location is cumbersome, unwieldy, and impractical.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-348 Log #2676 NEC-P16 **Final Action: Reject**
(830.2.Abandoned Network-Powered Broadband Communications Cable)

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Recommendation: Revise 830.2 to read as follows:

830.2 Abandoned Network-Powered Broadband Communications Cable to read:

Installed network-powered communications cable that is not terminated at equipment other than a connector and not identified for future use with a tag which is of a material impervious to the deleterious effects of temperature and dampness. The tag shall be resistant to the effects of gnawing by rodents. The tag shall contain the following information:

(1) Date tag was installed.

(2) Date of intended use of disconnected cable.

(3) Drawing or file number containing information relating to intended future use of disconnected cable.

The date of intended use of disconnected cable shall not exceed 90 days from date of disconnection.

Substantiation: Abandoned cables are a growing problem in the industry. These cables are left for others to deal with when present users discontinue their operation. Understanding this problem, the removal of abandoned cables, is required by Articles 640, 645, 725, 760, 770, 800, 820 and 830. 830.3(A) requires the removal of abandoned network powered communications cables. Tagging of cables intended for future use without a method of ensuring the intention of future use invites tagging of cables to avoid the responsibility of their proper removal.

Panel Meeting Action: Reject

Panel Statement: While the submitter makes the point that the "tagging" requirements may be used to circumvent abandoned cable removal, the proposed additional requirements are impractical, burdensome, and preclude the pre-wiring of buildings. For example, buildings are often "pre-wired" for network-powered broadband. While the current tenant may not require the pre-wiring, future tenants may have additional needs and require the network-powered broadband wiring. Allowing only "90 days" is insufficient to support pre-wiring. A tag that is immune to temperature, dampness, and rodents needs to be of special material and would likely require special means to mark the tag. Adding a file number implies the existence of a database. No suggestion is provided as to who is responsible for populating and maintaining the database.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-349 Log #3014 NEC-P16 **Final Action: Reject**
(830.2. Abandoned Network-Powered Broadband Communications Cable)

Submitter: Marcelo M. Hirschler, GBH International

Recommendation: Revise text to read as follows:

830.2 Definitions.

Abandoned Network-Powered Broadband Communications Cable. Installed network-powered broadband communications cable that is not terminated at equipment ~~other than a connector~~ and not identified for future use with a tag.

Substantiation: The definitions of abandoned cable in every article should be identical. The relevant articles are: 640, 645, 725, 760, 770, 800, 820 and 830. The definitions at articles 640 and 725 are already correct as follows:

640.2: Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag.

725.2: Abandoned Class 2, Class 3, and PLTC Cable. Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag.

The additional wording in this definition causes confusion. Proposals are being made to make changes to the definitions in articles 770, 800, 820 and 830, and to add a general definition into article 645 and into article 100.

Panel Meeting Action: Reject

Panel Statement: The AHJ is unlikely to have access to the database for every building under his/her jurisdiction. The majority of communications technicians (installation/repair) work at a multiplicity of locations. Database administrative responsibility is not identified in the proposal. Maintaining and referencing a database for every location is cumbersome, unwieldy, and impractical.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: This proposal should be accepted as submitted. The submitter substantiates that the definitions of abandoned cables in Articles 640, 645, 725, 760, 770, 800, 820, and 830 should be identical. This proposal deletes unnecessary language in the present definitions and provides consistent language throughout the above articles mentioned. The panel statement is incorrect.

16-350 Log #53 NEC-P16 **Final Action: Reject**
(830.2.Air Duct)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Add a definition to read as follows:
Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum. [NFPA 97:1.2.6]
Substantiation: The definition of air duct is in the definitions section of Articles 800 and 820. Add it to this article for editorial consistency.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
JENSEN, R.: We agree with rejecting this as it was evidently an oversight to be removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 770 even though the substantiation says it is. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".

16-351 Log #3032 NEC-P16 **Final Action: Reject**
(830.2.Air Duct)

Submitter: Marcelo M. Hirschler, GBH International / Rep. American Fire Safety Council
Recommendation: Delete the following text:
~~**800.2 Air Duct.** A conduit or passageway for conveying air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum.~~
Substantiation: The term "air duct" is not used in article 800 and should not be defined in the article, as per the manual of style of the National Electrical Code.
Panel Meeting Action: Reject
Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:
"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."
This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
JENSEN, R.: We believe that the interpretation of whether being allowed to address this proposal in view of the NFPA Standard Council Long Decision 05-24 (SC #05-7-4) was misunderstood.
We agree with deleting the term "air duct" as it was evidently an oversight that it was not removed during the last code cycle. Air duct was introduced for use with "air duct cable" which was not to be used in the 2005 code. Additionally, the term is not used within Article 800. To further not using this term, in proposal 16-29, the panel revised the proposal to not use "air duct", but instead to harmonize code language by using the term "ventilation or air handling ducts".
Comment on Affirmative:
OHDE, H.: This proposal should be rejected because there is no definition in 830.2 for "Air Duct". The panel rejected the proposal based on the NFPA 90A Standards Council Decision 05-24 (SC#05-7-4).

16-352 Log #2666 NEC-P16 **Final Action: Reject**
(830.2.Block)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Delete the following text:
~~**Block.** A square or portion of a city, town, or village enclosed by streets, including the alleys so enclosed but not any street.~~
Substantiation: This is a companion proposal to BICSI 830.90. If this proposal is accepted, this definition will no longer be needed because the concept of "block" will be removed.
Panel Meeting Action: Reject
Panel Statement: This is a companion proposal to 16-383, which was rejected.
See panel action on Proposal 16-383.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-353 Log #786 NEC-P16 **Final Action: Accept in Principle**
(830.2.Exposed)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise the definition of "Exposed" as follows:
Exposed <u>(</u> to Accidental Contact <u>)</u> ~~with Electrical Light or Power Conductors~~ . A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result.
<u>FPN: See Article 100 for two other definitions of *Exposed* .</u>
Substantiation: This is a clarification. (Task Group No. 830-03)
It clarifies the term "Exposed" as used in Article 800 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. The word "and" is deleted and replaced by the word "or" as either of the conditions, failure of supports or failure of insulation, may result in accidental contact. This is a companion proposal to 770.2, 800.2 and 820.2. The addition of the fine print note introduces to Articles 770, 800 and 820.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-354.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-354 Log #1941 NEC-P16 **Final Action: Accept**
(830.2.Exposed (to Accidental Contact))

Submitter: Stanley D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise the definition of "Exposed" as follows:
Exposed <u>(</u> to Accidental Contact <u>)</u> ~~with Electrical Light or Power Conductors~~ . A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result.
<u>FPN: See Article 100 for two other definitions of Exposed.</u>
Substantiation: This is a clarification. (Task Group 830-03A)
It clarifies the term "Exposed" as used in Article 830 to indicate possible contact with another circuit, as opposed to the definitions of "Exposed" contained in Article 100, i.e., live parts or wiring methods. The style used to differentiate the term is identical to that of Article 100 for consistency. This is a companion proposal to 770.2, 800.2 and 820.2. The changes to the definition and the addition of the fine print note provides consistency and correlation in the definition of "exposed" across Articles 770, 800, 820 and 830.
This is one of a group of proposals prepared by the CMP 16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related articles such that similar requirements are stated the same way in each article;
3) make the articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-355 Log #1876 NEC-P16 **Final Action: Accept in Principle**
(830.2.Exposed to (Accidental Contact))

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise the definition of "Exposed" as follows:
" **Exposed (to Accidental Contact)** ~~**with Electrical Light or Power Conductors**~~ **.** A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result."
Substantiation: The proposed revision establishes a consistent definition throughout Articles 770, 800, 820 and 830. The present definition contains an inconsistency between the defined term, i.e., "Exposed to Accidental Contact with Electrical Light or Power Conductors" and the actual wording of the definition, i.e., "contact with another circuit". The proposed revised definition reflects the intended meaning of the term and is consistent with the identical definition in Articles 770, 800 and 820. This is a companion proposal to 770.2, 800.2 and 820.2.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-354.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-356 Log #64 NEC-P16 **Final Action: Accept in Principle**
(830.2. Exposed to Accidental Contact with Electrical Light or Power Conductors)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
Exposed to Accidental Contact with Electrical Light or Power Conductors. A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result.
Substantiation: "Electrical Light or Power Conductors" has been changed to "Electric Light or Power Conductors" for editorial consistency with the usage in the Code.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-354.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-357 Log #37 NEC-P16 **Final Action: Accept in Principle**
(830.2. Point of Entrance)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
Point of Entrance. The point within a building at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) grounded to an electrode in accordance with 830.100(B).
FPN: See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).
FPN: See 344.2 for a definition of Rigid Metal Conduit (Type RMC).
Substantiation: The addition of a fine print notes pointing installers to the definitions of intermediate metal conduit and rigid metal conduit will help installers who are not Code experts. Use of the type designations will promote consistency throughout the code.
Panel Meeting Action: Accept in Principle
Change 830.2 to read as follows:
Point of Entrance. The point within a building at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) ~~grounded~~ connected by a grounding conductor to an electrode in accordance with 830.100(B).
FPN No. 1 : See 342.2 for a definition of Intermediate Metal Conduit (Type IMC).
FPN No. 2 : See 344.2 for a definition of Rigid Metal Conduit (Type RMC).
Panel Statement: The text inserted by the panel, "connected by a grounding conductor," provides for editorial consistency across Articles 770, 800, 820, and 830. Multiple FPNs are required to be numbered.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states "This Code is not intended as a design specification or an instruction manual for the untrained persons." The addition of the two FPN's referencing the definitions of IMC raceway in 342.2 and RMC raceway in 344.4 is not needed nor warranted. In the submitter's substantiation he states these Fine Print Notes will help installers who are not Code experts. A trained installer will know the Code content and how the Code book is to be used.
Comment on Affirmative:
JENSEN, R.: The panel action regarding FPN No. 2 for Rigid Metal Conduit should refer to 344.2, not 344.4.

16-358 Log #785 NEC-P16 **Final Action: Accept**
(830.2.Premises Wiring)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Remove the following text:
Premises Wiring. The circuits located on the user side of the network interface unit.

Substantiation: This proposal is technical. (Task Group No. 830-02)
Premises wiring may, in fact, be on the input side of an NIU. This definition is confusing, misleading, and unnecessary.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-359 Log #38 NEC-P16 **Final Action: Accept**
(830.2, FPN)

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Add a fine print note to the definition of Abandoned Network-Powered Broadband Communications Cable
Abandoned Network-Powered Broadband Communications Cable. Installed network-powered broadband communications cable that is not terminated at equipment other than a connector and not identified for future use with a tag.
FPN: See Article 100 for a definition of equipment.
Substantiation: The addition of a fine print note alerting installers that equipment is defined in Article 100 will help installers who are not Code experts.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:
JENSEN, R.: Propose to "Reject".
CMP 16 accepted proposal 16-5 to harmonize 770.2, 800.2, 820.2, and 830-2 by including a normative reference to "See Article 100". Adding a FPN to again "See Article 100" is redundant, especially since this FPN will be a few lines down from the identical wording in normative text. Additionally, the 2003 NEC Style Manual specifically states to avoid redundant use of references.
OHDE, H.: This proposal should be rejected. Section 90.1 (C) of the NEC states "This Code is not intended as a design specification or an instruction manual for the untrained persons." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing Article 100 for the definition of equipment is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-360 Log #3102 NEC-P16 **Final Action: Reject**
(830.3)

Submitter: Donald Hall, Corning Cable Systems
Recommendation: Revise text to read as follows:
830.3 Other Articles.
Circuits and equipment shall comply with 830.3(A) through 830.3(E).
(A) Spread of Fire or Products of Combustion. 300.21 shall apply. ~~The accessible portion of a~~ Abandoned network-powered broadband communications cables shall be removed.
Also, add the following FPN to 830.3(A):
FPN: ANSI/NECA/BICSI 568-2001, Standard for Installing Commercial Building Telecommunications Cabling, and other industry standards provide recommended cable installation practices which facilitate the eventual removal of cables as they become abandoned.
Substantiation: Abandoned cable should be removed to reduce unnecessary accumulation of fuel load and promote electrical safety. It is not reasonable or necessary to install cables in a manner that prevents their eventual removal.
The proposed FPN will provide useful information to architects, system designers, and installers to help minimize the cost and inconvenience of removing abandoned cable.

Panel Meeting Action: Reject
Panel Statement: The proposal would require all abandoned cable to be removed, irrespective of accessibility, presenting a compliance conundrum to installers. Without access, it is impossible to remove cables that are securely fastened without damaging the building or adjacent cables. The submitter's substantiation states: "It is not reasonable or necessary to install cables in a manner that prevents their eventual removal." However, the panel previously imposed additional securing and supporting requirements by referencing 300.11 in 830.24. Gaining access may sometimes require disassembly of part of the building. This is not the intent of the panel. The current requirement to remove only the accessible portion is reasonable. The submitter further proposes to add an FPN following 830.3(A) that is already contained in 830.24.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article. The FPN that the submitter submitted is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.

16-361 Log #787 NEC-P16 **Final Action: Accept in Principle**
(830.3(A))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:
~~**830.3(A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned network-powered broadband communications cables shall be removed.~~
830.25. Abandoned Cables. The accessible portion of abandoned network-powered broadband cables shall be removed.
830.26 Spread of Fire or Products of Combustion. Installations of network-powered broadband cables in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of network-powered broadband cables through fire-resistantĐrated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.Ê
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistanceĐrated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 830.26 can be found in building codes, fire resistance directories, and product listings.
Substantiation: This proposal is editorial. (Task Group No. 830-04)
The title of Section 830.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 830. It is out of place in section 830.3. This proposal will move it to a new section of Article 830. Rather than refer section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 830 which should be familiar to communications installers. The text of proposed section 830.26 is based on section 300.21 but modified to apply to network-powered broadband cables.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) mprove the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Principle
The panel accepts the submitter's proposal.
In addition, the alpha reference (B) to 770.3 is deleted only so there are not two separate subsections.
Panel Statement: The panel accepts the submitter's proposal, where editorial changes are made to reorder subsections of 830.3.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 830.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.
The substantiation provided to delete 830.3(A) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 830.26 is based on the requirements of 300.21. There was no substantiation submitted for this change. In addition there is no need for the FPN to be mentioned as the language in 830.3(A) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.

16-362 Log #1389 NEC-P16 **Final Action: Reject**
(830.3(A))

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Delete text concerning abandoned cables
830.3 Other Articles.
Circuits and equipment shall comply with 830.3(A) through 830.3(E).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. ~~The accessible portion of abandoned network-powered broadband communications cables shall be removed.~~
Substantiation: The NEC is an installation standard, not a maintenance standard. Because of this, this rule should not be a part of the NEC. Furthermore, this provision does not accomplish its intent, as the code is not a retroactive document. To require abandoned cables to be removed is similar to requiring facilities to update their receptacles to the new GFCI provision every three years. With that said, the only time this rule applies is when an installer creates an abandoned cable. Also, this provision does not fall within the purpose of the NEC 90.1(A). The NEC is concerned with the hazards created from the use of electricity…this rule seems to imply that a cable with a voltage applied to it is safe, but a cable with no voltage applied to it is dangerous.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-26.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-363 Log #2810 NEC-P16 **Final Action: Accept in Part**
(830.3(A))

Submitter: Harold C. Ohde, IBEW #134
Recommendation: Revise text to read as follows:
830.3 Other Articles. No change.
(A) Spread of Fire or Products of Combustion. ~~Section~~ 300.21 shall apply . ~~The accessible portion of abandoned network powered broadband communications cables shall be removed.~~
Substantiation: The requirements for removal of abandoned network-powered broadband communications cables would be better suited in appropriate code section within Article 830. I have submitted another proposal that would move the abandoned network-powered broadband communications cables requirements to 830.24 - Mechanical Execution of Work. The abandoned network-powerered broadband communications cables requirements are out of place in 830.3 - Other Articles. The requirements are not part of another Article as they are part of Article 830 and are located within Article 830.
The deletion of the word "Section" is an editorial change to comply the National Electrical Code Style Manual.
Similar proposals have been submitted for 640.3, 725.3, 760.3, 770.3, 800.3 and 820.3 to revise these sections as well.
Panel Meeting Action: Accept in Part
The panel accepts the part that deletes the second sentence of 830.3(A) concerning abandoned cables.
The panel rejects the proposed revisions to the first sentence.
Panel Statement: The panel agrees that the requirement to remove abandoned cable does not belong in 830.3 and should be relocated. A direct reference to 300.21 is inappropriate, as it applies to electrical installations and not network-powered broadband communications installations. See panel action on Proposal 16-361 that relocates the requirement to remove abandoned cable to 830.25 (new) and restates the spread of fire requirements in network-powered broadband terms in 830.26 (new).
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should have been accepted as originally submitted. The panel statement seems to be in conflict as it states the provisions of 300.21 will work well in the new proposed section 830.26 but not in 830.3(A) where it has always been properly located. The panel accepted the same 300.21 requirements whose concern is the spread of fire and products of combustion in hollow spaces, vertical shafts and ventilation and air- handling ducts caused by electrical installations and located them in 830.26.

16-364 Log #3011 NEC-P16 **Final Action: Reject**
(830.3(A))

Submitter: Marcelo M. Hirschler, GBH International
Recommendation: Revise text to read as follows:
830.2 Definitions.
Abandoned Network-Powered Broadband Communications Cable. Installed network-powered broadband communications cable that is not terminated at equipment other than a connector and not identified for future use with a tag.
830.3 Other Articles.
Circuits and equipment shall comply with 830.3(A) through 830.3(E).
(A) Spread of Fire or Products of Combustion. Section 300.21 shall apply. ~~The accessible portion of abandoned~~ Abandoned network-powered broadband communications cables shall be removed. Removal of abandoned cables shall not damage the building structure or finish and shall not compromise the performance of adjacent wiring systems or components.
Substantiation: This comment recommends a change in wording to ensure that abandoned cables are removed and to prevent confusion in future. There have been multiple proposals that would permit some cables to remain in "inaccessible spaces". This is not conducive to safe electrical practice; this the key change is the elimination of the words "the accessible portion of".
If the intent of the code-making panel was to clarify that removal of cable should not be done if such removal would damage the building, which is obviously not the intent, a second sentence can be added stating that removal of abandoned cables shall not be performed if it would damage the building structure or finish or in any way compromise the functional performance of any other wiring systems or components. This would be accomplished by the optional added sentence.
Consistent wording on removal of abandoned cables is being proposed for sections: 640.3, 725.3, 770.3, 770.154, 800.3, 800.154, 820.3, 820.154 and 830.3.
For information, see the relevant definitions in the NEC.
Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.
Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.
Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.
Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.
Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.
Panel Meeting Action: Reject
Panel Statement: See panel action on Proposal 16-28.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We concur with submitter's substantiation and believe a change of wording will ensure that are abandoned cables are remove and prevent confusion in future. We suggest that the submitter resubmit his recommendation in the 2008 ROC stage in a more appropriate section with Part 1 – General so these requirements will apply throughout the entire Article.

16-365 Log #3315 NEC-P16 **Final Action: Accept in Principle in Part**
(830.3(A), 830.25 (new) & 830.26 (new))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal relative to the panel action text to accept the deletion of 830.3(A), not 830.3(C). This action will be considered by the Panel as a Public Comment.
Submitter: William E. Koffel, Koffel Assoc., Inc. / Rep. Society of the Plastics Industry
Recommendation: Make the following changes:
~~**830.3(A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned network-powered broadband communications cables shall be removed.~~
830.25. Abandoned Cables. The accessible portion of abandoned network-powered broadband cables shall be removed.
830.26 Spread of Fire or Products of Combustion. Installations of network-powered broadband cables in hollow spaces, concealed spaces, vertical shafts and air ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of network-powered broadband cables through fire-resistant–rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire-resistance–rated wall assembly. An example is the 600-mm (24-in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 830.26 can be found in building codes, fire resistance directories, and product listings.
FPN No. 2: FPN: See 8.14.1 of NFPA 13, *Installation of Sprinkler Systems* , for requirements for sprinklers in concealed spaces containing exposed combustibles.
Substantiation: The title of Section 830.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 830. It is out of place in section 830.3. This proposal will move it to a new section of Article 830. Rather than refer to Section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 830 which should be familiar to communications installers. The text of proposed section 830.26 is based on Section 300.21 but modified to apply to network-powered broadband cables. For clarity, "ventilation or air-handling ducts" has been simplified by replacing it with "air ducts". Also, "concealed spaces" have been added to the list of areas requiring fire protection vigilance (hollow spaces, vertical shafts, and air ducts) to correlate with NFPA 13, *Installation of Sprinkler Systems,* which has requirements for protecting concealed spaces. A FPN is included to refer users to the NFPA 13 requirements.
It should be noted that the section reference may need to be updated when the 2006 edition of NFPA 13.
Panel Meeting Action: Accept in Principle in Part
The panel accepts the submitter's deletion of 830.3(C), the addition of 830.25 (new), and the addition of 830.26 (new), but revises "air ducts" to "ventilation or air handling duct" in keeping with the existing NEC text. The panel accepts FPN No. 1, but rejects the addition of FPN No.2.
Panel Statement: See panel action on Proposal 16-361.
The Panel rejects the addition of FPN No. 2 because it introduces undefined terminology. "Concealed spaces" should be adequately defined. See action on Proposals 16-13, 16-110, and 16-247 where the proposed definition was determined to be unacceptable.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 830.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.
The substantiation provided to delete 830.3(A) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 830.26 is based on the requirements of 300.21 but modified to apply to network-powered broadband cables. There was no substantiation submitted for this change. In addition there is no need for the FPN No.1 to be mentioned as the language in 830.3(A) clearly states the requirements of 300.21 apply. 300.21 has the identical FPN that is being proposed.
We believe that the panel statement should also reflect the latest NFPA 13 Technical Committee actions. Included in the submitter's substantiation was the 2002 Section 8.14 which since has been revised. We would like to add that NFPA 13 just completed their balloting process for the 2006 NFPA 13 Standard. The Technical Committee on Sprinkler Installation submitted a comment on Proposal 13-284.
This comment reworded proposed A.8.14.1.2.1 to read " *Minor quantities of combustible materials such as but not limited to: cabling, nonmetallic plumbing piping, non-structural wood, etc…can be present in concealed spaces constructed of limited or noncombustible materials but should not be viewed as requiring sprinklers (see 8.14.1.1) For example, it is not the intent of this section to require sprinklers, which would not otherwise be required, in the interstitial space of a typical office building solely due to the presence of the usual amount of cabling within the space. The threshold value at which sprinklers become necessary in the concealed space is not defined* ."
In the NFPA 13 committee's substantiation, they wanted to clarify that the normal amount of cabling would not require sprinklers due to the construction of the space. They also expanded the list of combustibles to provide examples of potential combustible loading.

16-366 Log #788 NEC-P16 **Final Action: Reject**
(830.3(B))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Delete the following:
~~**(B) Ducts, Plenums, and Other Air-Handling Spaces.** Section 300.22 shall apply where installed in ducts, plenums, or other spaces used for environmental air.~~
~~*Exception: As permitted in 830.154(B)*~~
Substantiation: This proposal is editorial and technical. (Task Group No. 830-05)
Section 830.3(B) provides no additional guidance or requirements that are not already in 830.154(A). It conflicts with Article 830 because Article 830 requires listed network-powered broadbad cables whereas 300.22 permits various electrical power and control cables that are not permitted to be used

for network-powered broadband circuits in Article 830. Section 800.3 does not have a similar requirement.

Acceptance of this proposal will make Articles 770, 800, 820 and 830 consistent and in compliance with section 3.3.5 of the NEC Style Manual, shown below:

3.3.5 Parallel Construction. Parallel construction means stating similar requirements in similar ways for greater consistency. This helps makes the *NEC* clear for users. Lack of consistency often creates confusion, causing users to ask: *Does this difference in wording represent a different requirement? Or is it simply two different ways of trying to say the same thing?* There are several kinds of parallel construction:

Organization and Numbering . If practicable, the subsections of similar articles should be numbered in the same order (see 2.4.1).

Sections. Different sections, within the same article, that reflect similar or closely related subjects, should have similar structures.

Lists. All items in a list should be parallel (that is, singular or plural, written in the same verb tense, using phrases or sentences but not a mix).

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Reject

Panel Statement: The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-367 Log #789 NEC-P16 **Final Action: Accept in Part**
(830.3(E))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal and give further consideration to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the changes as shown:

~~**(A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned network-powered broadband communications cables shall be removed.~~

~~**(B) Ducts, Plenums, and Other Air-Handling Spaces.** Section 300.22 shall apply where installed in ducts, plenums, or other spaces used for environmental air.~~

~~*Exception: As permitted in 830.154(B).*~~

(B ~~C~~) Equipment in Other Space Used for Environmental Air. Section 300.22(C) shall apply.

(C ~~D~~) Output Circuits. As appropriate for the services provided, the output circuits derived from the network interface unit shall comply with the requirements of the following:

(1) Installations of communications circuits — Article 800Ê

(2) Installations of community antenna television and radio distribution circuits — Article 820

Exception: 830.90(B)(3) shall apply where protection is provided in the output of the NIU.

(3) Installations of optical fiber cables —Article 770

(4) Installations of Class 2 and Class 3 circuits — Article 725

(5) Installations of power-limited fire alarm circuits — Article 760

(A ~~E~~) Hazardous (Classified) Locations. Network-powered broadband communications circuits and equipment installed in a location that is classified in accordance with ~~Article~~ 500 .5 shall comply with the applicable requirements of Chapter 5.

Substantiation: This proposal is editorial. (Task Group No. 830-06)

It re-letters 830.3(E) to (A) so the hazardous locations requirements will be in the same place in all CMP-16 Articles. The definitions of hazardous locations are in 500.5. This proposal correlates with other task group proposals that deleted (A) & (B), thereby requiring the re-lettering of this section.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept in Part

Change 830.3(E) to read as follows:

(A) Hazardous (Classified) Locations. Network-powered broadband communications circuits and equipment installed in a location that is classified in accordance with 500.5 shall comply with the applicable requirements of Chapter 5.

(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22 shall apply where installed in ducts, plenums, or other spaces used for environmental air.

Exception: As permitted in 830.154(B).

(C) Equipment in Other Space Used for Environmental Air. Section 300.22(C) shall apply.

(D) Output Circuits. As appropriate for the services provided, the output circuits derived from the network interface unit shall comply with the requirements of the following:

(1) Installations of communications circuits — Article 800

(2) Installations of community antenna television and radio distribution circuits — Article 820

Exception: 830.90(B)(3) shall apply where protection is provided in the output of the NIU.

(3) Installations of optical fiber cables —Article 770

(4) Installations of Class 2 and Class 3 circuits — Article 725

(5) Installations of power-limited fire alarm circuits — Article 760

Delete 830.3(E).

Panel Statement: The panel accepts the submitter's deletion of subsection (A).

The panel rejects the submitter's revision of subsection (B).

The panel is acting on this and other proposals related to wire and cable in plenum and other air handling spaces based on NFPA Standards Council Decision 05-24 (SC #05-7-4) dated 29 July 2005 that states, in pertinent part, as follows:

"So as not to inject the problems identified in the 2002 edition of NFPA 90A into the NEC®, and in order to give the Technical Committee on Air Conditioning the opportunity to fully address all technical issues related to plenum cables by processing the issues through the entire upcoming NFPA 90A revision cycle, the Council directs the NEC Project to maintain the status quo in the NEC until the Technical Committee on Air Conditioning has, through the processing of NFPA 90A, addressed the issues and released the next edition of NFPA 90A."

This action does not constitute agreement or disagreement with any of the substantiations submitted for the affected proposal.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14 Negative: 1

Explanation of Negative:

OHDE, H.: The submitter did not substantiate for the deletion of 830.3(A). The panel statement and action is also unclear as they deleted the previous 830.3(A) with no explanation.

16-368 Log #1878 NEC-P16 **Final Action: Accept in Principle**
(830.15)

Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc.

Recommendation: Revise 830.15 **Power Limitations** as follows.

Network-powered broadband communications systems shall be classified as having low or medium power sources as defined in Table 830.15 or as having a listed Remote Feeding Telecommunication – Voltage (RFT-V) power source .

FPN: One way to determine applicable requirements for listing of information technology equipment intended to supply and receive operating power via a telecommunication network using RFT-V circuits, is to refer to UL 60950-21-03, *Standard for Safety for Information Technology Equipment – Safety – Part 21: Remote Power Feeding* .

Substantiation: CSA/UL6950-21 (first edition, 2003), Standard for Safety for Information Technology Equipment – Safety – Part 21: Remote Power Feeding, is the ANSI standard that applies to communications systems intended to supply and receive power over the communications network. This is a first proposal of a set of several proposals intended to harmonize the requirements of UL6950-21 and the NEC Article 830.

The RTF-V circuit specified in the CSA/UL document permits voltages up to 200V dc between each conductor and ground with monitoring and control devices that limit the current to ground to 10 mA. The RFT-V is power-limited to 100 W rated power (150 VAmax). Rationale and background for the provisions of CSA/UL 60950-21 can be found in the Annex A to the standard.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Proposal 16-369.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-369 Log #2797 NEC-P16 **Final Action: Accept**
(830.15)

Submitter: Randolph J. Ivans, Underwriters Laboratories Inc. / Rep. Telecommunications Industry Association (TIA) Subcommittee TR41.7; Environmental and safety Considerations
Recommendation: Revise as follows:
830.15 Power Limitations. Network-powered broadband cmmunications systems shall be classified as having low or medium power sources as ~~defined~~ specified in ~~Table~~ ~~830.15~~ 830.15(1) or 830.15(2).
(1) Sources shall be classified as defined in Table 830.15.
(2) DC power sources exceeding 150 volts to ground, but no more than 200 volts to ground, with the current to ground limited to 10 mA dc, that meet the current and power limitation for medium power sources in Table 830.15 shall be classified as medium power sources.
FPN: One way to determine compliance with 830.15(2) is listed information technology equpment intended to supply power via a telecommunication network that complies with the requirements for RFT-V circuits as defined in UL 60950-21, Standard for Safety for Information Technology Equipment - Safety - Part 21: Remote Power Feeding.
Substantiation: CSA/UL 60950-21 (first edition, 2003), Standard for Safety for Information Technology Equipment - Safety - Part 21: Remote Power Feeding, is the ANSI standard that applies to communications systems intended to supply and receive power over the communications network. This proposal is intended to harmonize the requirements of UL 6950-21 and the NEC Article 830.
An RFT circuit or “Remote Feeding Telecommunication” circuit is a secondary circuit intended to supply or receive d.c. power via a telecommunication network. An RFT-V circuit is an RFT circuit that is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited.
The RFT-V circuit specified in the CSA/UL document permits voltages up to 200V dc between each conductor and ground with monitoring and control devices that limit the current to ground to 10 mA. The RFT-V is power-limited to 100 W rated power (150 V Amax). Rationale and background for the provisions of CSA/UL 60950-21 can be found in the Annex A to the standard.
By adding these circuit characteristics to the medium power source, this proposal is also intended to allow the use of Type BMU, Type BM, or Type BMR cables for these circuits. These cables are presently allowed for medium power network-powered broadband communications circuits in 830.40(A). The RFT-V circuits have more stringent power limitations than the medium-power circuit. As insulation for the individual conductors of Type BMU, Type BM, and Type BMR Cables is required to be rated for 300 volts minimum for each conductor, so these cables are suitable for the RFT-V circuits.
This proposal was prepared by the TR41.7, Environmental and Safety Considerations, subcommittee appointed by the Telecommunications Industry Association (TIA) TR41 Committee, User Premises Telecommunications Requirements and consisting of Randolph Ivans as chairman and subcommittee members. A list of participating companies and subcommittee members can be found in the document identified as TR41.7-Voting Attendance quorum V1.3xls located on the TIA TR4.17 public ftp site at: http://ftp.tiaonline.org/tr-41/tr41.7/Public/
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
DORNA, G.: Listing requirements are in Part VI of this article. The information in the new FPN belongs in part VI.
KAHN, S.: The panel action should have been “accept in principle” with the new FPN placed in Part VI of this article where all listing requirements are included.

16-370 Log #2800 NEC-P16 **Final Action: Accept in Principle**
(830.15)

Submitter: Randolph J. Ivans, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
830.15 Power Limitations. Network-powered broadband communications systems shall be as specified in (1) or (2) below .
(1) Classified as having low or medium power sources as defined in Table 830.15.
(2) Listed information technology (communications) equipment remote feeding telecommunications circuit, RFT-V.
FPN: One method of determining applicable requirements for listing of information technology (communications) equipment and remote feeding telecommunications circuits, RFT-V is to refer to UL 60950-1, Information Technology Equipment - Safety - Part 1: General Requirements and UL 60950-21, Information Technology Equipment - Safety - Part 21: Remote Power Feeding. Typically such circuits are used to supply d.c. operating power via a telecommunication network.
No change to Table 830.15.
Substantiation: The voltage limitations in 830.15 do not include some common communication industry practices for powering broadband communications equipment not under the exclusive control of the communications utility.
UL 60950-21, Standard for safety for Information Technology Equipment - Safety - Part 21: Remote Power Feeding, is the ANSI standard that applies to communications systems intended to supply and receive power over the communications network.
An RFT circuit or “Remote Feeding Telecommunication” circuit is a secondary circuit intended to supply or receive d.c. power via a telecommunication network. An RFT-V circuit is an RFT circuit that is so designed and so protected that under normal operating conditions and single fault conditions, the voltages are limited.
An RFT-V circuit as described in UL 609590-21 is so designed and protected that under normal operating conditions the voltages are limited between each conductor and ground to 140V dc, or up to 200 V dc provided that a monitoring and control device is used that limits the current to earth to 10 mA. Power is limited to a maximum rating of 100VA under normal operation and 150VAmax under fault conditions, which are lower than the limits for medium power circuits. In addition, the output current is limited to a value that would not cause damage to the communications wiring system, typically 1.3 A or less. These limits reflect common industry practices for remote feed applications that are now being employed to power broadband equipment not under the exclusive control of the communications utility.
This is a first proposal of a set of three proposals intended to harmonize the requirements of UL60950-21 and the NEC Article 830.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-369.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-371 Log #762 NEC-P16 **Final Action: Accept**
(830.21)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:
830.21 Access to Electrical Equipment Behind Panels Designed to Allow Access.
Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ network-powered broadband communications cables that prevents removal of panels, including suspended ceiling panels.

Substantiation: This is an editorial proposal. (Task Group No. 830-07)
It creates consistency among parallel articles and references the specific medium used in this article. Article 830 does not use “wires” so that term was removed.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-372 Log #1390 NEC-P16 **Final Action: Accept in Principle**
(830.24)

Submitter: Mike Holt, Mike Holt Enterprises
Recommendation: Add “Cable Ties” to the list of supporting methods
830.24 Mechanical Execution of Work.
Network-powered broadband communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by straps, staples, cable ties , hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.
FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568–2001, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved installation standards.
Substantiation: This is being proposed in an effort to create uniform language with the chapter three cable wiring method support sections, specifically, 230.30(A), 330.30(A) and 334.30. Similar proposals are also being made to 725.8, 640.6, 760.8, 770.24 and 800.24.

Panel Meeting Action: Accept in Principle

Change 830.24 to read as follows:

830.24 Mechanical Execution of Work. Network-powered broadband communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by listed hardware including straps, staples, cable ties , hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4(D) and 300.11.

Panel Statement: The panel basically accepts the submitter's revision to 830.24 but modified for coordination.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 11 Negative: 3 Abstain: 1

Explanation of Negative:

BOYER, J.: NEMA does not believe that all such product used for the securement of communications circuits need be listed. Code Panel 8 has steadily rejected similar proposals relating to the support of conduit and cables. UL 1565 provides requirements for listed cable ties intended for primary support of flexible conduits and cables in accordance with the NEC. Such cable ties must have a minimum loop tensile strength rating of 23 kg (50 lbs) or greater. NEMA proposes that the panel reconsider its action and ACCEPT the proposal in principle and in part with the following action. Accept the proposed addition of "cable ties" in the third sentence, reject the requirement that all such hardware be "listed", and add the following new fourth sentence. " Cable ties that provide primary support for such cables shall have a minimum loop tensile strength of 23 kg (50 lbs.)"

BRUNSSEN, J.: See my explanation of negative vote on Proposal 16-43.

DORNA, G.: See my explanation of negative vote on Proposal 16-45.

Explanation of Abstention:

KAHN, S.: Though I agree with the proposal and the submitter's intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

16-373 Log #1877 NEC-P16 **Final Action: Reject**
(830.24)

TCC Action: The Technical Correlating Committee notes that neither the panel statement nor the revised statement shown in the affirmative vote are responsive to the submitter's substantiation for the recommendation. The Technical Correlating Committee directs the panel to act on the merits of the recommendation. This action will be considered by the Panel as a Public Comment.

Submitter: James E. Brunssen, Telecordia Technologies Inc. / Rep. Alliance for Telecommunications Industry Solutions

Recommendation: In the final sentence, delete the reference to 300.11 as follows:

"The installation shall also conform with 300.4(D) ~~and 300.11~~ ."

Substantiation: The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for Network-Powered Broadband Communications Systems conductors. The Fine Print Note associated with 830.24 presently directs the reader to the appropriate installation practices for Network-Powered Broadband Communications Systems conductors. Section 300.11 is directed toward power cable assemblies that are heavier, larger and operate at greater electrical power levels than Network-Powered Broadband Communications Systems conductors. Deletion of the reference to 300.11 will yield consistency throughout the NEC as Panel 3 did not see fit to adopt this reference in Articles 760 and 725.

Panel Meeting Action: Reject

Panel Statement: The requirements of 300.11 are applicable to optical fiber cables.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 13 Negative: 2

Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. The requirement added by Panel 16 during the 2005 revision cycle is overly restrictive and inappropriate for network-powered broadband communications cables. The Fine Print Note associated with 830.24 directs the reader to the appropriate installation standards. The Panel has enhanced the Fine Print Note during this cycle by the addition of three new references covering the installation of network-powered broadband communications cables (see Proposal 16-376). These references are all that is necessary and sufficient for such cables without imposing the burdensome requirements of 300.11. Section 300.11 is directed toward power cable assemblies that are heavier and larger than network-powered broadband communications cables, operate at much greater power levels and present a greater risk of injury if not properly installed.

JOHNSON, S.: I agree with the submitter's points in his proposal. 300.11 deals with cables that are larger and heavier than network-powered broadband communications cables. Referencing 300.11 also creates an inconsistency with Sections 760 and 725, which deal with similar sized cables and do not make this reference. I vote against the Panel's action to reject.

Comment on Affirmative:

JENSEN, R.: The panel statement should read:

The requirements of 300.11 are applicable to network-powered broadband communications cables.

This appears as though it was copied from another panel statement regarding optical fiber.

STENE, S.: The panel statement should be revised to state "The requirements of 300.11 are applicable to ~~optical fiber cables~~ network-powered broadband cables ."

16-374 Log #3056 NEC-P16 **Final Action: Accept in Principle in Part**
(830.24)

Submitter: Harold C. Ohde, IBEW #134

Recommendation: Revise 830.24 as follows:

830.24 Mechanical Execution of Work

(A) Neat and Workmanlike Manner. Network-powered broadband communications equipment, circuits and cables shall be installed in a neat and workmanlike manner.

(B) Installation of Network-Powered Broadband Communications Cables . Network-powered broadband communications cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the network-powered broadband communications cables will not be damaged by normal building use. Such cables shall be secured by listed straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D) and 300.11.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling,* and other ANSI- approved installation standards.

(C) Abandoned Network-Powered Broadband Communications Cables. Abandoned network-powered broadband communications cables shall be removed.

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling,* and other ANSI- approved standards which provide cable installation that facilitates the removal of abandoned cables.

Substantiation: This proposal revises this section into a practical working tool which will assist in making 830.24 a clear, usable and enforceable code. Each first level subdivision contains a code rule that requires action and the required action has been presented in clear, usable and enforceable manner.

In the electrical industry, the electrician, contractor and AHJ have been taught the importance and significance of the concept of mechanical execution of work. I am an electrical instructor who teaches this important concept to the people involved. This is one of the basis for 90.1(A) which serves as the purpose of this Code. The Code's purpose is to provide a safe installation from hazards arising from the use of electricity.

The revised text in 830.24(A) will require all network-powered broadband communications equipment cables and circuits to be installed in a neat and workmanlike manner.

830.24(B) is an editorial change with additional language to require the means of securing and supporting to be listed for the purpose.

The addition of 830.24(C) would replace the requirements that are located in 830.3(A). It makes sense to have the requirements of both the installation of cable and the removal of cable in the same Code section. This would provide the proper guidance to everyone involved. The installer, contractor and the AHJ would gain from this revised section as the rules are centrally located in one Code section. If network-powered broadband communications cables are installed properly then the removal of network-powered broadband communications cables should be no problem if it is not needed anymore or abandoned. The proposed FPN will provide useful guidance and information to everyone involved regarding correct installation practices which would facilitate the removal of the cable as well.

Similar proposals have been submitted for 640.6, 725.8, 760.8, 770.24, 800.24, and 820.24.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the incorporation of the term "listed". See panel action on Proposal 16-372.

The panel accepts in principle the part of the proposal that recommends relocating requirements for abandoned cable. See panel action on Proposal 16-361 for the correct text.

The panel does not accept the breaking up of 830.24 and the changes to the FPN.

Panel Statement: See panel action on Proposal 16-372.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 10 Negative: 4 Abstain: 1

Explanation of Negative:

BRUNSSEN, J.: See my explanation of negative vote on Proposal 16-43.

DORNA, G.: See my explanation of negative vote on Proposal 16-45.

OHDE, H.: This proposal should have been accepted in part. The FPN located after 830.24(C) is not required as this Standard is very basic and really does not provide enough information that is applicable to the removal of abandoned cables.

PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

Explanation of Abstention:

KAHN, S.: Though I agree with the proposal and the submitter's intent to introduce consistency, the material is used in plenums and other air handling spaces and the proposal should be subjected to the direction given by the Standards Council relative to such proposals and rejected. The directive of the Standards Council, as interpreted, must be applied consistently.

16-375 Log #2277 NEC-P16 **Final Action: Reject**
(830.24, FPN)

Submitter: H. Brooke Stauffer, National Electrical Contractors Assn. (NECA)
Recommendation: Update the publication date of the referenced standard as follows:

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling, and other ANSI-approved installation standards.

Substantiation: ANSI/NECA/BISCI 568-2001 is currently being revised, and the 2008 NEC should reference the latest edition.

ANSI/NECA/BICSI 568-2006 will be completed prior to the Public Comment deadline.

Panel Meeting Action: Reject
Panel Statement: The panel cannot act on ANSI/NECA/BICSI 568-2006, as it has not yet been issued.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-376 Log #2335 NEC-P16 **Final Action: Accept in Principle**
(830.24, FPN)

Submitter: James W. Romlein, MV Labs LLC / Rep. TIA
Recommendation: Add an FPN to read:

FPN: Accepted industry practices are described in:

ANSI/TIA/EIA-568-B.1 2004 - Part 1 General Requirements Commercial Building Telecommunications Cabling Standard, ANSI/TIA-569-B 2004 - Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA-570-B - Residential Telecommunications Infrastructure.

(List Other Documents Here) and other ANSI-approved installation standards.

Substantiation: TIA standards contain the source specifications that drive the performance-related industry practices. These TIA documents have a long history of demonstrated successful guidance to the installation, inspection, and network ownership communities. TIA wiring standards have been recognized by the Federal Communications Commission since before 2000 as the appropriate industry standards to be used for new and revised wiring, and are encouraged to be called out in building codes. (See, "Third Report and Order" in CC Docket No. 88-57 (FCC 99-405) (2000), released January 10, 2000, and 47 CFR section 68.213(c) of the FCC Rules.)

Panel Meeting Action: Accept in Principle

Change FPN to read as follows:

FPN: Accepted industry practices are described in ANSI/NECA/BICSI 568–2001, Standard for Installing Commercial Building Telecommunications Cabling; ANSI/TIA/EIA-568-B.1 2004 - Part 1 General Requirements Commercial Building Telecommunications Cabling Standard; ANSI/TIA-569-B 2004 - Commercial Building Standard for Telecommunications Pathways and Spaces; ANSI/TIA-570-B - Residential Telecommunications Infrastructure, and other ANSI-approved installation standards.

Panel Statement: The panel combined the submitter's FPN with the existing text.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:

PREZIOSO, L.: The proposal adds a Fine Print Note (FPN) identifying an ANSI/NECA/BICSI Standard as the source for identifying accepted industry practices. While FPNs are not enforceable, referencing these standards in a FPN as a means for determining the acceptable industry standard is, at best, misleading. I fully support these standards, but on many projects these standards are not incorporated as requirements into the design or the construction of the system or the building. The owners and tenants often waive compliance with these standards as a means of reducing costs. In this situation, the installation of wires and cables cannot be completed in accordance with the standards, and it is therefore unfair to reference these standards as accepted industry practices. Accordingly, the proposal should be rejected and the FPN should not be added to the NEC.

16-377 Log #1764 NEC-P16 **Final Action: Reject**
(830.24 Exception)

TCC Action: The Technical Correlating Committee notes that neither the panel statement nor the revised statement shown in the affirmative vote are responsive to the submitter's substantiation for the recommendation. The Technical Correlating Committee directs the panel to act on the merits of the recommendation. This action will be considered by the Panel as a Public Comment.

Submitter: Percy E. Pool, Verizon NS
Recommendation: Add the following exception to 830.24:

"Exception: 300.11(C) shall not apply."

Substantiation: 300.11(C) is clearly not applicable to network-powered broadband communications cabling. Network-powered broadband communications cables are typically lashed together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. Network-powered broadband communications cables are physically smaller, lighter and carry less voltage and current than power cables. It is overly restrictive to prohibit lashing of network-powered broadband communications cables together to form a cable assembly. Network-powered broadband communications cables secured in this manner have adequate support (see 300.11(A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.

Panel Meeting Action: Reject
Panel Statement: The requirements of 300.11(C) are applicable to optical fiber cables.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 13 Negative: 2
Explanation of Negative:

BRUNSSEN, J.: This proposal should be accepted. If the Panel continues to support the addition of the requirements of 300.11 to 830.24, then at the very least, the requirements of 300.11(C) should be waived. Section 300.11(C) is clearly not applicable to network-powered broadband communications cables. Installation practice is to lash network-powered broadband communications cables together to form a "cable assembly". This frequently occurs during modifications or additions to an existing installation. Network-powered broadband communications cables are physically smaller and lighter than power cables and contain limited power. Application of 300.11(C) is overly restrictive and will preclude lashing of network-powered broadband communications cables together to form a cable assembly. Network-powered broadband communications cables secured in this manner have adequate support (see 300.11 (A)), are supported independently of the suspended ceiling grid, and are not likely to collapse in the event the suspended ceiling collapses. Such restriction imposes additional installation costs with no improvement in safety.

JOHNSON, S.: I agree with the submitter's points in his proposal. There is no safety issue that should preclude the long-standing practice of lashing an additional network-powered broadband communications cable to an existing bundle that is already installed and supported properly where it is owned by the same entity. These cables are lightweight, and carry much less voltage and current than power cables. No evidence has been shown that this practice has not been used safely and successfully in the past and should not continue to be allowed. I vote against the Panel's action to reject.

Comment on Affirmative:

JENSEN, R.: The panel statement should read:

The requirements of 300.11 are applicable to network-powered broadband communications cables.

This appears as though it was copied from another panel statement regarding optical fiber.

STENE, S.: The panel statement should be revised to state "The requirements of 300.11(C) are applicable to ~~optical fiber cables~~ network-powered broadband cables ."

16-378 Log #57 NEC-P16 **Final Action: Accept in Principle**
(830.25 (New), 830.26 (New) & 830.3(A))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: **830.25. Abandoned Cables.** The accessible portion of abandoned network-powered broadband cables shall be removed.

FPN: See Article 100 for a definition of "accessible"

830.26 Spread of Fire or Products of Combustion. Installations of network-powered broadband cables in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of network-powered broadband cables through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

FPN: See Article 100 for the definition of "approved".

~~**830.3(A) Spread of Fire or Products of Combustion.** Section 300.21 shall apply. The accessible portion of abandoned network-powered broadband communications cables shall be removed.~~

Substantiation: The title of Section 830.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 830. It is out of place in section 830.3. This proposal will move it to a new section of Article 830. Rather than refer section 300.21 requirements for the prevention of the spread of fire, it is better to have the requirements in Article 830 which should be familiar to communications installers. The text of proposed section 830.26 is based on section 300.21 but modified to apply to network-powered broadband cables. The fine print notes pointing to definitions are intended to assist installers who are not code experts and may not be aware of Article 100. The fine print note in 300.21 was not copied because does not provide sufficient guidance for a communications cable installer.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-361.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be deleted in its entirety. We agree that the requirements for the removal of abandoned cables are out of place in 820.3(A) and needs to be located in another section within Part 1 –General. There are other proposed proposals with the same intent to locate the abandoned cable requirements that seem better suited and make good enforceable code.
The substantiation provided to delete 820.3(A) which contains the requirements of 300.21 is unclear. The submitter stated the proposed 820.26 is based on the requirements of 300.21 but modified to apply to network-powered broadband cables. There was no substantiation submitted for this change.
In addition, Section 90.1(C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states these FPN's will help installers who are not Code experts. The addition of the FPN following 820.25 referencing Article 100 for the definition of accessible the FPN following 820.26 referencing Article 100 for the definition of approved is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-379 Log #2667 NEC-P16 **Final Action: Accept in Principle**
(830.30)

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Move to a new section:
<u>**830.30 Abandoned Cables.** The accessible portion of abandoned network-powered broadband communications cables shall be removed.</u>
Remove wording in 830.3(A) "The accessible portion of abandoned network-powered broadband communications cables shall be removed."
Substantiation: The title of Section 830.3 is "Other Articles". The requirement for the removal of abandoned cables is not in another article; it is in Article 830. It is out of place in section 830.3. This proposal will move it to a new section of Article 830.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-361.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: We agree with the submitter's intent to locate all abandoned cable requirements to a new section in Part 1- General within the Article. Part 1- General applies to the entire article and therefore would reduce the confusion. We believe that not just the accessible portion of abandoned cables but all abandoned cables be removed to reduce the fuel load.

16-380 Log #2815 NEC-P16 **Final Action: Accept in Principle**
(830.40)

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Randolph J. Ivans, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
830.40 Entrance Cables. Network-powered broadband communications cable located outside and entering buildings shall comply with 830.4(A) <u>, and</u> 830.40(B) <u>and</u> 830.40(C).
Add new paragraph (C) after (B) as follows:
<u>(C) RFT-V Circuits. RFT-V network-powered broadband communications circuits located outside and entering buildings shall be installed using Type BMU, Type BM, or Type BMR network-powered broadband communications medium power cables.</u>
Substantiation: This is part of a set of three proposals intended to harmonize the requirements of UL60950-21 and the NEC Article 830. This proposal is a companion proposal to allow RFT-V circuits in 830.15. The voltage limitations in 830.15 do not include some common communication industry practices for powering broadband communications equipment not under the exclusive control of the communications utility.
This proposal is intended to allow the use of Type BMU, Type BM, or Type BMR cables for RFT-V circuits as described in the proposal to allow RFT-V circuits in 830.15. These cables are presently allowed for medium power network-powered broadband communications circuits in 830.40(A). As insulation for the individual conductors of Type BMU, Type BM, and Type BMR Cables are required to be rated for 300 volts minimum, these cables are suitable for the RFT-V circuits.
UL60950-21, Standard for Safety for Information Technology Equipment - Safety - Part 21: Remote Power Feeding, is the ANSI standard that applies to communications systems intended to supply and receive power over the communications network.
An RFT circuit or "Remote Feeding Telecommunication" circuit is a secondary circuit intended to supply or receive d.c. power via a telecommunication network. An RFT-V circuit is an RFT circuit that is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited.
The RFT-V circuits have more stringent power limitations than the medium-power circuit. An RFT-V circuit as described in UL60950-21 is so designed and protected that under normal operating conditions the voltages are limited between each conductor and ground to 140V dc, or up to 200V dc provided that a monitoring and control device is used that limits the current to earth to 10 mA. Power is limited to a maximum rating of 100VA under normal operation and 150VAmax under fault conditions, which are lower than the limits for medium power circuits. In addition, the output current is limited to a value that would not cause damage to the communications wiring system, typically 1.3 A or less. These limits reflect common industry practices for remote feed applications that are now being employed to power broadband equipment not under the exclusive control of the communications utility.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-369.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRUNSSEN, J.: The Panel Action should be "Reject". The Panel accepted Proposal 16-369 that classifies RFT-V circuits as medium-power circuits. Therefore, it is not necessary to provide additional cable requirements for RFT-V circuits; they are already medium-power circuits and use the same cable types as other medium-power network-powered broadband communications circuits. Therefore, NFPA staff should not add any additional text to 830.40 based on this proposal.

16-381 Log #1879 NEC-P16 **Final Action: Accept in Principle**
(830.40(C) (New))

TCC Action: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc.
Recommendation: Add new (C) after the Exception in 830.40 **Entrance Cables** as follows.
<u>(C) RFT-V Circuits. RFT-V network-powered broadband communications circuits located outside and entering buildings shall be installed using Type BMU, Type BM, or Type BMR network-powered broadband communications medium power cables</u> .
Substantiation: CSA/UL6950-21 (first edition, 2003), Standard for Safety for Information Technology Equipment – Safety – Part 21: Remote Power Feeding, is the ANSI standard that applies to communications systems intended to supply and receive power over the communications network. This is part of a set of several proposals intended to harmonize the requirements of UL6950-21 and the NEC Article 830.
The RTF-V circuit specified in the CSA/UL document permits voltages up to 200V dc between each conductor and ground with monitoring and control devices that limit the current to ground to 10 mA. The RFT-V is power-limited to 100 W rated power (150 VAmax). Rationale and background for the provisions of CSA/UL 60950-21 can be found in the Annex A to the standard.
This proposal is intended to allow the use of Type BMU, Type BM, or Type BMR cables for RFT-V circuits. These cables are presently allowed for medium power network-powered broadband communications circuits in 830.40(A). The RFT-V circuits have more stringent power limitations than the medium-power circuit. As insulation for the individual conductors of Type BMU, Type BM, and Type BMR Cables is required to be rated for 300 volts minimum, these cables are suitable for the RFT-V circuits. This proposal is a companion proposal to allow RFT-V circuits in 830-15.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-369.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRUNSSEN, J.: The Panel Action should be "Reject". The Panel accepted Proposal 16-369 that classifies RFT-V circuits as medium-power circuits. Therefore, it is not necessary to provide additional cable requirements for RFT-V circuits; they are already medium-power circuits and use the same cable types as other medium-power network-powered broadband communications circuits. Therefore, NFPA staff should not add any additional text to 830.40 based on this proposal.

16-382 Log #790 NEC-P16 **Final Action: Accept in Principle**
(830.47)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add the sentence as shown:
830.47. Underground Circuits Entering Building. Underground network-powered broadband communications cables entering buildings shall comply with 830.47(A) through 830.47(D).
Change the title of (A) as follows:
(A) ~~Underground Systems.~~ With Electric Light and Power Conductors.
Substantiation: This proposal is editorial and technical. (Task Group No. 830-08)
It proposes wording parallel to that in Article 800 and properly describes the requirements of the Section and the title change also parallels that of Article 800 and is more descriptive of the paragraph.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Principle
Accept the submitter's proposal with the following revisions:
In the title of 830.47, make "Building" plural as in 2005 NEC text.
In proposed new title of 830.47(A), delete the period following "Systems".
Panel Statement: These changes reflect the 2005 NEC existing text and provide a correction to punctuation.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-383 Log #2668 NEC-P16 **Final Action: Reject**
(830.90(A))

Submitter: Robert W. Jensen, dbi / Rep. BICSI, A Telecommunications Association
Recommendation: Add new text to read:
(A) Application. Primary electrical protection shall be provided on all aerial network-powered broadband communications conductors. Primary electrical protection shall be provided on all underground network-powered broadband communications conductors that are neither grounded nor interrupted and are exposed to lightning or accidental contact with electric light or power conductors operating at over 300 volts to ground.
Substantiation: This proposal simplifies and clarifies the requirement for protection of network powered broadband circuits.
Panel Meeting Action: Reject
Panel Statement: The submitter proposes to "add new text to read" when in actuality it appears that he intends to replace the existing text of 830.90(A). The submitter has not simplified, but has eliminated requirements! The proposed revision would require primary protection to be applied at all installations, irrespective of exposure considerations, i.e., contained within a block. There continues to exist today many urban communities and neighborhoods where dwellings are served from underground communications plant that is contained within a block, circuits are unexposed to possible contact with power, and lightning exposure is minimal. Primary protection is unnecessary and will not result in improved safety.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-384 Log #791 NEC-P16 **Final Action: Accept**
(830.90(C))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the change as shown:
(C) Hazardous (Classified) Locations. The primary protector or equipment providing the primary protection function shall not be located in any hazardous (classified) location as defined in ~~Article 500~~ 500.5 or in the vicinity of easily ignitable material.
Exception: As permitted in 501.150, 502.150 , and 503.150.
Substantiation: This is an editorial proposal. (Task Group No. 830-09)
The definitions of hazardous locations are in 500.5
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-385 Log #906 NEC-P16 **Final Action: Accept in Principle**
(830.90(C))

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Change "Article 500" to "500.5".
Substantiation: Edit. To conform to Style Manual requirements.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-384.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-386 Log #793 NEC-P16 **Final Action: Reject**
(830.93)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Revise the title of 830.93 as follows:
830.93 Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables Entering Buildings . The shields of network-powered broadband communications cables …….
Substantiation: This is an editorial proposal. (Task Group No.)
It will provide consistency between 770.93, 800.93, 820.93 and 830.93. This is a companion proposal to 770.93, 800.93 and 820.93.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Reject
Panel Statement: Changing the title of the section is inappropriate, as the cable may not actually enter the building.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-387 Log #1309 NEC-P16 **Final Action: Accept in Principle**
(830.93)

Submitter: Steven C. Johnson, Time Warner Cable / Rep. National Cable Telecommunications Association
Recommendation: Revise as follows:
830.93 Grounding of Outer Conductive Shield of a Coaxial Cable. For purposes of this section, grounding or interruption of network-powered broadband communications cable metallic members installed at mobile home service equipment located ~~in sight from, and not more~~ within 9.0 m (30 ft) ~~from~~ of the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with 250.32 and located ~~in sight from, and not more~~ within 9.0 m (30 ft) ~~from~~ of the exterior wall of the mobile home it serves shall be considered to meet the requirements of this section.
Substantiation: Improves clarity. The existing, double-negative wording is difficult to interpret. This editorial change makes the text easier to interpret and clarifies the requirements.
For purposes of grounding or bonding network-powered broadband communications cables, being able to see the power disconnection point is immaterial. Whereas "in sight from" may be critical for disconnecting power in an emergency, maintaining a reasonable length grounding conductor is the key in a network-powered broadband communications application. This proposal does not affect service equipment placement requirements. It only clarifies where the network-powered broadband communications grounding will be done based on where the service equipment is already placed.
Panel Meeting Action: Accept in Principle
The panel accepts the submitter's proposal with the following revisions:
Change the title to read as follows:
Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables.
Panel Statement: The panel has corrected the title.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-388 Log #792 NEC-P16 **Final Action: Accept**
(830.93, FPN (New))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Add a Fine Print Note Number 1 (FPN No 1) to 830.93 as follows:
FPN No. 1: See 830.2 for the definition of *point of entrance* .
Renumber the existing FPN as "FPN No. 2".
Substantiation: This proposal is editorial. (Task Group No. 830-10)
Its addition will provide consistency between 770.93, 800.93, 820.93 and 830.93. This is a companion proposal to 770.93 and 820.93.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
OHDE, H.: This proposal should be rejected. Section 90.1(C) of the NEC states " *This Code is not intended as a design specification or an instruction manual for the untrained persons* ." In the submitter's substantiation he states this FPN will help installers who are not Code experts. The addition of the FPN referencing 830.2 for the definition of point of entrance is not needed nor warranted. A trained installer will know the Code content and how the Code book is to be used.

16-389 Log #3511 NEC-P16 **Final Action: Reject**
(830.100)

Submitter: Paul Dobrowsky, Holley, NY
Recommendation: Revise as Follows:
830.100 Cable, Network Interface Unit, and Primary Protector Grounding. Network interface units containing protectors, NIUs with metallic enclosures, primary protectors, and the metallic members of the network-powered broadband communications cable that are intended to be grounded shall be grounded as specified in 830.100(A) through 830.100(D).
(A) Grounding Electrode Conductor.
(1) Insulation. The grounding electrode conductor shall be insulated and shall be listed as suitable for wet locations ~~the purpose~~ .
(2) Material. The grounding electrode conductor shall be copper or other corrosion-resistant conductive material, stranded or solid.
(3) Size. The grounding electrode conductor shall not be smaller than 14 AWG and shall have a current-carrying capacity approximately equal to that of the grounded metallic member(s) and protected conductor(s) of the network-powered broadband communications cable. The grounding electrode conductor shall not be required to exceed 6 AWG.
(4) Length. The grounding electrode conductor shall be as short as practicable. In one-family and multifamily dwellings, the grounding electrode conductor shall be as short as permissible, not to exceed 6.0 m (20 ft) in length.
FPN: Similar grounding electrode conductor length limitations applied at apartment buildings and commercial buildings will help to reduce voltages that may be developed between the building's power and communications systems during lightning events.
Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum grounding electrode conductor length of 6.0 m (20 ft), a separate communications ground rod meeting the minimum dimensional criteria of 830.100(B)(2)(2) shall be driven, and the grounding electrode conductor shall be connected to the communications ground rod in accordance with 830.100(C). The communications ground rod shall be bonded to the power grounding electrode system in accordance with 830.100(D).
(5) Run in Straight Line. The grounding electrode conductor shall be run to the grounding electrode in as straight a line as practicable.
(6) Physical Protection. Where subject to physical damage, the grounding electrode conductor shall be adequately protected. Where the grounding electrode conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding electrode conductor or the same terminal or electrode to which the grounding electrode conductor is connected.
(B) Electrode. The grounding electrode conductor shall be connected as follows.
(1) In Buildings or Structures with Grounding Means. To the nearest accessible location on the following:
(1) The building or structure grounding electrode system as covered in 250.50
(2) The grounded interior metal water piping system, within 1.5 m (5 ft) from its point of entrance to the building, as covered in 250.52
(3) The power service accessible means external to enclosures as covered in 250.94
(4) The metallic power service raceway
(5) The service equipment enclosure
(6) The service, system, building or structure grounding electrode conductor or the grounding electrode metal enclosure, or
(7) The grounding electrode conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in 250.32
For purposes of this section, the mobile home service equipment or the mobile home disconnecting means, as described in 830.93, shall be considered accessible.
(2) In Buildings or Structures Without Grounding Means. If the building or structure served has no grounding means, as described in (B)(1), the grounding conductor shall be connected to either of the following:
(1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)
(2) If the building or structure served has no grounding means, as described in 830.100(B)(1) or (B)(2)(1), to an effectively grounded metal structure or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (½ in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or lightning-rod conductors shall not be employed as electrodes for protectors, NIUs with integral protection, grounded metallic members, NIUs with metallic enclosures, and other equipment.
(C) Electrode Connection. Connections to grounding electrodes shall comply with 250.70.
(D) Bonding of Electrodes. A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the network-powered broadband communications system grounding electrode and the power grounding electrode system at the building or structure served where separate electrodes are used.
Exception: At mobile homes as covered in 830.106.
FPN No. 1: See 250.60 for use of lightning rods.
FPN No. 2: Bonding together of all separate electrodes limits potential differences between them and between their associated wiring systems.
Substantiation: The concept of listed for the purpose needs to be explained. If being suitable for a wet location is not the intent, then please describe what is.
The term grounding conductor should be replaced with grounding electrode conductor. A proposal was submitted to Article 100 to modify the existing definition of grounding electrode and to delete the term grounding conductor. to clarify this issue. The Term Grounding conductor is sometimes used to describe a connection to the earth and other times to describe any of the different types of conductors that use the term "grounding". Separate grounding electrodes are already required to be bonded together by 250.50.
Describing what listed for the purpose will improve usablity.
Panel Meeting Action: Reject
Panel Statement: The term "grounding electrode conductor" specifically applies to the conductor that connects the grounding electrode(s) to the equipment grounding conductor or to the grounded conductor, or both, at the electric service to the building. The conductor connecting the metallic members of the cable sheath and the primary protector grounding terminal to the building grounding means is not a "grounding electrode conductor", but a "grounding conductor" as determined by the TCC Grounding & Bonding Task Group.
The listing of a grounding electrode conductor does not include a special investigation for a wet location.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-390 Log #849 NEC-P16 **Final Action: Accept**
(830.100(A))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
830.100 Cable, Network Interface Unit, and Primary Protector Grounding.
Network interface units containing protectors, NIUs with metallic enclosures, primary protectors, and the metallic members of the network-powered broadband communications cable that are intended to be grounded shall be grounded as specified in 830.100(A) through 830.100(D).
(A) Grounding Conductor
(1) Insulation. The grounding conductor shall be insulated and shall be listed. ~~as suitable for the purpose.~~
Substantiation: Listed insulated conductors are currently being used for this purpose and there doesn't appear to be insulated conductors listed specifically for the purpose of accomplishing the grounding required by this section.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-391 Log #845 NEC-P16 **Final Action: Reject**
(830.100(A)(1))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
830.100 Cable, Network Interface Unit, and Primary Protector Grounding.
Network interface units containing protectors, NIUs with metallic enclosures, primary protectors, and the metallic members of the network-powered broadband communications cable that are intended to be grounded shall be grounded as specified in 830.100(A) through 830.100(D).
(A) Grounding Conductor
(1) Insulation. The grounding conductor shall be insulated and shall be listed and marked as a grounding protector wire. ~~as suitable for the purpose.~~
Substantiation: Under the category KDER and the UL White Book, Protector Grounding wires are addressed. The guide card information indicates that this wire is required to be marked with the manufacturer's name, size, and the words "protector grounding wire". In step with the directives to address the term listed or listed as suitable for the purpose, this proposal is an effort to be more specific in the rule to require a conductor specifically listed and marked for this purpose.
Panel Meeting Action: Reject
Panel Statement: There is nothing special about the conductor used to ground the protector. The communications industry has used listed wire to ground the protector universally and safely for many years. There is no need to specifically mark this conductor "as a grounding protector wire". Such marking may lead to confusion and misinterpretation. The submitter has demonstrated no safety issue with the present practice.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-392 Log #377 NEC-P16 **Final Action: Reject**
(830.100(A)(6))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:
" ~~Physical~~ Protection. Where subject to ~~physical~~ damage, the grounding conductor shall be adequately protected...".
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion." I also leave it to you whether to update "adequately" to something like "by a means acceptable to the AHJ.")
Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: The grounding conductor is potentially subject to multiple sources of damage: electrical, physical, and environmental. The word "physical" is necessary to specifically identify the type of damage that the section is addressing.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-393 Log #860 NEC-P16 **Final Action: Accept**
(830.100(A)(6))

Submitter: Michael J. Johnston, Plano, TX
Recommendation: Revise text to read as follows:
(6) Physical Protection. The grounding conductor shall be protected where exposed to physical damage. ~~Where subject to physical damage, the grounding conductor shall be adequately protected.~~ Where the grounding conductor is run in a metal raceway, both ends of the raceway shall be bonded to the grounding conductor or the same terminal or electrode to which the grounding conductor is connected.
Substantiation: Adequately is subjective in this requirement and can lead to inconsistencies. The word "adequate" is a word that is identified by the Style Manual as one to avoid in Code rules for that reason.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-394 Log #794 NEC-P16 **Final Action: Accept in Principle**
(830.100(B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. The Panel Action text addresses the change in 830.110(B), rather than the correct section of 830.100(B). This action will be considered by the Panel as a Public Comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the following changes:
(B) Electrode. The grounding conductor shall be connected in accordance with 830.100(B)(1) and (B)(2).
Substantiation: This is an editorial proposal. (Task Group No.)
P rovides consistency with the Style Manual requirements and provide parallel structure with 820.100(B).
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept in Principle
Chan ge 830.110(B) to read as follows:
(B) Electrode. The grounding conductor shall be connected in accordance with 830.100(B)(1) and (B)(2).
Panel Statement: The panel revised the submitter's text for clarity.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-395 Log #1887 NEC-P16 **Final Action: Accept**
(830.100(B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with respect to the use of the word "and" in the sentence "The grounding conductor shall be connected in accordance with 830.100(B)(1), (B)(2), and (B)(3)."
It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-20.
This action will be considered by the Panel as a Public Comment.
Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions
Recommendation: Revise 830.100(B) **Cable and Primary Protector Grounding (Electrode)** as follows:
(B) Electrode. The grounding conductor shall be connected ~~as follows~~ in accordance with 830.100(B)(1), (B)(2) and (B)(3).
(1) In Buildings or Structures with an Intersystem Grounding Termination. If the building or structure served has an intersystem grounding termination the grounding conductor shall be connected to the intersystem grounding termination.
~~(1)~~ (2) In Buildings or Structures with Grounding Means. If the building or structure served has no intersystem grounding termination, the grounding conductor shall be connected to the nearest accessible location on the following:
....
.................Retain existing list and text.
....
~~(2)~~ (3) In Buildings or Structures Without Intersystem Grounding Termination or Grounding Means. If the building or structure served has no intersystem grounding termination or grounding means ~~,~~ as described in 830.100(B)(~~1~~ 2), the grounding conductor shall be connected to either of the following:.
. (1) To any one of the individual electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)
(2) If the building or structure served has no intersystem grounding termination or grounding means, as described in 830.100(B)(~~1~~ 2) or (B)(~~2~~ 3)(1), to an effectively grounded metal structure or to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or lightning-rod conductors shall not be employed as electrodes for protectors, NIUs with integral protection, grounded metallic members, NIUs with metallic enclosures, and other equipment.
Substantiation: This is one of several correlated proposals (100 Definitions, 250.95, Chapter 8 Articles) to improve the requirements related to intersystem bonding and grounding of communication systems. The intent is to create a dedicated and well-defined location for terminating the grounding conductors

required in Chapter 8 Articles and 770.93. These grounding conductors also provide between communication and power systems (intersystem bonding). The proposed termination would have sufficient capacity to handle multiple communication systems (telecom, satellite, CATV) on premises. The proposed revision makes the intersystem bonding terminal the preferred destination for grounding conductor in Article 830. See the figures I have provided.

Intersystem bonding accomplished by connection of a communication grounding conductor to the power system is an important safety measure to prevent occurrences of voltages between communication system and power system. However, the existing requirements are not adequate. Bonding is becoming difficult to implement due to changes in building construction practices such as increased prevalence of flush construction and use of PVC conduits. Frequently, in new construction, the grounding electrode, the raceway and the grounding electrode conductor are hidden behind walls and not accessible for bonding connection.

Even in older construction with accessible equipment, the requirement for installation of intersystem bonding connection is subject to varying interpretation because there is not a clearly defined dedicated bonding location. The connection to the power system is sometimes haphazard. Installers are sometimes confused over where the connection should be made especially if multiple Communication Systems are present on premises.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-396 Log #1994 NEC-P16 **Final Action: Accept in Principle**

(830.100(B))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal based on the affirmative comment. This action will be considered by the Panel as a Public Comment.

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute-Electric Light & Power Group

Recommendation: Add these two sentences after the last sentence of 830.100(B):

<u>A device intended to provide a termination point for the grounding conductor (inter-system bonding) shall be prohibited from use when the installation of such device interferes with opening a service or metering equipment enclosure. An inter-system bonding device shall not be installed on an enclosure cover.</u>

Substantiation: Poor grounding practices by installers of CATV, telephone, satellite and other communication systems using termination devices that clamp to enclosure covers have resulted in interruption of grounding continuity. This is a companion proposal to proposals to add this requirement to 800.100(B), 810.21(F), and 820.100(B).

Panel Meeting Action: Accept in Principle

Add the following after the last sentence of 830.100(B):

A device intended to provide a termination point for the grounding conductor shall not interfere with the opening of an equipment enclosure. A bonding device shall be mounted on non-removable parts. A bonding device shall not be mounted on a door or cover even if the door or cover is non-removable.

Panel Statement: The panel accepts the intent of the submitter and has reworded the text for clarity. It is requested that the TCC forward to Panel 5 for take similar action as applicable.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

Comment on Affirmative:

BRUNSSEN, J.: The submitter's text, as modified by the Panel, should be placed following the existing text of 830.100(B)(5) rather than at the end of 830.100(B). Section 830.100(B)(5) specifically addresses connection to the service equipment enclosure and that is the issue that the submitter intended to address.

16-397 Log #1553 NEC-P16 **Final Action: Accept**

(830.100(B)(2)(2))

Submitter: Technical Correlating Committee on National Electrical Code®,

Recommendation: Delete the term "effectively" from the terms "effectively grounded" and "effectively bonded" from Articles 830 and revise text as shown for the affected NEC sections.

830.100(B)(2)(2):

(2) If the building or structure served has no grounding means, as described in 830.100(B)(1) or (B)(2)(1), ~~to an effectively grounded metal structure o~~ r <u>to any one of the individual electrodes described in 250.52 (A)(6), and (A)(7) or</u> to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (1/2 in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in 800.53 and at least 1.8 m (6 ft) from electrodes of other systems. Steam or hot water pipes or lightning-rod conductors shall not be employed as electrodes for protectors, NIUs with integral protection, grounded metallic members, NIUs with metallic enclosures, and other equipment.

Substantiation: 830.100(B)(2)(2): Here the reference to "effectively grounded metal structure" seems superfluous.

The definition of "effectively grounded" is ambiguous and very subjective without any defined values or parameters for one to judge as either "effective" or "ineffective."

This is the result of the TCC Task Group on Grounding and Bonding in resolve of the 2005 NEC cycle actions related to Proposal 5-1 and Comment 5-1 as directed by the Technical Correlating Committee. This is a companion proposal to delete the term "grounded, effectively" and its definition from Article 100 and other companion proposals throughout the NEC relative to this Task Group's recommendations. The substantiation of this proposal is as follows.

The term "Effectively Grounded" is used 29 times in the NEC. It appears as though in the majority of the locations where it is used, the word "grounded" or phrase "connected to an equipment grounding conductor" could be used. Other proposals are submitted to make those changes.

The 1996 NEC in Section 250.51 used the term "effective grounding path," and those concepts were incorporated in 250.2 (1999 NEC) and then expanded in 250.4(A) and (B) in the 2002 NEC. The performance criteria of grounding and bonding are currently provided in Section 250.4 and include the concepts contained in the vague definition of the term "effectively grounded."

The definition "Effectively Grounded" is very subjective and without any defined values or parameters for one to judge grounding as either "effective" or "ineffective." "Effective" is described in Section 250.4(A) and (B), but it relates to the effective ground-fault current path as a performance criteria. Deleting the term in the NEC and the definition is logical because there are no definitive parameters for Code users to make a determination on what constitutes "effectively grounded." Systems are solidly grounded, grounded through a resistor or impedance, or ungrounded. Equipment (normally noncurrent-carrying metal parts are grounded where connected to an equipment grounding conductor.

This proposal is to change the term "Effectively Bonded" to just "Bonded" in each of the section where it is used. The term "Effectively Bonded" is currently not defined in the NEC.

The term "effectively bonded" is also used a few times in the NEC and is undefined. The same situation exists. There are no defined parameters for Code users to judges what the difference between "Effectively Bonded" and "Bonded" really is. Where the term appears in the NEC, it is revised to just "bonded" and still has the same meaning in each rule.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-398 Log #1073 NEC-P16 **Final Action: Reject**

(830.100(D))

Submitter: Daniel Leaf, Seneca, SC

Recommendation: Revise text to read as follows:

A <u>copper</u> bonding jumper not smaller than 6 AWG ~~copper~~ or equivalent...". (remainder unchanged)

Substantiation: Edit. The intent appears to require copper, however, the wording permits aluminum if not smaller than 6 AWG copper.

Panel Meeting Action: Reject

Panel Statement: The present text is clear. The bonding jumper can be "… not smaller than 6 AWG copper or equivalent …". An equivalent conductor is one with at least the same ampacity and corrosion-resistance capability and could be of different material and/or larger in size (AWG). The Panel notes that the submitter did not see the necessity to revise "equivalent" in his proposals on similar requirements in 820.100(A)(3) and 830.100(D).

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-399 Log #795 NEC-P16 **Final Action: Accept**

(830.100(D), FPN 1)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.

Recommendation: Make the following change:

FPN No. 1: See 250.60 for use of <u>air terminals (</u> lightning rods <u>)</u> .

Substantiation: This is an editorial proposal. (Task Group No. 830-13)

It makes this section consistent with articles 800 and 820.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.**Panel Meeting Action: Accept**

Number Eligible to Vote: 15

Ballot Results: Affirmative: 15

16-400 Log #796 NEC-P16 **Final Action: Accept**
(830.106)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change title as shown:
830.106 ~~Bonding and~~ Grounding and Bonding at Mobile Homes.
Substantiation: This proposal is editorial. (Task Group No. 830-14)
It provides uniformity with the similar title in Section 800.106.
Note: A similar change is proposed to Section 820.106.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-401 Log #1314 NEC-P16 **Final Action: Accept in Principle**
(830.106(A))

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal by determining whether an "and" should be used or an "or" should be used in the accepted text as follows: "shall comply with 830.106(A)(1) and (A)(2)" or "shall comply with 830.106(A)(1) or (A)(2)". The Technical Correlating Committee also directs that consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
Submitter: Steven C. Johnson, Time Warner Cable / Rep. National Cable Telecommunications Association
Recommendation: Revise as follows:
(A) Grounding. Grounding shall comply with (1) and (2).
(1) Where there is no mobile home service equipment located ~~in sight from, and not more~~ within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, the network-powered broadband communications cable network interface unit, and primary protector ground shall be installed in accordance with 830.100(B)(2).
(2) Where ~~or~~ there is no mobile home disconnecting means grounded in accordance with 250.32 and located ~~within sight from, and not more~~ within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, the network-powered broadband communications cable, network interface unit, and primary protector ground shall be installed in accordance with 830.100(B)(2).
Substantiation: Improves clarity. The existing, double-negative wording is difficult to interpret. This editorial change makes the text easier to interpret and clarifies the requirements.
For purposes of grounding or bonding network-powered broadband communications cables, being able to see the power disconnection point is immaterial. Whereas "in sight from" may be critical for disconnecting power in an emergency, maintaining a reasonable length grounding conductor is the key in a network-powered broadband communications application. This proposal does not affect service equipment placement requirements. It only clarifies where the network-powered broadband communications grounding will be done based on where the service equipment is already placed.
Panel Meeting Action: Accept in Principle
Revise the submitter's text as follows:
(A) Grounding. Grounding shall comply with 830.106(A)(1) and (A)(2).
(1) Where there is no mobile home service equipment located in sight from, and not more than within 9 m (30 ft) from, the exterior wall of the mobile home it serves, the network-powered broadband communications cable, network interface unit, and primary protector ground shall be installed connected to a grounding conductor in accordance with 830.100(B)(2).
(2) Where there is no mobile home disconnecting means grounded in accordance with 250.32 and located within sight from, and not more than 9 m (30 ft) from, the exterior wall of the mobile home it serves, the network-powered broadband communications cable, network interface unit, and primary protector ground shall be installed connected to a grounding conductor in accordance with 830.100(B)(2).
Panel Statement: The changes made by the panel provide conformity to Section 4.2.1 of the NEC Style Manual in referencing sections of the NEC, incorporate revisions made to similar section 820.106(A) by the TCC Grounding and Bonding Task Group (see panel action on Proposal 16-4, 820.106(A)), and provide editorial consistency across Articles 800, 820, and 830.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
BRUNSSEN, J.: There are a number of typographical errors in the revised text as provided by the Panel. Revise the Panel's revised text under "Panel Meeting Action" as follows:
" **(A) Grounding.** Grounding shall comply with 830.106(A)(1) and (A)(2).
(1) Where there is no mobile home service equipment located ~~in sight from, and not more than~~ within 9.0 m (30 ft) from ~~,~~ the exterior wall of the mobile home it serves, the network-powered broadband communications cable, network interface unit, and primary protector ground shall be ~~installed~~ connected to a grounding conductor in accordance with 830.100(B)(2).
(2) Where there is no mobile home disconnecting means grounded in accordance with 250.32 and located within ~~sight from, and not more than~~ 9.0 m (30 ft) from ~~,~~ the exterior wall of the mobile home it serves, the network-powered broadband communications cable, network interface unit, and primary protector ground shall be ~~installed~~ connected to a grounding conductor in accordance with 830.100(B)(2)."

16-402 Log #58 NEC-P16 **Final Action: Accept**
(830.110 (New))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Add a new section 830.110 in Part V.
830.110 Raceways For Low And Medium Power Network-Powered Broadband Communications Cables. Where low and medium power network-powered broadband communications cables are installed in a raceway, the raceway shall be of a type permitted in Chapter 3 and installed in accordance with Chapter 3.
Exception: Conduit fill restrictions shall not apply to low power network-powered broadband communications cables.
Substantiation: This is a corollary proposal to proposals being submitted for Articles770, 800 and 820. Articles 800 and 820 have a section 110. Adding this section provides parallelism between the articles.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-403 Log #797 NEC-P16 **Final Action: Accept**
(830.133)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Delete Section 830.133 (C), renumber 830.133 (D) as 830.133(C).
Substantiation: This is an editorial proposal. (Task Group No. 830-15)
It places the text concerning "cable substitutions" in a similar section as articles 770, 800 and 820, promoting usability of the Code. Section 830.133© has been moved to 830.154 in another proposal.
This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:
1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.
The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-404 Log #985 NEC-P16 **Final Action: Reject**
(830, Part V)

Submitter: Daniel Leaf, Seneca, SC
Recommendation: Add:
"...or Structures" to the heading.
Substantiation: Edit. Structures which may not be deemed buildings should be included, as in (B)(1) and (B)(2) of this section.
Panel Meeting Action: Reject
Panel Statement: The requirements of Section V. apply only to buildings.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-405 Log #784 NEC-P16 **Final Action: Accept**
(830 Part V)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change title:
From V. Wiring Methods Within Buildings
To V. Installation Methods Within Buildings
Substantiation: This proposal is editorial. (Task Group No. 830-01)
The sections included under V. include more than cables and the recommended change is more descriptive. This title is consistent with similar recommendations for Articles 770, 800 and 820.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-406 Log #2632 NEC-P16 **Final Action: Reject**
(830.133(A) Exception (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add a new exception to 830.133(A) to read as follows:
<u>Exception: Where all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the Network-Powered Broadband Communication cables by a permanent barrier or listed divider.</u>
Substantiation: This is a new exception for 830.133(A) that would allow a Network-Powered Broadband Communication cable to share the same raceway, outlet box, or enclosure as long as a barrier was in place. This language is similar to the language found in 800.133(A)(1)(c) Exception No. 1. Network-Powered Broadband Communication cable can become energized if it comes in contact with electrical conductors. This proposal defines the barrier as a permanent function of the enclosure or that it may be a removable field installed listed divider. These barriers are used to divide the coaxial cable from the power circuits.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Reject
Panel Statement: Exception No.1 presently meets the submitter's intent.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-407 Log #1286 NEC-P16 **Final Action: Accept**
(830.133(A)(1))

Submitter: Gerald Lee Dorna, Belden CDT. Inc.
Recommendation: Revise text to read:
(1) In Raceways <u>, Cable Trays</u> and Enclosures.
(a) Low and Medium Power Network-Powered Broadband Communications Circuit Cables. Low and medium power network-powered broadband communications cables shall be permitted in the same raceway <u>, cable tray</u> or enclosure.
(b) Low-Power Network-Powered Broadband Communications Circuit Cables. Low-power network-powered broadband communications cables shall be permitted in the same raceway <u>, cable tray</u> or enclosure with jacketed cables of any of the following circuits:
(1) Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
(2) Power-limited fire alarm systems in compliance with Article 760
(3) Communications circuits in compliance with Article 800
(4) Nonconductive and conductive optical fiber cables in compliance with Article 770
(5) Community antenna television and radio distribution systems in compliance with Article 820
(c) Medium Power Network-Powered Broadband Communications Circuit Cables. Medium power network-powered broadband communications cables shall not be permitted in the same raceway <u>, cable tray</u> or enclosure with conductors of any of the following circuits:
(1) Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
(2) Power-limited fire alarm systems in compliance with Article 760
(3) Communications circuits in compliance with Article 800
(4) Conductive optical fiber cables in compliance with Article 770
(5) Community antenna television and radio distribution systems in compliance with Article 820
(d) Electric Light, Power, Class 1, Non–Powered Broadband Communications Circuit Cables. Network-powered broadband communications cable shall not be placed in any raceway, <u>cable tray,</u> compartment, outlet box, junction box, or similar fittings with conductors of electric light, power, Class 1, or non–power-limited fire alarm circuit cables.
Exception No. 1: Where all of the conductors of electric light, power, Class 1, non–power-limited fire alarm circuits are separated from all of the network-powered broadband communications cables by a permanent barrier or listed divider.
Exception No. 2: Power circuit conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to the network-powered broadband communications system distribution equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum 6-mm (0.25-in.) separation from network-powered broadband communications cables.
Substantiation: Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray. Stating that these cables are allowed "in the same cable tray" will avoid having the user assume that they are not permitted to be installed together in the same cable tray. It clarifies the use in the Code. Article 770, in section 770.133(B), has text similar to that proposed here. This is one of five similar proposals that are being submitted for Articles 725, 760, 800, 820 and 830.

Conversely thinking, I therefore also added "cable tray" to 830.133(A)(1)(d).

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
JONES, R.: The submitter is obviously in error with the assertion "Obviously, cables that can be safely installed in the same raceway or enclosure can also be safely installed in the same cable tray." O NLY cABLES LISTED FOR INSTALLATION IN CABLE TRAYS CAN BE INSTALLED IN CABLE TRAYS.

16-408 Log #3434 NEC-P16 **Final Action: Reject**
(830.133(A)(1)d. Exception No. 1)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Recommendation: Delete the phrase "listed divider" at the end; substitute the words "a securely installed barrier identified for the use."
Substantiation: This wording correlates with the changes made by CMP 9 to an equivalent rule in 404.8(B) in response to an equivalent proposal from the same submitter. The problem is that Article 314 does not require conventional steel outlet boxes to be listed, and therefore not all steel box dividers manufactured for this purpose are listed. In addition, none of these barriers (for outlet boxes) are permanently installed; but they certainly can be securely installed, and they certainly meet the provisions of the Article 100 definition of identified, in that they are recognizable as suitable for this purpose. This wording refers to the identical products and should therefore correlate with Article 314 requirements.
Panel Meeting Action: Reject
Panel Statement: This situation is not the same as 404.8(B). Section 404.8(B) deals with the grouping of snap switches with other snap switches and similar devices such as receptacles. The barriers described in 404.8(B) are used to separate these similar devices containing similar circuits.

800. 133(A)(1)c. Exception No. 1;820. 133(A)(1)2. Exception No. 1; and 830.133(A)(1)d. Exception No. 1 deal with the separation of communications, CATV and broadband circuits from electric light, power and Class 1 circuits.

A permanent barrier as currently permitted is okay, as it is a physical part of the metal box or listed plastic box and its suitability can be determined by the AHJ or is covered by the listing. There are concerns associated with a non-permanent barrier or divider that cannot be easily dealt with at the point of installation. For example, compatibility with the box (fit and secureness), compatibility with the installed hardware such as power receptacle materials, ease of installation, clarity of proper installation procedures, affect on wiring space inside the box, and the like, need to be investigated and listed.

These articles do not only cover metal boxes. The proposal would allow non-listed barriers in metal and listed non-metallic boxes, voiding the listing of a non-metallic box.

Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-409 Log #2633 NEC-P16 **Final Action: Reject**
(830.135 (New))

Submitter: David H. Kendall, Carlon
Recommendation: Add a new section to read as follows:
<u>830.135 Network-Powered Broadband Communication Device and Equipment Mounting. Network-Powered Broadband Communication devices or equipment shall be mounted in listed boxes, brackets or assemblies designed for the purpose, and such boxes or assemblies shall be securely fastened in place. Boxes or brackets can be completely enclosed or backless.</u>
<u>(A) Network-Powered Broadband Communication Devices and Equipment Mounted to Boxes or Brackets. Communication devices or equipment shall be mounted to a listed boxes or bracket and installed per 314.20.</u>
<u>(B) Network-Powered Broadband Communication Devices and Equipment Mounted on Covers. Communication device and equipment mounted to and supported by a cover shall be held rigidly against the cover which is mounted to the box or bracket.</u>
Substantiation: This proposal adds a new section to Article 830 addressing the mounting of devices or equipment to listed boxes and brackets. Currently, depending on the quality of workmanship, coaxial devices or equipment have not been mounted to boxes or brackets that can support them. After several years device and/or covers that are mounted directly to the dry wall will become a hazard because they have become loose and exposed. Coaxial cable can become energized by coming in incidental contact with electrical conductors.

830.135 was only a suggestion for the location of this new section. (A) addresses devices mounted directly to boxes or devices where as (B) address devices mounted to covers.
Panel Meeting Action: Reject
Panel Statement: The submitter has provided no data supporting an existing hazard. The submitter offers only an individual opinion that, depending on the quality of workmanship, equipment or devices mounted directly to drywall may, over time, loosen and become a hazard. The addition of listed boxes or assemblies will not, in itself, guarantee a hazard-free installation. The same quality of workmanship is necessary to help ensure a hazard-free equipment installation whether or not listed boxes are used.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15
Comment on Affirmative:
OHDE, H.: We concur with submitter's recommendation which addresses the mounting of equipment or devices to listed boxes and brackets. However the submitter has not provided CMP 16 member any technical substantiation or data supporting the existing hazard. The submitter should resubmit the proposal in the 2008 ROC and provide CMP 16 members with such data.

16-410 Log #1883 NEC-P16 **Final Action: Accept in Principle**
(830.151)

TCC Action: The Technical Correlating Committee understands that no change in the NEC occurs as a result of the panel action on this proposal.
Submitter: Jeffrey Boksiner, Telcordia Technologies, Inc.
Recommendation: Modify 830.151 **Medium Power Network-Powered Broadband Communications System Wiring Methods** as follows.
830.151 **Medium Power Network-Powered Broadband Communications System <u>and RFT-V Network-Powered Broadband Communications System</u> Wiring Methods** .
Medium power network-powered broadband communications systems shall be installed within buildings using listed Type BM or Type BMR, network-powered broadband communications medium power cables. <u>RFT-V network-powered broadband communications systems shall be installed within buildings using listed Type BM or Type BMR, network-powered broadband communications medium power cables.</u>
No change in the remainder of this section.
Substantiation: CSA/UL6950-21 (first edition, 2003), Standard for Safety for Information Technology Equipment – Safety – Part 21: Remote Power Feeding, is the ANSI standard that applies to systems intended to supply and receive power over the communications network. This is part of a set of several proposals intended to harmonize the requirements of UL6950-21 and the NEC Article 830.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-369.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRUNSSEN, J.: The Panel Action should be "Reject". The Panel accepted Proposal 16-369 that classifies RFT-V circuits as medium-power circuits. Therefore, it is not necessary to provide additional cable requirements for RFT-V circuits; they are already medium-power circuits and use the same cable types as other medium-power network-powered broadband communications circuits. Therefore, NFPA staff should not add any additional text to 830.151 based on this proposal.

16-411 Log #2814 NEC-P16 **Final Action: Accept in Principle**
(830.151)

TCC Action: The Technical Correlating Committee understands that no change in the NEC occurs as a result of the panel action on this proposal.
Submitter: Randolph J. Ivans, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
830.151 Medium Power <u>and RFT-V</u> Network-Powered Broadband Communications System Wiring Methods. Medium power <u>and RFT-V</u> network-powered broadband communications systems shall be installed within buildings using listed Type BM or Type BMR, network-powered broadband communications medium power cables.
No change in the remainder of this section.
Substantiation: This is part of a set of three proposals intended to harmonize the requirements of UL60950-21 and the NEC Article 830. This proposal is a companion proposal to allow RFT-V circuits in 830.15. The voltage limitations in 830.15 do not include some common communication industry practices for powering broadband communications equipment not under the exclusive control of the communications utility.
This proposal is intended to allow the use of Type BMU, Type BM, or Type BMR cables for RFT-V circuits as described in the proposal to allow RFT-V circuits in 830.15. These cables are presently allowed for medium power network-powered broadband communications circuits in 830.40(A). As insulation for the individual conductors of Type BMU, Type BM, and Type BMR Cables are required to be rated for 300 volts minimum, these cables are suitable for the RFT-V circuits.
UL60950-21, Standard for Safety for Information Technology Equipment - Safety - Part 21: Remote Power Feeding, is the ANSI standard that applies to communications systems intended to supply and receive power over the communications network.
An RFT circuit or "Remote Feeding Telecommunication" circuit is a secondary circuit intended to supply or receive d.c. power via a telecommunication network. An RFT-V circuit is an RFT circuit that is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited.
The RFT-V circuits have more stringent power limitations than the medium-power circuit. An RFT-V circuit as described in UL60950-21 is so designed and protected that under normal operating conditions the voltages are limited between each conductor and ground to 140V dc, or up to 200V dc provided that a monitoring and control device is used that limits the current to earth to 10 mA. Power is limited to a maximum rating of 100VA under normal operation and 150VAmax under fault conditions, which are lower than the limits for medium power circuits. In addition, the output current is limited to a value that would not cause damage to the communications wiring system, typically 1.3 A or less. These limits reflect common industry practices for remote feed applications that are now being employed to power broadband equipment not under the exclusive control of the communications utility.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-369.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 14 Negative: 1
Explanation of Negative:
BRUNSSEN, J.: The Panel Action should be "Reject". The Panel accepted Proposal 16-369 that classifies RFT-V circuits as medium-power circuits. Therefore, it is not necessary to provide additional cable requirements for RFT-V circuits; they are already medium-power circuits and use the same cable types as other medium-power network-powered broadband communications circuits. Therefore, NFPA staff should not add any additional text to 830.151 based on this proposal.

16-411a Log #CP1602 NEC-P16 **Final Action: Accept**
(830.154)

Submitter: Code-Making Panel 16,
Recommendation: Revise 830.154
830.154 <u>Applications of</u> Low-Power Network-Powered Broadband Communications System ~~Wiring Methods~~ . <u>Cables</u>
Substantiation: This proposal is editorial. Acceptance of this proposal will make the title of 830.154 consistent with the titles of 770.154, 800.154 and 820.154 and comply with the style manual requirement for parallel text.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-412 Log #798 NEC-P16 **Final Action: Accept**
(830.154)

TCC Action: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. The accepted action changes the title of old "(B) Ducts, Plenums and Other Air Handling Spaces." to "(A) Plenums." However, all three applications are still within the subsection. This action will be considered by the Panel as a Public Comment.
Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Delete subsection (A), renumber remaining existing sections (B), (C) and (D) as (A), B) and (C), relocate Section 830.133 (C) to 830.154 (D) as follows:
830.154 Low-Power Network-Powered Broadband Communications System Wiring Methods.
Low-power network-powered broadband communications systems shall comply with any of the requirements of 830.154(A) through 830.154(D).
~~**(A) In Buildings.** Low-power network-powered broadband communications systems shall be installed within buildings using listed Type BLX, Type BL, Type BLR, or Type BLP network-powered broadband communications low-power cables.~~
~~**(B)**~~ **<u>(A)</u>** ~~**Ducts,**~~ **Plenums,** ~~**and Other Air-Handling Spaces.**~~ Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type BLP. Type BLX cable installed in compliance with 300.22 shall be permitted.
~~**(C)**~~ **<u>(B)</u> Riser.** Cables installed in risers shall comply with any of the requirements in 830.154(C)(1), (C)(2), or (C)(3).
(1) Cables in Vertical Runs. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type BLP, BLR, or BMR. Floor penetrations requiring Type BMR or BLR shall contain only cables suitable for riser or plenum use.
(2) Metal Raceways or Fireproof Shafts. Type BLX cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.

(3) One- and Two-Family Dwellings. Type BLX or BL cables less than 10 mm (0.375 in.) in diameter shall be permitted in one- and two-family dwellings.

~~**(D)**~~ **(C) Other Wiring Within Buildings.** Cables installed in locations other than those covered in 830.154(A), (B), and (C) shall comply with the requirements of 830.154~~(D)~~(C)(1) through ~~(D)~~ (C)(5).

(1) General. Type BLP, BL, or BM shall be permitted.

(2) In Raceways. Type BLX shall be permitted to be installed in a raceway.

(3) Type BLU Cable. Type BLU cable entering the building from outside shall be permitted to be run in rigid metal conduit or intermediate metal conduit. Such conduits shall be grounded to an electrode in accordance with 830.100(B)

(4) One- and Two-Family Dwellings. Type BLX or BL cables less than 10 mm (0.375 in.) in diameter shall be permitted to be installed in one- and two-family dwellings.

(5) Type BLX Cable. Type BLX cable entering the building from outside and terminated at a grounding block or a primary protection location shall be permitted to be installed, provided that the length of cable within the building does not exceed 15 m (50 ft).

FPN: This provision limits the length of Type BLX cable to 15 m (50 ft), while 830.90(B) requires that the primary protector, or NIU with integral protection, be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, or NIU with integral protection, Type BLX cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.

(D) Cable Substitutions. The substitutions for network-powered broadband cables listed in Table 830.154 shall be permitted. All cables in Table 830.154, other than network-powered broadband cables, shall be coaxial cables

Table 830.154 Cable Substitution

Cable Type	Permitted Cable Substitutions
BM	BMR
BLP	CMP, CL3P
BLR	CMP, CL3P, CMR, CL3R, BLP, BMR
BL	CMP, CMR, CM, CMG, CL3P, CL3R, CL3, BMR, BM, BLP, BLR
BLX	CMP, CMR, CM, CMG, CMX, CL3P, CL3R, CL3, CL3X, BMR, BM, BLP, BRP, BL

Substantiation: This is an editorial proposal. (Task Group No. 830-19)

Existing Section 830.154(A) may be editorially deleted as it adds no new information to Article 830 that is not covered elsewhere in the article. Renumbering the remaining subsections aligns Section 830.154 with similar requirements in 770.154, 800.154 and 820.154. Adding 830.154 (D) places the information regarding cable substitutions in its rightful place in the Article. This is a companion proposal to similar proposals concerning Sections 800.154, 820.154 and 830.154, and to the proposal to relocate Section 830.133(C) to Section 830.154(D).

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-413 Log #799 NEC-P16 **Final Action: Accept**
(830.154(D))

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Make the changes as shown:

(C ~~D~~) Other Wiring Within Buildings

Substantiation: This is an editorial proposal. (Task Group No. 830-17)

It creates consistency among parallel articles. Section (D) has been re-lettered to (C) by another task group proposal.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;
2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;
3) make the Articles as self-sufficient as is reasonably possible; and,
4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-414 Log #378 NEC-P16 **Final Action: Reject**
(830.157)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Revise text as follows:

Protection Against ~~Physical~~ Damage. Section 300.4 shall apply.

Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")

Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.

Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."

Panel Meeting Action: Reject
Panel Statement: The grounding conductor is potentially subject to multiple sources of damage: electrical, physical, and environmental. The word "physical" is necessary to specifically identify the type of damage that the section is addressing.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-415 Log #800 NEC-P16 **Final Action: Accept**
(830.179)

Submitter: S.D. Kahn, Tri-City Electric Co., Inc.
Recommendation: Change the titles as shown:

830.179 Network-Powered Broadband Communications Equipment and Cables.

Network-powered broadband communications equipment and cables shall be listed as suitable for the purpose.

Exception No. 1: This listing requirement shall not apply to community antenna television and radio distribution system coaxial cables that were installed prior to January 1, 2000, in accordance with Article 820 and are used for low-power network-powered broadband communications circuits.

Exception No. 2: Substitute cables for network-powered broadband communications cables shall be permitted as shown in Table 830.133.

(**A) Listing and Marking.** Listing and marking of network-powered broadband communications cables shall comply with 830.179(A)(1) or (A)(2).

(1) Type s BMU, ~~Type~~ BM, and ~~Type~~ BMR Cables. Network-powered broadband communications medium power underground cable, Type BMU; network-powered broadband communications medium power cable, Type BM; and network-powered broadband communications medium power riser cable, Type BMR, shall be factory-assembled cables consisting of a jacketed coaxial cable, a jacketed combination of coaxial cable and multiple individual conductors, or a jacketed combination of an optical fiber cable and multiple individual conductors. The insulation for the individual conductors shall be rated for 300 volts minimum. Cables intended for outdoor use shall be listed as suitable for the application. Cables shall be marked in accordance with 310.11. Type BMU cables shall be jacketed and listed as being suitable for outdoor underground use. Type BM cables shall be listed as being suitable for general-purpose use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire. Type BMR cables shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

FPN No. 1: One method of defining *resistant to spread of fire* is that the cables do not spread fire to the top of the tray in the vertical tray flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* . Another method of defining *resistant to the spread of fire* is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing

the CSA vertical flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985, *Test Methods for Electrical Wires and Cables.*
FPN No. 2: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-2002, *Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.*

(2) Type s BLU, ~~Type~~ BLX, ~~Type~~ BL, BLR and ~~Type~~ BLP Cables. Network-powered broadband communications low-power underground cable, Type BLU; limited use network-powered broadband communications low-power cable, Type BLX; network-powered broadband communications low-power cable, Type BL; network-powered broadband communications low-power riser cable, Type BLR; and network-powered broadband communications low-power plenum cable, Type BLP, shall be factory-assembled cables consisting of a jacketed coaxial cable, a jacketed combination of coaxial cable and multiple individual conductors, or a jacketed combination of an optical fiber cable and multiple individual conductors. The insulation for the individual conductors shall be rated for 300 volts minimum. Cables intended for outdoor use shall be listed as suitable for the application. Cables shall be marked in accordance with 310.11. Type BLU cables shall be jacketed and listed as being suitable for outdoor underground use. Type BLX limited-use cables shall be listed as being suitable for use outside, for use in dwellings, and for use in raceways and shall also be listed as being resistant to flame spread. Type BL cables shall be listed as being suitable for general-purpose use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire. Type BLR cables shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor. Type BLP cables shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN No. 1: One method of determining that cable is resistant to flame spread is by testing the cable to VW-1 (vertical-wire) flame test in ANSI/UL 1581-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* .

FPN No. 2: One method of defining *resistant to spread of fire* is that the cables do not spread fire to the top of the tray in the vertical tray flame test in ANSI/UL 1584-1991, *Reference Standard for Electrical Wires, Cables and Flexible Cords* .

FPN No. 3: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-1997, *Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.*

FPN No. 4: One method of defining a cable that is low smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262 -1999, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air Handling Spaces* .

Substantiation: This is an editorial proposal. (Task Group No. 830-18)

It will make the titles of this section consistent with Article 770.

The text also references network-powered broadband communications low-power riser cable, Type BLR. Type BLR should therefore be included in the title too.

This is one of a group of Proposals prepared by the CMP-16 Special Editorial Task Group. The goals of the task group were to:

1) place requirements in the appropriate sections;

2) improve the parallelism between related Articles such that similar requirements are stated the same way in each Article;

3) make the Articles as self-sufficient as is reasonably possible; and,

4) improve the language in the difficult to understand Sections.

The Task Group members are Donna Ballast, Jim Brunssen, Sandy Egesdal, Roland Gubisch, Stan Kahn, Stan Kaufman and Steve Johnson.

Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-416 Log #1425 NEC-P16 **Final Action: Accept**
(830.179(A)(1), FPN 1)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:

FPN No. 1: One method of defining *resistant to the spread of fire* is that the cables do not spread fire to the top of the tray in the " UL Flame Exposure , Vertical Tray Flame Test" in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords.~~ UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M- ~~1985~~ 2001 , Test Methods for Electrical Wires and Cables.

Substantiation: The revised wording is an update of the standard references and not a change in the test methods. UL 1581 now references UL 1685 for the text of the test method.
Panel Meeting Action: Accept
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-416a Log #16 NEC-P16 **Final Action: Accept in Principle**
(830.179(A)(2))

Submitter: Stanley Kaufman, Cable Safe Inc.
Recommendation: Revise as follows:
(2) Type BLU, Type BLX, Type BL, BLR and Type BLP Cables.
Substantiation: Type BLR wa s added to this section but not to the title. This proposal fixes the oversight.
Panel Meeting Action: Accept in Principle
Panel Statement: See panel action on Proposal 16-415.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

16-417 Log #1424 NEC-P16 **Final Action: Accept in Principle**
(830.179(A)(2), FPN 2)

Submitter: Thomas J. Guida, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:

FPN No. 2: One method of defining "resistant to the spread of fire" is that the cables do not spread fire to the top of the tray in the " UL Flame Exposure , Vertical Tray Flame Test" in ~~ANSI/UL 1581-2001, Standard for Electrical Wires, Cables, and Flexible Cords.~~ UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables . The CSA test is ae to coincie with FPN No.1 in 830.179(A)(1).

Substantiation: The revised wording is an update of the standard references and not a change in the test methods. UL 1581 now references UL 1685 for the text of the test method.
Panel Meeting Action: Accept in Principle

FPN No. 2 to read as follows:

FPN No. 2: One method of defining "resistant to the spread of fire" is that the cables do not spread fire to the top of the tray in the "UL Flame Exposure, Vertical Tray Flame Test" in UL 1685-2000 Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test - Cables in Cable Trays," as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables.

Panel Statement: The panel edited the submitter's text for clarity and to correct a reference error.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

(Note: Sequence nos. 16-418 and 16-419 were not used)

CHAPTER 9 TABLES

8-199 Log #1473 NEC-P08 **Final Action: Reject**
(Chapter 9, Table 1)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in Note 1 to Table 1.
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".

For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.

Panel Meeting Action: Reject
Panel Statement: The guide information in the UL White Book doesn't limit the use of fixture wire to luminaires. The product is listed, which means it can be used in the field. It is not limited to OEM internal luminaire wiring. Fixture wires are suitable for use for other than luminaires.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-200 Log #1840 NEC-P08 **Final Action: Accept**
(Chapter 9 Table 1)

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician
Recommendation: Revise as follows:
A multiconductor cable or <u>flexible cords</u> of two or more conductors shall be treated as a single conductor for calculating percentage conduit fill area.
Substantiation: This change would allow Table 1 to be used of Chapter 9 Tables.
Panel Meeting Action: Accept
Apply the proposed action to (9) in Notes to the Tables for Chapter 9 Table 1.
Panel Statement: The panel recognizes the submitter's proposal is actually for (9) in Notes to the Tables for Chapter 9 Table 1.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:
DABE, J.: The submitter has not supplied any technical substantiation supporting this proposal. Also Note (2) Table 1 applies only to complete conduit or tubing systems. 400.8(1) states that flexible cord is not to be used as a substitute for permanent wiring methods.

8-201 Log #436 NEC-P08 **Final Action: Reject**
(Chapter 9, Tables 1 & 4)

Submitter: Ben Stuckey, Piper Electric Co., Inc.
Recommendation: In Chapter 9, Tables 1 and 4 of the 2005 NEC the following revision is recommended:
Where 2 conductors are listed, the percentage of conduit fill should be in proportion to 1 conductor and over 2 conductors, not less. Therefore, the percentage of conduit fill for 2 conductors would be revised to 46 percent of conduit fill.
Substantiation: Why would more than 2 conductors be permitted to occupy more conduit space than only 2 conductors? Shouldn't this be a lesser percentage in order to dissipate heat more effectively? The percentage of conduit fill should be in proportion to the amount of conductors in the conduit. Therefore, the percentage of conduit fill for 2 conductors would be revised to 46% which would relate directly to the percentage of conduit fill for 1 conductor and over 2 conductors.
Panel Meeting Action: Reject
Panel Statement: Heat dissipation is only one concern when installing conductors. In a raceway, ease of installation and removal of conductors, and jamming, are also required to be taken into account.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-202 Log #2550a NEC-P08 **Final Action: Reject**
(Chapter 9, Tables 1 through 4)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: A square plate which is 2 ft 2 = 2 ft x 2 ft = 4 sq ft
A square plate which is 2 sq ft = 1.41 ft x 1.41 ft = 2 sq ft
This is a big difference between the two.
Substantiation: The NEC had to change the way 250 KCM used to be referred to as 250 MCM because of a history of using wrong terminology. It is now time to correct a long standing confusing way of referring to square feet and feet squared. They are two different values. The NEC is trying to say "square feet" in sections like 250.52(A)(6) and have it written as "feet squared". Table 220.12 has the term "square feet" written correctly. I find this confusion most often with my foreign students who are learning reading, writing, and math as adults and recent immigrants to the USA. They are the ones who point out the discrepancy. Every Table in Chapter 9 has the same misuse of the terms.
Panel Meeting Action: Reject
Panel Statement: The submitter has not identified where the changes are to take place. Additionally, the panel suggests the specific changes be detailed and substantiated.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-203 Log #379 NEC-P08 **Final Action: Reject**
(Chapter 9, Table 1, Note 2)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Recommendation: Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring from ~~physical~~ damage.
Substantiation: Use of the word "physical" is superfluous–the intent is obvious given the context. (I leave it to the CMP whether you want to get more specific naming some source of damage such as "blows or abrasion.")
Submitting proposals removing the adjective "physical" may strike people as about as useful as hunting gnats with a cannon. However, doing so seems worthwhile for two reasons. First, if we eliminate every unnecessary instance, as I am attempting to do, we actually cut the NEC down by up to oh, maybe a quarter-page. Keeping it from growing too much fatter every cycle is a goal many of us can agree on.
Second, the unneeded use of "physical" not only is poor writing–look at William Zinsser's classic, On Writing Well–but is silly, and reflects a bit poorly on the Code process. When references were changed to "physical damage," in 1959, from "mechanical injury" (with no substantiation recorded), an excellent opportunity was overlooked to eliminate the possibility of someone raising an eyebrow and saying fatuously, "Is anyone claiming electrical equipment needs protection from non-physical injury?" (Substitute the snide adjective of your choice.) Let's take care of that for good: for our purposes, "damage" means "physical damage."
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-4 (Log 336).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-204 Log #500 NEC-P08 **Final Action: Reject**
(Chapter 9, Table 2)

Submitter: Donald Shaner, Greenlee Textron Inc.
Recommendation: Change the radius of bends for one shot and full shoe benders for 2 inch trade size conduit from 9 1/2 inches to 9 inches.
Substantiation: Steel conduit springs back to a radius slightly larger than the radius of the bending shoe. Measuring the conduit is very difficult, so most inspectors use the published radius of the shoe to judge compliance with the code.
Greenlee has placed on the market more than 10,000 electric conduit benders with a 2 in. rigid shoe bend radius of 9 inches without any problems. Please refer to the Greenlee catalog pages that I have provided.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Reject
Panel Statement: The table value of 9 1/2 inches is correct. For field bends after any springback or not, the centerline of the raceway shall not be less than indicated in Table 2 Chapter 9. Additionally, there is no technical substantiation for the proposed change.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-204a Log #1937 NEC-P08 **Final Action: Accept**
(Chapter 9, Table 4)

Submitter: William Wagner, Certification Solutions
Recommendation: Revise Table headings as follows:
Article 352 — Rigid PVC Conduit (<u>PVC</u>) (~~RNC~~), Schedule 80
Articles 352 and 353 — Rigid PVC Conduit (<u>PVC</u>)(~~RNC~~), Schedule 40, and HDPE Conduit (<u>HDPE</u>)
Article 352 — Type A, Rigid PVC Conduit (<u>PVC</u>) (~~RNC~~)
Article 352 — Type EB, PVC Conduit (<u>PVC</u>)(~~RNC~~)
Substantiation: This is a companion proposal for the new definition of Rigid Nonmetallic Conduit in Article 100 and the revised Article 352 for Type PVC Conduit. It clarifies that rigid polyvinyl chloride conduit is designated as Type PVC, rather than the broader Type RNC which includes PVC, HDPE and RTRC. It additionally indicates that high density polyethylene conduit is designated as Type HDPE.
Panel Meeting Action: Accept
Panel Statement: The committee disagreed with the submitter's substantiation that HDPE is RNC, as is shown in the rejection of Proposal 8-2.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

6-94 Log #2550 NEC-P06 **Final Action: Reject**
(Chapter 9, Tables 5 through 9)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: A square plate which is 2 ft 2 = 2 ft x 2 ft = 4 sq ft
A square plate which is 2 sq ft = 1.41 ft x 1.41 ft = 2 sq ft
This is a big difference between the two.
Substantiation: The NEC had to change the way 250 KCM used to be referred to as 250 MCM because of a history of using wrong terminology. It is now time to correct a long standing confusing way of referring to square feet and feet squared. They are two different values. The NEC is trying to say "square feet" in sections like 250.52(A)(6) and have it written as "feet

squared". Table 220.12 has the term "square feet" written correctly. I find this confusion most often with my foreign students who are learning reading, writing, and math as adults and recent immigrants to the USA. They are the ones who point out the discrepancy. Every Table in Chapter 9 has the same misuse of the terms.

Panel Meeting Action: Reject

Panel Statement: The ft.² designates area and is the correct designation in accordance with the NEC Style Manual (page 31), and changes to the Manual of Style should be submitted to the TCC. The submitter has not complied with the requirements of 4-3.3(c) of the NFPA Regulations Governing Committee Projects that proposals must provide the specific "wording to be added, revised (and how revised), or deleted."

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-95 Log #131 NEC-P06 **Final Action: Reject**

(Chapter 9 Table 5)

Submitter: Mark Good, Good Electric Corp.

Recommendation: Delete discrepency.

Type RHH*, RHWI, THHN, THWN, THW, THW-2, TFN, TFFN, THWN, THWN-2, RF, XFF

~~THHW, THW, AF~~ RHH*, RHW* 10

~~XF, XFF~~ RHW-2*

Substantiation: The above discrepency is obvious because the #10 wire THW in the column to the left has different diameter and area.

Panel Meeting Action: Reject

Panel Statement: The panel is not sure what the submitter is requesting, unless the submitter is referring to the 2002 Code, in which case the issue was corrected in the 2005 Code (Proposal 6-106).

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-96 Log #563 NEC-P06 **Final Action: Reject**

(Chapter 9, Table 5)

Submitter: R. K. Varma, State of PA, DCED

Recommendation: Add a Table for Cable as shown below:

Substantiation: Currently, there exists no data for cables in terms of their overall areas. Bare conductor areas do not answer "conduit fills" requirements correctly. Forty percent fill, 60 percent fill is mostly not correct and even NEC/NFPA feels these calculations do not truly represent intent of NEC.

Panel Meeting Action: Reject

Panel Statement: The addition of the proposed table is not needed. The panel assumes that the submitter is referencing multiconductor cables, which are dealt with in Table 1, Notes 5 and 9. This table is not under the purview of Panel 6. In addition, Types TWW, THWW, TWW-2 do not exist.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-97 Log #1742 NEC-P06 **Final Action: Reject**

(Chapter 9, Table 5A (New) FPN)

Submitter: David Sroka, Turner Falls, MA

Recommendation: Table 5A - Add new FPN text as follows:

"FPN: Most aluminum building wire in types THW, THHW, THWN/THHN, and XHHW conductors is compact stranded. Table 5A provides appropriate dimensions for these types of wire."

Substantiation: This is currently a comment in the NEC Handbook. It would be more useful as a FPN below the table.

Panel Meeting Action: Reject

Panel Statement: The proposed fine print note is already included in the title of the table.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-98 Log #1741 NEC-P06 **Final Action: Accept in Principle**

(Chapter 9, Table 5B (New))

Submitter: David Sroka, Turner Falls, MA

Recommendation: Table 5B Compact Copper Building Wire Nominal Dimensions* and Areas - please copy "Bare Conductor" columns only from Table 5A - *Dimensions Are From Industry Sources.

Substantiation: This information is currently not included, to show that bare compact stranded dimensions are the same for copper and aluminum.

Note: Supporting material is available for review at NFPA Headquarters.

Panel Meeting Action: Accept in Principle

Add the words "Copper and " to the title of the existing Table 5A before "Aluminum".

Panel Statement: The panel resolved the submitter's issue without adding another table.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

6-99 Log #1838 NEC-P06 **Final Action: Reject**

(Chapter 9, Table 8)

Submitter: Mark T. Rochon, Mark J. Rochon Master Electrician

Recommendation: Add text as follows:

6 AWG 1 Stranding

4 AWG 1 Stranding

Substantiation: 6 AWG and 4 AWG is available in solid and used every day.

Panel Meeting Action: Reject

Panel Statement: The panel agrees with the concept and requests the submitter provide the technical substantiation and the dimensions.

Number Eligible to Vote: 11

Ballot Results: Affirmative: 11

[Proposal 6-96 (Log #563)]

Type	Size AWG of kcml	Approx. mm	Dia. in.	Approx. mm²	Area in.²
TW TWW THWW TWW-2	14 2 Cdtr with Ground or ----------------				

6-100 Log #1474 NEC-P06 **Final Action: Reject**
(Chapter 9, Table 5)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in Table 5.
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".

For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: The use of fixture wire is not limited to luminaires or lighting fixtures; they are also used within equipment. The action on this proposal should also be forwarded for information to CMP 2, 3, 5, 8, 9, 10, 12, and 15.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 9 Negative: 2
Explanation of Negative:

CLINE, S.: If "fixture" was the word which gave rise to "fixture wires" in the past, then it seems that the term should now be "luminaire wires." It is possible that a different word more inclusive of current applications for these conductors could be better than "luminaire," but "luminaire" is the defined word the Code now uses in place of "fixture." A new word could be done as a Comment should someone have one to suggest. I believe in struggling for uniformity and simplicity in the Code as much as is practically possible.

KENT, G.: See my Explanation of Negative Vote on Proposal 6-5.

6-101 Log #1661 NEC-P06 **Final Action: Reject**
(Chapter 9, Table 9)

Submitter: Stephen Nelson, Leo A. Daly
Recommendation: The reactance values for wire sizes 6, 8 and 10 appear to be out of order in both the PVC and Steel conduit columns. I believe the values for 10 AWG should be for 6 AWG, the values for 6 AWG should be for 8 AWG and the values for 8 AWG should be for 10 AWG.
Substantiation: Larger wire sizes have lower reactance values.
Panel Meeting Action: Reject
Panel Statement: This table is correct as written, and the panel recommends that the submitter provide calculations to support his proposal. Reactances are based on the spacing between conductors.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

6-102 Log #2249 NEC-P06 **Final Action: Reject**
(Chapter 9, Table 9)

Submitter: Noel Williams, Herriman, UT
Recommendation: Delete Table 9 from Chapter 9 and relocate it to a new annex or add to Annex B.
Substantiation: This table is not referenced anywhere in the NEC and as such has no application in NEC requirements. The table is useful, however, so it should be retained, but not in the main areas of the code. Since the table contains no requirement and is not referenced as a requirement, it is equivalent to a Fine Print Note.
Panel Meeting Action: Reject
Panel Statement: The information contained in Table 9 is used to perform various mathematical calculations required throughout the Code.
Number Eligible to Vote: 11
Ballot Results: Affirmative: 11

3-273a Log #3073 NEC-P03 **Final Action: Reject**
(Chapter 9 Table 11 (A))

Submitter: Michael Bandel, Juno Lighting Group
Recommendation: Add "(see Note 5)" indication to the "Not Inherently Limited Power Source (Overcurrent protection required), Class 3" columns in the "Over 100 through 150" location; also, add new Note 5 text. Please refer to Table 11(A) and Note 5 (table shown on following page)
Substantiation: Problem: Table 11(A) is insufficient in describing the limitations associated with a Class 3 AC power source in the "Over 100 through 150" Source voltage range; it currently designates Power limitation VAmax as "N.A., leaving little doubt that through the other table parameters and Note 1 that the only practical limitation here that would be calcuable is 150VA. This 150VA seems insufficient given the 250VA allowable power limitations of the other source voltage ranges for the "Not Inherently Limited Power Source."

The proposal will set up a 250VA max Power limitation to substitute for the "N.A.," as well as the other power and current parameters subject to a new Note 5. The substantiation for this is as follows:

Substantiation for Proposal: The boundary between the "Over 30 through 100" and "Over 100 through 150" ranges is not seamless. It implies that at 101 V max your discontinuously changes from a clear 250VA to the implied 150VA associated with "N.A." This transition discontinuity is not present in any of the other ranges except if you consider Note 3, and although Note 3 allows for a higher power limitation, it restricts the transition point to 15V as opposed to the 20V limit of the tabular range.

The power limitation itself implies that under the conditions of Note 1, any Article 725 wiring can indeed be circulating 250VA under, "after 1 minute and regardless of load and overcurrent protection bypassed, if used". This is because a short circuit fault could occur anywhere in a Class 3 wiring system; however, most ostensibly it's anticipated that it would occur at the Class 3 loads. If 250VA can circulate in a Class 3 wiring system, there should logically be no issues with allowing this amount in the nameplate rating with stipulations.

Note 6 anticipates the stipulations required in order to keep within the framework originally envisioned by Table 11(A), yet creates an aenue to the only real way to guarantee compliance with the suggested changes. It states that for the ranges of voltage, current and power suggested, the only sensible way to process the power is with a linear or switchmode type electronic power supply. As such, said power supply must include multiple safety circuits to be called safe from the fire initiation. Input fusing is a typical norm in electronic power equpment. It limits the power that can be absorbed from the Class 1 input and transferred externaly via the output. Active thermal shutdown similarly limits power transfer from input to output by sensing temperature at a strategic hot spot so that ouput can be terminated upon excessive power processing. Lastly, output overload shutdown protection monitors and shuts off the output for abnormal loading situations. The "Not Inherently Limited Power Source (Overcurrent Protetion Required)" section of Table 11(A) requires some overcurrent protection device. If an electronic power supply has an overload shutdown characteristic, it offers another basic safety mechanism to rely upon. Combining this with the aforementioned protections of fusing and thermal sensing offers additional levels of protection, any of which could compensate for the other. Additionally, other protections can be envisoned that could each be tested separately at UL to answer questions of their unique contributions to safety from a fire initiation standpoint on a power supply design.

The practical effects of Note 5 will also allow curents greater than the 1.0 specified under the Table 11(A) in effect now. The new range calculable is from 1.67 to 2.5 amperes, (250/V max). This is more restrictive than the current Table 11(A) in the "Over 30 through 100" source voltage range where the "Current limitations" vary from 33.4 to 10 amperes, (1000/V max), and the Maximum overcurrent protection" range is from 1.0 to 3.34 amperes, (100/V max). Again, the Note 5 restriction of the source to be an electronic power supply allows for much more precision in limiting power from a source, as well as qualifying as safe from fire initiation.

In conclusion, the main point to consider is the "Power limitations VA max (volt-amperes) (see Note 1)" levels for a "Not Inherently limited Power Source". Under what must be considered a fault condition 250VA can circulate indefiitely through an Article 725, Class 3 wiring system. It could be asked if the nameplate can be changed on the source voltage range requested, why can't it be changed in the other ranges? The answer is simple. It can be. However, at the lower voltages of those ranges the I 2 x R calculated power losses become greater and less likely to be of practical use. It's really only the higher voltages that allow lower current and a reasonable wiring methodolgy to be employed. The real question is if these changes will maintain safety from a fire initiaiton standpoint. The answer here is yes, if kept within the confines of Note 5, and can obtain a UL listing.
Panel Meeting Action: Reject
Panel Statement: The recommendation is assuming a power limitation in the last column of Table 11(A) of the maximum voltage of the source as 150 volts. With a 1-ampere current limitation, the power limitation would be 150 VA. The Table has this shown as N.A. and the submitter is assuming that Note 3 permits a higher power limitation but this only applies where the voltage is 15 volts or less and not as indicated in the over 100 though 150 volt column. The VA max in Note 1 indicates that the peak VA during a short circuit with the overcurrent protective device bypassed would be a peak of not more than 250 VA but this certainly does not provide permission to have this 250 VA peak during normal operation since a Class 3 system is not designed to operate in a short circuit situation for long periods of time. The 250 VA is a peak value since the power source nameplate cannot be greater than 100 VA. Class 3 systems can operate at a level that could be considered to be a shock hazard but not a fire initiation hazard when insulated at the proper voltage levels for conductors and equipment. Notes 5 and 6 do not seem to be provided with the proposal, however, the substantiation seems to indicate a linear switch-mode electronic power supply with an active thermal shutdown that would limit power transfer from input to output. It also alludes to an output overload shutdown protection monitor. The Table values in 11(A) and (B) have been long standing values that were originally tested and formulated in the late 1950s but have been used for many years to provide limitations for Class 2 and 3 circuits. As voltage is increased, the current level must be decreased to ensure the I 2 t will not exceed the energy limitation for fire initiation. This cannot just be a bolted fault condition since increasing the energy level by increasing the allowable VA will also result in a higher arcing fault level. Any proposed changes must be proven with substantial technical data to establish the proper protection for these circuits. A power supply that does not conform to the Table values must have a Fact Finding study that will address the principle issues of both fire initiation limitation and shock protection that exists in the present tables. This has not been provided in this proposal.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

[Proposal 3-273a (Log #3073)]

Table 11(A) Class 2 and Class 3 Current Power Source Limitations

		Inherently Limited Power Source (Overcurrent Protection Not Required)				**Not Inherently Limited Power Source (Overcurrent Protection Required)**			
Power Source		**Class 2**			**Class 3**	**Class 2**		**Class 3**	
Source voltage V_{max} (volts (see Note 1)		0 through 20*	Over 20 and through 30*	Over 30 and through 150	Over 30 and through 100	0 through 20*	Over 20 and through 30*	Over 30 and through 100	Over 100 and through 150 (see note 5)
Power Limitations VA_{max} (volt-amperes) (see Note 1)		—	—	—	—	250 (see Note 3)	250	250	N.A
Current limitations I_{max} (volts) (see Note 1)		8.0	8.0	0.005	$150/V_{max}$	$1000/V_{max}$	$1000/V_{max}$	$1000/V_{max}$	1
Maximum overcurrent protection (amperes)		—	—	—	—	5.0	$100/V_{max}$	$100/V_{max}$	1
Power source maximum nameplate rating	VA (volt-amperes)	$5.0 X V_{max}$	100	$0.005 X V_{max}$	100	$5.0 X V_{max}$	100	100	100
	Current (amperes)	5.0	$100/V_{max}$	0.005	$100/V_{max}$	5.0	$100/V_{max}$	$100/V_{max}$	$100/V_{max}$

New Note 5 for Table 11(A):

5. For the Class 3 Over 100 and through 150V range, if the power source is an electronic linear or switchmode type power supply with input fusing, active thermal shutdown, and output overload shutdown protection, power limitations and power source maximum nameplate rating can be increased to equal the power limitations VA_{max} limit of 250VA. The current limitations, maximum overcurrent protection, and maximum nameplate rating for current can be calculated as $250/V_{max}$.

3-273b Log #2859 NEC-P03 **Final Action: Reject**
(Chapter 9, Tables 11(A) and 11(B), Footontes)

Submitter: Ole Nilssen, Innovention Center
Recommendation: Table 11(A) and 11(B), Note 1 revised:

I max Maximum output current under any non-capacitive load, including short circuit, and with overcurrent protection bypassed if used. Where a transformer limits the out current Imax limits apply after 1 minute of operation. Where a current-limiting impedance, listed for the purpose or as part of a listed product, is used in combination with a non-power-limited device - such as a transformer or a stored energy device, e.g., storage battery, to limit the output current - I max limits apply after 5 seconds.

VA max Maximum volt-ampere output after 1 minute of operation regardless of load and overcurrent protection bypassed if used. Overcurrent protection need not be bypassed if investigation for listing evaluated the suitability of the overcurrent protection in the event of abnormal operation.

Add to cell in tables "Power source maximum nameplate rating" (See Note 5):

Note 5. The method of marking is customary for simple transformers. Alternatively, the equipment output shall be marked, "class 2" or "class 3" as appropriate.

Substantiation: Present electrical parameter limits for Class 2 and 3 were originally written around a step-down, two winding, isolating transformer operated from a 60 Hz. source of supply. Electrical parameter limits for Class 2 were originally developed and included in the 1933 edition of the NEC, while limits for Class 3 were added with the 1975 edition. The limits do not consider new technology such as electronic circuits operating at higher frequencies or having active circuitry that can limit circuit energy in the advent of abnormal operation or interference with the Class 2 or 3 circuits. In the notes to Table 11, I max definition, last sentence describes a case where a non-power-limited device is used in combination. The mention of a transformer or battery should be noted as an example, not limited to just those two. Also, that same sentence describes when current limiting impedance (within the Class 2 or 3 circuit) can be relied upon, i.e., when listed with that purpose. This was not repeated in the VA max definition, but for consistency, should have been.

The method of marking as "power source maximum nameplate rating", although acceptable for transformers should not be limited to that alone for electronic equipment. Using the input rating in determining the acceptability of a Class 2 or 3 rating does not acknowledge that there could be electrical equipment with several functions, only one of which happens to be that it is the source of a Class 2 or 3 circuit.

Panel Meeting Action: Reject
Panel Statement: There was no technical substantiation to make the change in Note 5 of Tables 11(A) and (B). The reason a transformer is used in Note 1 was to provide information due to transformer core saturation on transformer startup. Once the transformer core saturation occurs, the transformer current stabilizes within the first minute of operation. This table applies to all different types of Class 2 and 3 power sources that can vary as widely as batteries and transformers to electronic power supplies. The information provided in the Table applies to all of these power sources. Maintaining the maximum ampere levels, peak power, and maximum voltages are critical in ensuring that shock and fire hazards do not occur.

Any proposed changes must be proven with substantial technical data to establish the proper protection for these circuits. A power supply that does not conform to the Table values must have a Fact Finding study that will address the principle issues of both fire initiation limitation and shock protection that exists in the present tables. This has not been provided in this proposal. As voltage is increased, the current level must be decreased to ensure the I 2 t will not exceed the energy limitation for fire initiation. This cannot just be a bolted fault condition since increasing the energy level by increasing the allowable VA will also result in a higher arcing fault level.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-274 Log #2550b NEC-P03 **Final Action: Reject**
(Chapter 9, Tables 11(A) & (B) & Tables 12(A) & (B))

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: A square plate which is 2 ft 2 = 2 ft x 2 ft = 4 sq ft

A square plate which is 2 sq ft = 1.41 ft x 1.41 ft = 2 sq ft

This is a big difference between the two.

Substantiation: The NEC had to change the way 250 KCM used to be referred to as 250 MCM because of a history of using wrong terminology. It is now time to correct a long standing confusing way of referring to square feet and feet squared. They are two different values. The NEC is trying to say "square feet" in sections like 250.52(A)(6) and have it written as "feet squared". Table 220.12 has the term "square feet" written correctly. I find this confusion most often with my foreign students who are learning reading, writing, and math as adults and recent immigrants to the USA. They are the ones who point out the discrepancy. Every Table in Chapter 9 has the same misuse of the terms.

Panel Meeting Action: Reject
Panel Statement: Neither Tables 11(A) and 11(B) or Tables 12(A) and 12(B) have square foot measurements, so this proposal does not apply to these tables.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

3-275 Log #3047 NEC-P03 **Final Action: Reject**
(Chapter 9 Tables 11(A) and 11(B))

Submitter: Dale Fiene, International Product Development, Inc.
Recommendation: Add the following:

"(see Note 5)" in the boxes of Tables 11(A) and 11(B) containing the words "Power source maximum nameplate rating"

Add a note 5 to "Notes for Tables 11(A) and 11(B)" as follows:

5. Multiple loads shall be permitted to be connected to a single listed Power Source. No single load shall draw more than the power and current shown in Tables 11(A) or 11(B). The Nameplate rating shall reflect the total power and current drawn by the maximum number of loads that the Power Source is listed to supply. Only loads listed for connection to the Power Source may be connected.

Substantiation: The wording of the current standard is limiting with respect to newer technologies that can provide much more capability and provide higher levels of safety in much smaller packages than the typical step-down transformers that the limits were originally written around. Active current limiting can provide much safer control in packages that can provide higher levels of power without compromising safety.

Panel Meeting Action: Reject
Panel Statement: A maximum power source nameplate rating was established in Tables 11(A) and 11(B) to ensure that a transformer or a power supply internal failure will not permit more than the rated output of the power source. The maximum current for a small voltage application (0 through 30 volts) is 8 amps. Imax is located in the Notes below the table and is the maximum output current under any non-capacitive load, including short circuits, with any overcurrent protection bypassed, if installed in the circuit. If a transformer is used, the current limitation must not exceed that value after one minute of operation. This permits stabilizing of the current during start-up of the transformer and any internal transformer saturation of the core. The notes at the bottom of the Tables have additional current limitations. There was no technical substantiation provided to make changes to these levels or to accept a new note relaxing these long-established rules.

Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

1-167 Log #3468 NEC-P01 **Final Action: Reject**
(Chapter 9, Table 13)

Submitter: Richard F. Van Wert, Middle Department Inspection Agency / Rep. Benjamin Franklin Chapter IAEI
Recommendation: Revise table to read:

Chapter 9 Table 13
3 m 10 ft
7.5 m 25 ft
15 m 50 ft
30 m 100 ft
etc. etc.

Substantiation: Soon enough the metric system of measurement will be the only measurement system used. A complete and comprehensive conversion chart is needed now.

Panel Meeting Action: Reject
Panel Statement: The Code uses two measurement systems, SI and inch-pound. Since dual dimensions are used throughout the text and in other tables, there is no need to add a conversion table in Chapter 9.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ANNEX A

1-168 Log #2450 NEC-P01 **Final Action: Accept in Principle**
(Annex A)

Submitter: Eliana Beattie, ISA
Recommendation: Annex A

Change ISA S12.23.01 to ANSI/ISA-60079-18 (12.23.01)-2005.
Change ISA 12.0.01 to ANSI/ISA-60079-0 (12.00.01)-2005.
Change ISA S12.16.01 to ANSI/ISA-60079-7 (12.16.01)-2002.
Change ISA S12.22.01 to ANSI/ISA-60079-1 (12.22.01)-2005.
Change ISA S12.25.01 to ANSI/ISA-60079-5 (12.25.01)-1998.
Change ISA S12.26.01 to ANSI/ISA-60079-6 (12.26.01)-1998.
Change ISA S12.12 to ANSI/ISA-12.12.01-2000.

Substantiation: Change format to match actual ISA standards numbering.
Panel Meeting Action: Accept in Principle
Panel Statement: The panel accepts the change of ISA S12.12 to ISA-12.12.01-2000. The panel concludes that the action on 1-169 addresses the submitter's intent on the other documents.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-169 Log #2794 NEC-P01 **Final Action: Accept**
(Annex A)

Submitter: Sonya M. Bird, Underwriters Laboratories Inc.
Recommendation: This proposal is made to:
(1) Update the following standard titles and designations:
(a) Conduit, Tubing, and Cable Fittings, UL 514B - Update title and re-position in the Annex based on the new tittle.
(b) Electric Sign Components, UL 879 - Update title and re-position in the Annex based on the new title.
(c) Electrical Intermediate Metal Conduit - Steel, UL 1242 - Update title and re-position in the Annex based on the new title.
(d) Electrical Rigid Metal Conduit - Steel, UL 6 - Update title and re-position in the Annex based ont he new title.
(e) Gas-Tube-Sign Cable, UL 814 - Update title.
(f) Optical Fiber and Communication Cable Raceway, UL 2024 - Update title.
(g) Schedule 40 and 80 Rigid PVC Conduit and fittings, UL 651 - Update title.
(2) Remove the generic reference to the UL 60079 series of standards addressing Electrical Apparatus for Explosive Gas Atmospheres, and replace it with reference to the 8 specific parts of the standards. Each of these parts is co-published with ISA, and the references are to both the UL and the ISA designations.
(3) Replace the reference to UL 486A (wire connectors and soldering lugs for use with copper conductors) and UL 486B (wire connectors for use with aluminum conductors), and replace them with a combined reference to the single UL standard addressing all wire connectors, UL 486A (wire connectors and soldering lugs for use with copper conductors) and the single UL standard addressing all wire connectors, UL 486A-486B, wire Connectors.
(4) Replace the former reference to UL 62, previously addressing both flexible cord and fixture wire, with references to the 2 unique standards, UL 62, Flexible Cords, and UL 66, Fixture Wire.
(5) Add reference to UL 60947-1, Low-Voltage Switchgear and Controlgear, Part 1: General Requirements, and the existing UL 508, Industrial Control Equipment Standard. These two IEC-based UL standards incorporate the international requirements with relevant national differences based on UL 508.
(6) Add reference to UL 60950-21, Safety of Information Technology Equipment, Part 21: Remote Power Feeding, for specific requirements associated with the general requirements already referenced in UL 60950-1.
(7) Add reference to the following UL standards in order to reflect the product listing requirements of the NEC, and to reflect those standards that are suitable for evaluating products and identifying these for a particular purpose within the NEC (listing for these product safety standards is one mechanism for meeting the requirement that a product be identified for a particular purpose):
(a) UL 514D, Cover Plates for Flush-Mounted Wiring Devices
(b) UL 1459, Telephone Equipment
(c) UL 1573, Stage and Studio Lighting
(d) UL 1642, Lithium Batteries
(e) UL 1666, Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
(f) UL 1989, Standby Batteries
(g) UL 1993, Self-Ballasted Lamps and Lamp Adapters
(h) UL 2075, Gas and Vapor Detectors and Sensors
(i) UL 2108, Low Voltage Luminaires
(j) UL 2196, Fire Resistive Cables
(k) UL 2239, Hardware for the Support of Conduit, Tubing and Cable.
(8) Add reference to UL 1640, Portable Power Distribution Units, to correlate with a proposed addition of a FPN and corresponding reference to UL 1640.
Substantiation: Annex A, Product Safety Standards, is proposed to be updated in order for the annex to reflect the most recent product standard designations and names for those UL standards that are currently referenced. Additionally, changes to the Annex are needed in order to reflect the product listing requirements of the NEC, and to reflect those standards that are suitable for evaluating products and identifying them for a particular purpose within the NEC. Listing to these specific product safety standards is one mechanism for meeting the requirement that a product be identified for a particular purpose.
Note: Supporting material is available for review at NFPA Headquarters.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-170 Log #3605 NEC-P01 **Final Action: Reject**
(Annex A)

Submitter: Robert Alexander, Laguna Hills, CA
Recommendation: Add the following after the first paragraph:
Inclusion in this list should not imply that the referenced products are always required to be listed nor that generic references to certain classes of equipment apply to all equipment of that class.
Substantiation: For example, as of the date and time of this Proposal (November 4, 2005/ 2:45pm EST) General Purpose Electric Motors are not listed. Note the reference to Electric Motors is somewhat misleading. The UL Standard for General Purpose Electric Motors is UL1004B, rather than UL1004. As of this moment no products are listed under that Standard nor does the NEC require it.
Panel Meeting Action: Reject
Panel Statement: The first sentence of the annex states: "Annex A is not a part of the requirements of this NFPA document, but is included for informational purposes only." Requirements for equipment listing, where applicable, appear within the individual articles for different types of equipment. In addition, "should not imply" is not acceptable Code language as defined in Section 3.1 of the NEC Style Manual.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-171 Log #3653 NEC-P01 **Final Action: Reject**
(Annex A through G)

Submitter: Kevin McCall, Local Union #98 IBEW
Recommendation: This Annex provides particular informational requirements of this NFPA document and may be used for informational purposes and may be specially adopted by the local jurisdiction adopting the National Electrical Code.
Substantiation: The Annexes provide information and Article section references which are considered requirements of the NFPA document. There should be clarity expressed why required article sections are considered informational purposes.
Panel Meeting Action: Reject
Panel Statement: CMP-1 concludes that Annexes A and G are clear in their intended purpose and that they comply with the NEC Style Manual, Section 3.3.4, for word clarity. The submitter's proposed language adds no clarity and is in violation of Section 3.1.1 of the Manual by use of the word "may." The submitter has not provided the specific locations for the recommended changes or proposed text as required by 4.3.3(b) and (c) of the NFPA Regulations Governing Committee Projects. The concerns of the submitter appear to be addressed in the first paragraphs of Annex A. Annexes B through F are not under the jurisdiction of CMP-1.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

ANNEX C

8-205 Log #1475 NEC-P08 **Final Action: Reject**
(Annex C)

Submitter: Ryan Jackson, West Valley City, UT
Recommendation: Rename the term "fixture wires" to "luminaire wires" in Annex C.
Substantiation: With the changing of the term "fixture" to "luminaire" it only makes sense that the term "fixture wires" be changed to "luminaire wires".
For the purposes of correlation, this proposal is also being submitted to the following Articles/Sections/Tables/Annexes: 200.6; 210.19; 210.20; 210.24; 240.4; 240.5; 300.17; 310.1; 314.16; Article 402; 517.74; 660.9; Table 1; Table 5; Annex C.
Panel Meeting Action: Reject
Panel Statement: See panel action and statement on Proposal 8-199.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

8-206 Log #827 NEC-P08 **Final Action: Reject**
(Table C.8)

Submitter: Dale Smuck, Martin Riley Architects/Engineers
Recommendation: Table 8 - Type THHN/THWN/THWN-2 35 (1 1/4) number of conductors should read 3 not ~~4~~ .
Substantiation: Using Table 5 for size 1 THHN/THWN/THWN-2 and Table 4 Article 344 RMC - over 2 wire 40 percent 4 number 1's exceed the conduit fill for 35 mm (1 1/4) conduit size.
Panel Meeting Action: Reject
Panel Statement: When using the Notes to Tables in Chapter 9, Note 7 of Table 1 applies. When calculated, the result is 3.9, which is rounded to 4.
Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

2-361 Log #154 NEC-P02 **Final Action: Accept**
(Annex D)

TCC Action: The Technical Correlating Committee understands that the Panel Action was to revise the text in Example D4(a) in Annex D, and that similar revisions should be made following "20 ranges" in the same Example, for consistency.
Submitter: Joseph Penachio, Joe Penachio Electrician
Recommendation: Revise as follows:
Range Load: 10 ranges (not over (~~less than~~ 12 kVA) (see Col. C, 25,000 VA Table 220.55)
Substantiation: Less than 12 kVA indicates that a 12 kVA range is not in column C. Column C states ranges "Not over 12 kW rating" indicating that a 12 kVA range is included in Column C.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

2-362 Log #135 NEC-P02 **Final Action: Reject**
(Annex D)

Submitter: Paul Hamann, Lake Forest, IL
Recommendation: Calculate the actual connected lighting load. (8500 VA) Determine the appropriate minimum lighting load from Table 220.3(A). (3VA x 3000 square foot building = 9000 VA).
Select the larger value and multiply by 1.25 for the continuous general lighting load. (9000 VA x 1.25 = 11250 VA)
Substantiation: If the connected lighting load was 8999 VA, then the minimum lighting load from Table 220.3(A) would be used. (9000 VA)
If the connected lighting load was 9001 VA then 125% of the actual connected lighting load would be used. (9001 x 1.25 = 11251 VA)
The problem is that the 1.25 factor is only used when the actual connected lighting load is used.
The example above illustrates that, when 2 VA is added, the lighting load increased by 2251 VA. (11251 - 9000 = 2251)
Panel Meeting Action: Reject
Panel Statement: The proposal does not comply with 4.3.3(c) of the NFPA Regulations Governing Committee Projects in that it does not specifically indicate what text is to be deleted and what text is to be added.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

3-275a Log #CP303 NEC-P03 **Final Action: Accept**
(Annex A)

Submitter: Code-Making Panel 3,
Recommendation: Add the following to Annex A:
Circuit Integrity (CI) cable------ Subject 1724, Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems
Circuit Integrity (CI) cable ----- UL 2196, Tests of Fire Resistive Cables
Substantiation: Adding UL 2196 and Subject 1724, Outline of Investigation, to the annex will provide the user of the Code with two different documents with which to determine product safety for circuit integrity cable.
Panel Meeting Action: Accept
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

2-363 Log #3169 NEC-P02 **Final Action: Accept**
(Annex D, Example D3)

Submitter: Wally Harris, Atlantic Inland Inspections
Recommendation: Add text reference as indicated by underlined type to "Continuous Loads" section of calculation as follows;
Show Window Lighting Load
30 ft at 200 VA per ft [see 220.14(G)]
Substantiation: This proposal will be yet another change that would make it easier for Code users to arrive at the proper reference for calculation requirements.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

11-114 Log #3655 NEC-P11 **Final Action: Reject**
(Annex D Example D 8)

Submitter: Kevin McCall, Local Union #98 IBEW
Recommendation: Conductor Ampacity
Determine the minimum required conductor ampacity for three induction type motors on a 480 VCH, 3 phase feeder. The full-load current value used to determine the minimum required conductor ampacity is obtained from (Table 430.250) for the squirrel-cage motor and the primary of the wound-rotor motors
For the 25 horsepower motor,
34A (As of Table 430.250)
For the 30 horsepower motor
40A (as of Table 430.252)
40A x 1.25 = 50A (As of 430.24 and Table 430.250)
Total Several Motor Load Ampacity = 124 amperes.
Substantiation: To provide clarity and adequate example with proper reference to Articles, Sections and Tables of NFPA 70.
Panel Meeting Action: Reject
Panel Statement: The panel is uncertain as to the intent of the proposal, and the submitter's direction for change is not clear and has incorrect references.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

11-115 Log #3654 NEC-P11 **Final Action: Reject**
(Annex D, Example D8)

Submitter: Kevin McCall, Local Union #98 IBEW
Recommendation: Conductor Ampacity
The full-load current value vied to determine the minimum required conductor is obtained from 430.750 [see 430.6(A)] for the squirrel-cage motor and the secondary of the wound motors. To obtain the minimum required conductor ampacity, the full-load current is multiplied by 1.75 [see 430.22 and 430.23]
For the 25 horsepower motor,
34A x 1.25 = 42.5A (As of Table 430.250 and 430.22)
For the 30 horsepower motor
65A x 1.25 = 81.25A (As of 430.23)
[Add: secondary of the (words not readable) maker [Delete: 40A x 1.25 = 50A]
Substantiation: To provide clarity and adequate example with proper reference to Articles, Sections and Tables of NFPA 70.
Panel Meeting Action: Reject
Panel Statement: The panel is uncertain as to the intent of the proposal, and the submitter's direction for change is not clear and has incorrect references.
Number Eligible to Vote: 15
Ballot Results: Affirmative: 15

ANNEX G

1-172 Log #535 NEC-P01 **Final Action: Reject**
(Annex G 80.13(15))

Submitter: William Torres, Ludvik Electric
Recommendation: Revise text to read:
80.13(15) ~~The authority having jurisdiction shall be permitted to waive specific requirements in this code or permit alternative methods where is assured that equivalent objectives can be achieved by establishing and maintaining effective safety.~~ Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency and that the system, method, or device is approved for the intended purpose.
Substantiation: This section of the National Electrical Code 2002 edition seems to be contradicting to the standards of code. As electricians, we are required to perform our duties under the requirements of the National electrical Code. When these requirements are altered according to different interpretations of code by different authorities, it is inconsistent. The authority having jurisdiction being Federal, State or local should all be under the same requirements with no exceptions for alterations.
Panel Meeting Action: Reject
Panel Statement: It is not the purpose of the NEC to suppress emerging technology. See Section 90.4, in which the authority having jurisdiction has the authority to waive specific requirements or permit alternative methods. A number of states and municipalities have adopted laws which waive specific requirements, permit alternative methods, or impose additional requirements. Annex G is for informational purposes and is not a part of the requirements of the NEC unless specifically adopted by the local jurisdiction adopting the NEC.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

1-173 Log #1659 NEC-P01 **Final Action: Reject**
(Annex G 80.90(D))

Submitter: Joe Tedesco, Boston, MA
Recommendation: Existing Electrical Systems:
(1) The Home Inspector shall observe:
(a) The exterior of the exposed service entrance conductors.
(b) Readily accessible Service equipment, grounding equipment, main over current device, main and distribution panels.
(c) Amperage and voltage ratings of the service.
(d) The exterior of the readily accessible exposed branch circuit conductors, their over current devices, and the compatibility of their ampacities and voltages.
(e) The operation of a representative number of permanently installed lighting fixtures, switches and receptacles located inside the house, garage, and on its exterior walls.
(f) The polarity and grounding of all three-prong receptacles within six feet of interior plumbing fixtures and all readily accessible nondedicated receptacles in the garage and on the exterior of inspected structures.
(g) The operation of Ground Fault Circuit Interrupters.
(2) The Inspector shall report on the following:
(a) The size and the voltage of the main service disconnect (30, 60, 100, 125, 150 and or 200 amp, other service, 120, 120/240, 120/208-volt system).
(b) Service entry conductor materials (copper and or aluminum, if aluminum are the tips coated with a corrosion inhibitor and is the over load device rated for the use of aluminum wire).
(c) Service type as being overhead or underground.
(d) The number of branch circuits in the panels.
(e) The type of branch circuit conductor materials (copper and or aluminum, if aluminum are the tips coated with a corrosion inhibitor and is the over load device rated for the use of aluminum wire).
(f) The compatibility of the overload protective devices and the size of the protected conductor.
(g) The type of branch circuit wiring (BX, conduit, Romex, knob and tube, wire mold, other).
(h) If there is ground fault protection provided.
(i) If the system is grounded.
(3) The Inspector is not required to:
(a) Collect engineering data on the compatibility of the disconnects and individual circuit breakers with the panel and or determine the short circuit interrupting current capacity. (Engineering services).
(b) Determine and or report on the adequacy of the in place systems to provide sufficient power to the dwelling, or reflect on the sufficiency of the electric distribution system in the dwelling (Engineering services).
(c) Insert any tool, probe, or testing device inside the panels.
(d) Test or operate any over current device except Ground Fault Circuit Interrupters.
(e) Dismantle any electrical device or control other than to remove the covers of the main and sub-distribution panels, if readily accessible and not painted in place.
(f) Observe and or report on:
The quality of the conductor insulation. (Electrical Services).
Test for Electro-Magnetic fields. (Electrical Services).
Low voltage systems, door bells.
Smoke detectors (Seller’s responsibility).
Telephone, security alarms, cable TV, intercoms, or other ancillary wiring that is not a part of the primary electrical distribution system.
Substantiation: This information should be available for the public to review and to make the Home Inspection Community follow rules that will lead to electrical safety.
Panel Meeting Action: Reject
Panel Statement: The Electrical Inspection Code for Existing Dwellings, NFPA 73 is available to the home inspection community. The suggested subject matter is not within the stated purpose of Annex G, Article 80. The proposal does not contain substantiation as required by 4.3.3(d) of the Regulations Governing Committee Projects.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

FORM FOR COMMENTS FOR 2008 NATIONAL ELECTRICAL CODE®

INSTRUCTIONS PLEASE READ CAREFULLY	
Type or print **legibly** in **black** ink. Use a separate copy for each comment. Limit each comment to a **SINGLE** section. All comments must be received by NFPA by **5 p.m., EDST, Friday, October 20, 2006**, to be considered for the 2008 National Electrical Code. Comments received after 5:00 p.m., EDST, Friday, October 20, 2006 will be returned to the submitter. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.	LOG # Date Rec'd: Office Use Only

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1. Section/Paragraph_______________________________________

2. Comment on Proposal No. (from ROP): ________________

3. Comment recommends: (check one) ☐ new text ☐ revised text ☐ deleted text

4. Comment (include proposed new or revised wording, or identification of wording to be deleted): (Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (<u>inserted wording</u>) and strike-through to denote wording to be deleted (~~deleted wording~~).____

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5. Statement of Problem and Substantiation for Comment: (Note: State the problem that will be resolved by your recommendation; give the specific reason for your comment including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.) ____

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